

FINAL MINUTES OF CEOS SIT-35 - 25-26 March 2020

Executive Summary

1. A list of candidate **COAST pilots** is being developed, with the selection of 1-2 pilots and presentation of an Implementation Plan to take place at CEOS Plenary.
2. **COAST** and **GEO Blue Planet** are positioned to develop requirements for **SDG Indicator 14.1.1**.
3. **SDG AHT** presented a **proposal for three subteams** for the three selected Indicators. CEOS Agencies have been asked to nominate individuals to contribute/co-lead these subteams.
4. **SDG AHT** will develop options for continuity of CEOS support to the SDGs for discussion at TW, in preparation for a Plenary decision. Options include: renewing the AHT with revised TORs; dissolve the AHT with CEOS other entities absorbing the planned tasks; and, dissolve the AHT and leave CEOS Agencies join relevant GEO activities (no CEOS coordination).
5. WMO affirmed the importance of the key **GCOS documents and processes**. The future governance of GCOS will be finalised in 2023. CEOS will continue to follow the GCOS reorganisation efforts closely.
6. SIT recognised the significance of the **CEOS Biomass Protocol** work and looks forward to considering a business case for CEOS agency support for biomass reference sites at the SIT TW.
7. JAXA and ESA will explore the development of a **CEOS AFOLU Roadmap** and determine whether there is critical mass of support and contributions amongst CEOS agencies. The Roadmap will follow the model of the GHG Roadmap and focus on data products in support of the Global Stocktake.
8. A final version of the **External Request Process Paper** will be presented for Plenary endorsement.
9. Dialogue around **CEOS ARD activities beyond land** was continued, with interaction with the **COAST pilots** and **COVERAGE** being promising ways forward.
10. Engaging the **private sector early before ARD standards are defined**, and promoting **complementarity** between government and private sector datasets should be considered.
11. **CEOS** should identify **representatives** on each of the new **GEO Working Groups**.
12. **GEO Secretariat** flagged strong interest in **CEOS support on data cube instances and SDGs**.
13. **GEO Secretariat** asked CEOS Agencies to consider supporting **GEOGLAM** and **GFOI** via the CEOS LSI-VC subgroups.
14. SIT Chair Team will continue with its **engagement plan for CEOS Working Teams** via: Working Team All-Hands calls; the new VC reports to CEOS SEC; and informal working telcons with VC Co-Leads.
15. CEOS community is encouraged to utilize the **CEOS Deliverables Tracking Tool** fully in updating their Deliverables in order to help support the **sustainability of the CEOS Work Plan**.
16. **Draft Work Plan for review** is expected by 15 April 2020 with **virtual endorsement** by 15 May.
17. The **GEOSS Water Strategy is on hold** which means the **CEOS Water Strategy** is also impacted. CEOS is encouraged to **support water-related aspects** of the **SDGs, Paris Agreement, and Sendai Framework**, and related GEO activities (e.g., **AquaWatch, GEOGLOWS, Blue Planet, GEO Wetlands**).
18. Strong support from SIT for the **implementation** of the vision defined in the **SST-VC White Paper**.
19. Links between **WGDIsasters** and **commercial data providers** around **ARD** were identified as a possible area for engagement. Whether within the ARD discussion or not, CEOS should give more consideration to access to commercial data.
20. **GTOS** will be **reinstated** as an Associate Member of CEOS.
21. A **proposal for CEO continuity** was presented and will be followed up by NASA and ISRO.
22. The **2020 SIT TW will be planned as a virtual-only** event.

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Wednesday March 25th

Session 1: Opening; COASTS; SDGs; SEO Report

1.1: Welcome and Introductions [[PPT](#)]

Presenters: Alex Held (CSIRO), Adam Lewis (GA), SIT Co-Chairs

Main points:

- Alex thanked everyone for joining and for supporting the shift to a virtual meeting for such a major and complex CEOS meeting.
- Alex reviewed the meeting plan and the three main priorities of the CSIRO/GA SIT Chair Team for 2020-2021, which will all feature throughout SIT-35: ARD, Carbon & Biomass, SDGs.
- Adam thanked everyone for their patience as SIT-35 moved quickly from a physical to a virtual meeting. He thanked all for joining and bringing the requisite broad technical expertise needed to carry out this meeting.

1.2: CEOS Coastal Observations and Applications Study Team (CEOS-COAST) Update [[CEOS COAST](#)]

Presenter: Paul DiGiacomo (NOAA), COAST Study Team lead

Main points:

- CEOS-COAST was first discussed at the SIT Technical Workshop (SIT TW) in Fairbanks. At CEOS Plenary 2019 a 12 month initial term (Phase 1) was agreed, calling for a Work Plan to be submitted by December 2019, and a progress report at SIT-35.
- The objective is to define a CEOS approach for coastal observations addressing the unique issues presented by these regions, bridging land, atmosphere and water.
- The focus is on the downstream value chain, users, and engaging stakeholders from the start. CEOS-COAST represents a potential contribution to the Decade of Ocean Science on behalf of CEOS.
- The team is very active, having held several telecons including multiple CEOS entities (WGs, VCs) and agencies, and including GEO Aquawatch and Blue Planet participants.
- A list of potential pilot projects has been developed based on interest of contributing agencies and entities. This will be reduced to a short list, and then Implementation Plans will be developed and presented at Plenary. This represents the end of Phase 1. Phase 2 (Q4 2020-Q3 2021) is the implementation phase for these pilots. Phase 3 follows with a user/stakeholder engagement focus (Q4 2021-Q3 2022).
- The pilot projects are categorised under four themes: coastal characterization and mapping; coastal disasters/hazards; coastal ecosystems/water quality/habitat; and, cross-cutting products, tools and services.
- A joint GEO-CEOS Coastal Workshop prospectus will also be developed in Phase 1 (Spring-Summer 2021 is the target for this).

Main discussion points:

- Adam Lewis (GA, SIT Co-Chair) asked for further details on criteria for pilot selection, and the potential for implementation resources. Paul noted selection has looked at existing resources in agencies, noting best effort nature.
- Ivan Petiteville (ESA) noted there are currently numerous activities that use non-ARD products, and the focus should not only be on ARD products as. ARD does enable uptake by non-experts, but development of new ARD specifications by the coastal community will take time, as will operational generation of these products.
- Steve Volz (NOAA) noted a mix of archival observations and also operational ones, and asked if COAST will look at a mix of both. Paul said yes, noting that one of the fundamental points of interest is change over time which requires a good archival baseline.

- Ake Rosenqvist (JAXA) asked whether COAST pilots could be ongoing activities or are preferably new initiatives. Paul replied that a mix of both would be workable.
- Mark Dowell (COM) asked if the team considered asking UNESCO-IOC upfront for priorities in the context of Decade of Ocean Science, i.e. make our priorities to be user-driven from outset. Paul noted they have done this through Blue Planet, and are seeking this kind of input from the outset.
- Jörg Schulz (EUMETSAT, WGClimate Chair) suggested that WGClimate's ECV Inventory might be a good resource for the pilots to look for the existing climate products.
- Ken Casey (NOAA) noted that COAST is a good opportunity to explore ARD using a cross-domain approach. He noted that in WGISS they are discussing a number of different tools, technologies, and approaches that could support COAST.
- Raj Kumar (ISRO) noted that a lot of what is being proposed for the pilots will build upon existing work in CEOS Agencies around water, disaster management, etc. and will in turn help to improve these foundations.
- Ken Holmlund (EUMETSAT) asked how COAST is addressing rivers and river outflows, and Paul noted these are referred to in the main priorities for the pilots.
- Sandra Cauffman (NASA, Principal) asked how COAST is addressing resilience, noting that WGDIsasters has proposed a pilot study in the context of this CEOS working group. Paul noted the disaster pilot is building on the GEO-LEO work, and this has been expanded adding SAR products. The intention is to build on this activity and apply it to coastal zones. He noted the target is 4-5 different regional case studies, ideally hitting the ground running based on tailoring past CEOS work for coasts.
- Doug CRIPE (GEO Secretariat) noted the GEO Secretariat is developing a Resource Mobilization strategy which will target projects with concrete deliverables. They will be looking to see how the CEOS-COAST pilot projects could fit into the resourcing matrix being developed.

Decision 01

Strongly recognised the substantial progress on the CEOS COAST study. The COAST Study Team will take on board the discussion from SIT-35, which included views on prioritisation of projects and on ARD.

1.3: Sustainable Development Goals (SDG)

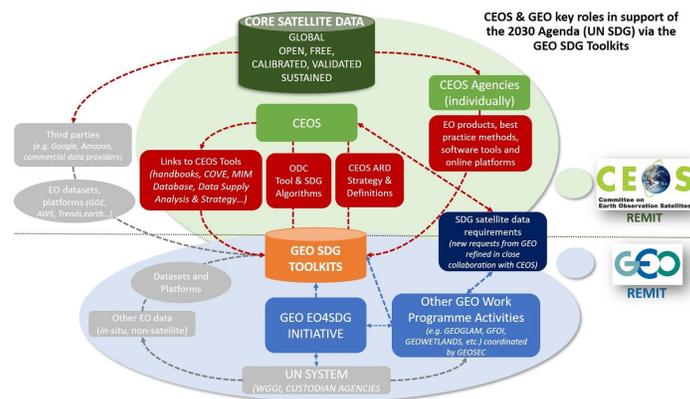
Priority Indicators [\[PPT\]](#)

Presenter: Alex Held (CSIRO), SDG *Ad Hoc* Team Co-Lead

Main points:

- The CEOS role on sustainable development seen as: overcoming data access issues; being a space enabler for SDG monitoring and overall; undertaking data supply and analysis strategy; and, listing and promoting core missions that are providing the data necessary for SDG reporting.
- To date the *Ad Hoc* Team (AHT) has: put out publications such as EOHB; participated in various UN fora around EO and SDGs; connecting with the science community through journal contributions; achieved recognition by the UN governance system on SDGs (rep at the IAEG-SDGs WGGI); and, participated in technical events and panels at GEO (including at the 2019 GEO Ministerial SDG high level side event).
- There has been increasing collaboration with GEO including supporting EO4SDG with GEO SDG Toolkits and their 'Federated approach' concept notes, and interactions with GEO Secretariat.
- A key output of the AHT has been the development of SDG satellite data requirements tables, with one listing CEOS core missions for SDGs, and makes a start at adding requirements.
- The AHT has recognised the cross-cutting nature of SDGs, and is further engaging across CEOS entities with this in mind, in particular with the SEO and WGCapD

- There has been a focus on three SDG Indicators to help narrow scope of work: 6.6.1, 11.3.1, 15.3.1. Though the long term intention is to address a broader set of Indicators. These three were selected due to their obvious link to EO uptake and following the Inter-agency and Expert Group on SDG Indicators Working Group on Geospatial Information (IAEG-SDGs WGGI) suggestions. Satellite Earth observations have been recognised by a number of SDG Custodian Agencies (e.g. within the United Nations) in their Indicator monitoring guidelines.
- More SDG Indicators are being analysed by GEO Blue Planet/NOAA/EC (14.1.1), GEOGLAM/NASA (2.4.1) and the SDG AHT as well as CEOS Agencies with existing activities will engage on these too. Though the proposal is not that all activities need to be funnelled through the SDG AHT (e.g. CEOS Agencies interacting directly with the UN), but it is helpful for SDG-AHT to be aware of these efforts.
- The AHT is interested in feedback on what the future of CEOS activity on SDGs looks like, feedback on efforts to date (e.g., link to GEO), and targets for the rest of the year.



Main discussion points:

- Ivan Petiteville (ESA) thanked the SDG AHT, stressed that SDGs represent a great opportunity to enlarge the user base for EO including the UN agencies and the National Statistical Agencies, and noted there is a lot to gain for CEOS Agencies. He noted the three Indicators currently in focus have many activities ongoing in CEOS Agencies already, and is a good opportunity to promote these collectively through the SDG AHT. There is also a good opportunity to make a positive impact with CEOS external partners. Ivan and ESA encourage all CEOS Agencies to consider joining the SDG AHT sub-teams where their activities are relevant.
- Steve Volz (NOAA) questioned the team about whether options have been considered about the trajectory for what will happen to the SDG AHT long term (e.g. will it become a Working Group or other)
- Kauo Tachi (JAXA) has already expressed its interest in contributing to the 6.6.1, 11.3.1 and 15.3.1 Indicator activities. They also cited Global Mangrove Watch activity using satellite data, including from JAXA, has been adopted by the UN Custodian agency (UNEP) working on this SDGs.
- Simonetta Cheli (ESA, Acting Principal) suggested that operations ready data and ARD as main contributions to SDGs may be too restrictive. She stressed that an essential role for CEOS in supporting the SDGs is providing access to EO data, including free and open data. She reiterated that ESA would like to see stronger engagement from the space agencies.
- Mark Dowell (COM) provided a recent update, noting that Mauro has received a letter from UNEP. They are already using the Copernicus Water Extent product for Indicator 6.6.1, and are now starting to implement Copernicus products for inland waters. UNEP is asking Copernicus to provide these products for the next ten years. Mark stressed that custodian agencies are looking for very long-term data to build Indicator datasets.
- Mauro Facchini (COM) added that Copernicus is seeing increased links with the EU Statistics Division, and they are approaching the Copernicus team more frequently regarding EO. It is clear that the message around the role EO can play in Indicator monitoring is getting through.

- Adam Lewis (GA, SIT Ch-Chair) noted that in order for statistical agencies to build reporting programs based on EO data streams, an assurance of continuity is necessary.
- P G Diwakar (ISRO) highlighted the work that ISRO is doing with UNESCAP for the Asia-Pacific region, and noted the potential for EO to play a big role in action plans for Asia-Pacific countries. ISRO and many others are engaging in these fora, and Diwakar thinks the CEOS SDG-AHT could engage with UNESCAP too on their 2030 plan. Sandra Cauffman (NASA, Principal) asked if ISRO could share the UNESCAP plan for SDGs.
- Sandra acknowledged the work that has been done by the AHT, but noted that if the SDG AHT is not continued at CEOS Plenary 2020, CEOS need serious consideration about where and how will of the constituent element activities be carried forward within CEOS.
- Douglas Cripe (GEO Secretariat) shared a [presentation](#) which summarises the GEO Secretariat view on the SDGs. The main message is that further progress towards SDGs requires cooperation of CEOS to improve data quality and availability.
- Jorge Del Rio Vera (UNOOSA) shared a report of the UN/Austria workshop on Space for the SDGs organized by the United Nations Office for Outer Space Affairs and the Government of Austria: <https://cms.unov.org/dcpms2/api/finaldocuments?Language=en&Symbol=A/AC.105/1196>.

Update on Broader CEOS SDG Activity and Links to GEO [PPT]

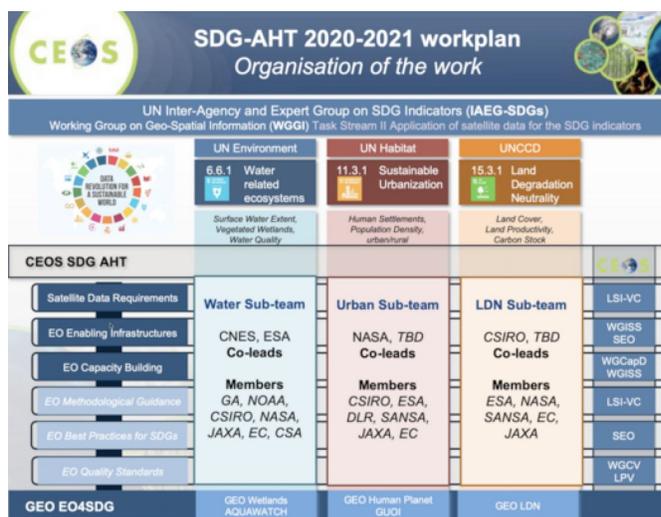
Presenter: Marc Paganini (ESA, SDG Co-Lead)

Main points:

- Marc reviewed the ‘cardinal requirements’ for the SDG AHT and the three target Indicators.
- CEOS activities on SDGs and deliverables will be embedded in the GEO Federated Approach on SDGs and related work flows. GEO’s SDG Toolkits will provide custodian agencies with practical guidance, and information on data and tools, etc. Expected inputs to Toolkits include:

| CEOS Core Products | CEOS Agencies Products |
|---|--|
| <ul style="list-style-type: none"> ▪ Analysis Read Data (ARD) specifications ▪ Open Data Cube (ODC) workflows for SDGs ▪ Satellite Data Supply Analysis (in partnership with the GEO thematic initiatives) | <ul style="list-style-type: none"> ▪ EO Methodological Guidance / Best Practices ▪ EO Global and Regional datasets ▪ EO Enabling Infrastructures (tools and platforms) ▪ Capacity Building / Training material |

- The core function of CEOS is supply of relevant and continuous EO data. This work will be captured in the data supply strategy that is currently being worked. With the SEO support, we have compiled a list of core missions for the focus SDG Indicators and a table of satellite data requirements for each of the target indicators.
- Marc outlined the work SDG-AHT is undertaking with WGCapD. Of particular note is the Space Capacity Development Advisory Board (SCDAB).



Main discussion points:

- Steve Volz noted it remains unclear on what will be put forward at CEOS Plenary, i.e. continuation of AHT or alternatives, and this remains a challenge for AHT to bring potential solutions to the SIT TW. Alex agreed, noting they are struggling to find the right model, but remain keen for CEOS to support GEO, have a link to the SDG process, and have a link to the specific actions and activities are done across CEOS groups. He agreed this is a challenge to streamline, and needs more discussions. Marc noted the three options outlined in the closing slide of [Alex's presentation](#).
- Selma (CNES, Principal) agreed with Marc that there are some key objectives for CEOS around data supply and defining requirements, and these should be progressed before the next Plenary. She noted CNES will strongly support these activities.
- Ivan (ESA) noted Steve’s comments, and that a big part of the initial effort has been around determining the needs of the user community on the three Indicators. For example, the experience through GEO with UNEP in translating needs to observation requirements . On options going forward, he agreed that a Working Group with the three subgroups is one option, but this depends on the level of activity and engagement of the various CEOS Agencies. There is a need to confirm the names of agency staff that will be represented in each of the subgroups.
- Raj Kumar (ISRO, CEOS Chair Team) noted that ISRO would like to be involved in 6.6.1 and 15.3.1, and that they have existing related activities and contributions (including to UNCCD). The SDG AHT would welcome the nomination of names and contact individuals from ISRO and all CEOS Agencies engaged.

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| SIT-35-01 | CEOS Agencies are invited to consider nominations for representatives and co-leads for the SDG <i>Ad Hoc</i> Team subgroups (with Water, Urban and Land degradation focus) and to share agency activities of relevance to the AHT efforts on specific indicators. | April 2020 |
| | <i>Rationale: Request from AHT to confirm level of Agency commitment and engagement.</i> | |
| SIT-35-02 | SDG-AHT to provide an update on agencies and nominees contributing to the Subgroups. | SIT TW 2020 |

Rationale: Agencies are keen to see SDG-AHT progress towards a clear decision on its future at Plenary.

1.4: Systems Engineering Office (SEO) Report [PPT]

Presenter: Brian Killough (NASA), CEOS SEO lead

The main areas of activity for the SEO are as follows:

- **Digital Earth Africa (DE-Africa)** the SEO has been supporting the Landsat data flow until Collection 2 is released, and is also working to engage potential ‘power users’, and perhaps a help desk. The prototyping work the SEO has been supporting under the African Regional Data Cube (ARDC) is being absorbed by the DE-Africa as an operational system.
- **SDG AHT** SEO supports the development of satellite data requirements.
- **Data Flows** working with ESA on promoting Sentinel-1 and Sentinel-2 data supply.
- **GEO technical support** on both their AWS and Google Cloud Grant programs (helping vet submissions).
- **Mission Database** maintained by the SEO is being worked on, including interactions with the MIM team. One key issue is around discovering when missions have been decommissioned, and Brian will be reaching out to agencies on a few missions soon.
- Brian stressed that the SEO can provide support for virtual meetings of CEOS groups via GoToMeeting licences.

Main discussion points:

- Kerry noted that any data cube sandbox activities being undertaken by the SEO can be reflected in the CEOS Work Plan if desired.

Session 2: Climate, Carbon and Biomass; External Requests

2.1 Climate, Carbon and Biomass

Alex Held (CSIRO, SIT Co-Chair) introduced the session, noting that the topic is one of the SIT Chair Team’s priorities.

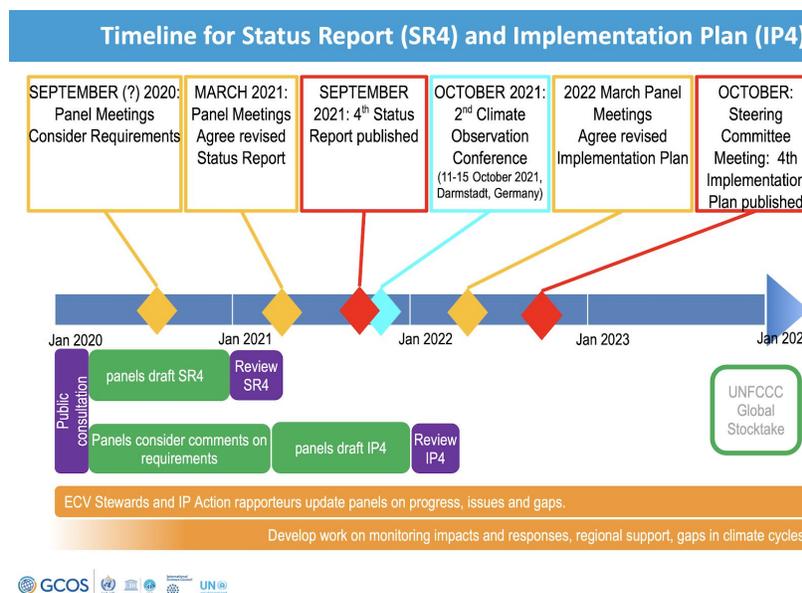
Updates on technical activities: GCOS [PPT]

Presenter: Anthony Rea (WMO)

Main points:

- Anthony stressed WMO’s commitment to GCOS and the frameworks and processes around which space agencies and CEOS have designed considerable effort, including in relation to reporting to UNFCCC & SBSTA.
- As part of WMO cost-cutting and restructuring, the 8 WMO Commissions are being reduced to 2
 - Commission for Observation, Infrastructure and Information Systems (Infrastructure Commission);
 - Commission for Weather, Climate, Water and Related Environmental Services & Applications (Services Commission);
- Study Group being formulated to decide future governance in 2023 timeframe. Meantime in the Infrastructure Dept.
- A WMO GCOS Study Group, including the four co-sponsors and major partners, will consider the future governance arrangements and make proposals in 2023.
- The GCOS Secretariat will be based in the Infrastructure Department reporting to its Director (Anthony Rea) at WMO (previously it was in the Climate and Water Department).

- GCOS Panels will continue and support the review of ECVs, Status Report and IP.
- WMO recognises the importance of GCOS to space agencies; they are looking to exploit the WMO regulatory framework to strengthen GCOS, so it can better meet needs of the community and co-sponsors.
- The key document schedule was shown and is substantially unchanged (COVID-19 delays aside).



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| SIT-35-03 | Anthony Rea (WMO) to provide link to the TORs for the GCOS Study Group for CEOS reference. | ASAP |
| | <i>Rationale: Significant interest in CEOS and agencies on the process by which WMO will revise the GCOS structure and processes.</i> | |

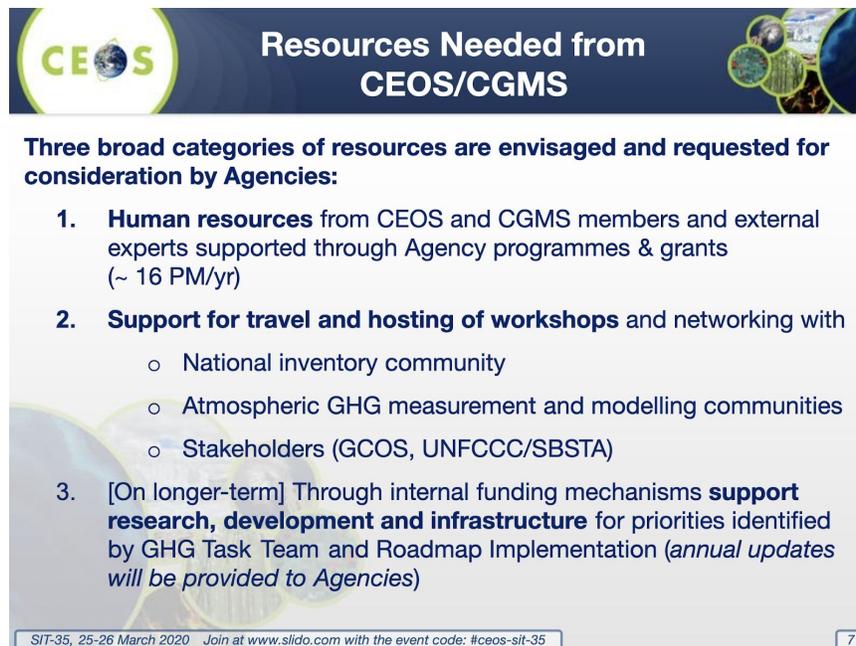
Updates on technical activities: GHG Task Team & Roadmap Status Update [PPT]

Presenter: Mark Dowell (COM) on behalf of David Crisp and Albrecht von Bargaen, with inputs from Jörg Schulz.

Main points:

- GHG roadmap objectives, and table of contents were revisited.
- A mature GHG Roadmap and Project Plan has been developed specifying deliverables, responsible organisations, schedules and resources and covers:
 - o Establishing interfaces with National Inventory community;
 - o Establishing interfaces with stakeholders (UNFCCC/SBSTA & GCOS);
 - o A workshop on synergies and opportunities between GHG and AFOLU Earth Observation communities working in support of UNFCCC (now July 6-9th, 2020);
- This is very much a distributed activity, leveraging lots of existing components. The new task team established under WGClimate is coordinating the various parts. The bulk of the work will happen in VCs, CGMS WGs, CEOS WGs, etc.
- A very constrained timeline is foreseen. Pilot datasets are the key focus for the next few years to initiate dialogue with the user community and inventory community, to build confidence, and learn lessons for the second global stocktake (data needed from 2026 for the stocktake in 2028).

- Resources requested at Plenary remain the same (see slide).



Resources Needed from CEOS/CGMS

Three broad categories of resources are envisaged and requested for consideration by Agencies:

- 1. Human resources** from CEOS and CGMS members and external experts supported through Agency programmes & grants (~ 16 PM/yr)
- 2. Support for travel and hosting of workshops** and networking with
 - o National inventory community
 - o Atmospheric GHG measurement and modelling communities
 - o Stakeholders (GCOS, UNFCCC/SBSTA)
- 3. [On longer-term] Through internal funding mechanisms support research, development and infrastructure** for priorities identified by GHG Task Team and Roadmap Implementation (*annual updates will be provided to Agencies*)

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- The GHG Roadmap is a 'living document' with a draft available for review. It will continue to be refined. The Team plans to continue efforts to:
 - o establish links to national inventory community to refine needs for atmospheric inventories;
 - o enhance links with critical interfaces at GCOS, IPCC and IG3IS following WMO reorganization;
 - o Foster integration of CGMS Working Groups;
 - o Prepare for endorsement of the GHG Roadmap/Project Plan at 2020 Plenary.

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| SIT-35-04 | WGClimate GHG Task Team to coordinate with the CEOS Chair to share the current draft of the Roadmap document with CEOS agencies and to prepare for endorsement of the Roadmap at 2020 Plenary. | April 2020 |
| | <i>Rationale: GHG Roadmap is a living document. A draft is available for review by CEOS agencies and the team has signalled its intent to complete the document by Plenary.</i> | |

Updates on technical activities: WGClimate [PPT]

Presenter: Jörg Schulz (EUMETSAT), WGClimate Chair

Main points:

- NOAA NESDIS is supporting nomination of the new WGClimate vice-chair (Dr Jeff Privette); to be confirmed in writing.
- WGClimate-12 in Japan will be replaced by a virtual meeting in late April.
- First version of GHG Roadmap delivered by the task team.
- The ECV gap analysis and coordinated action plan are delayed - expecting a draft by WGClimate-12 virtual meeting.

- The space agency statement was delivered at SBSTA-51 in Madrid and WGClimate lead and several members successfully participated in the SBSTA Earth Information Day featuring the architecture for climate monitoring from space and the constellation architecture for GHG monitoring in direct interaction with the SBSTA Parties.
- The Joint CEOS/CGMS WGClimate is of the firm opinion that GCOS remains the single voice for climate-related requirements towards space agencies. The current requirements process requires closer interaction of GCOS and WGClimate to make requirements relevant for space agencies, i.e., we should work towards application-specific requirements beyond the classical large scale trend estimation application. Current requirements setting as presented for review in January 2020 is seen as not fully adequate (a coordinated response on this from WGClimate will follow WGClimate#12). WGClimate is open to supporting the GCOS Status Report update based on findings from the ECV Inventory analysis - but closer coordination of the processes will be needed. Participation of GCOS leadership in WGClimate is seen as essential, in particular for the WGClimate#12 meeting

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| SIT-35-05 | WGClimate Chair to follow up with WMO/GCOS on participation in WGClimate#12 and interaction between the ECV inventory analysis and the GCOS Status Report update - with a report back to the SIT TW 2020. | ASAP |
| | <i>Rationale: WGClimate has indicated importance of GCOS representation at WGClimate#12.</i> | |

- ECV Inventory, Gap Analysis and Coordinated Action Plan:
 - o The 2019 version of the web-based Inventory of climate data records (V3) with about 1,300 entries is ready for publication;
 - o Multi-stage gap analysis has been performed and was supported by many agencies. It was nevertheless slow going with contributions arriving up to late December 2019;
 - o Space agencies provide long-term observations for 35 out of 54 GCOS Essential Climate Variables (ECV) (37 being accessible by satellite);
 - o Data access is global, free and open for more than 98% of the data records.
 - o The 2019 Inventory fills previously identified gaps for the ECVs including lightning, sea-surface salinity, above ground biomass, and permafrost - the latter two having significance for the study and analysis of the Earth's carbon cycle;
 - o WGClimate #12 will discuss the plan to reshape the gap analysis work into one workshop-like event, collating experts on ECVs to perform the gap analysis. First is planned for 31/08-04/09 in 2020 at EUMETSAT.

Main discussion points:

- Jörg asked for more detail from WMO on who is involved and what direction the GCOS Study Group will take in the next 2-3 years. Anthony Rea noted that it will be a co-sponsored Group including WMO, IOC and UNEP. There should be scope to include perspectives from the space agencies and from the user side too. Terms of reference are available online and Anthony offered to share a link. The scope of the work is to look at GCOS governance and processes, building on the review done in 2012 - to make sure systems are still fit for purpose and meeting the needs of the co-sponsors. The space agencies' need for a single voice on climate requirements is well heard and understood.
- CEOS Chair Team, Raj Kumar noted that ISRO would be pleased to engage in upcoming WGClimate meetings.

- Sandra Cauffman (NASA, Principal) and Mark Dowell (COM) suggested that CEOS Secretariat consider sending a letter to Carolin Richter to thank her for the significant contributions to CEOS and GCOS over the last decade.

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| Decision 02 | SIT recognised the significant contribution of Carolin Richter in her role as GCOS Director for the past 11 years and will pass on best wishes for her future in a letter from CEOS. |
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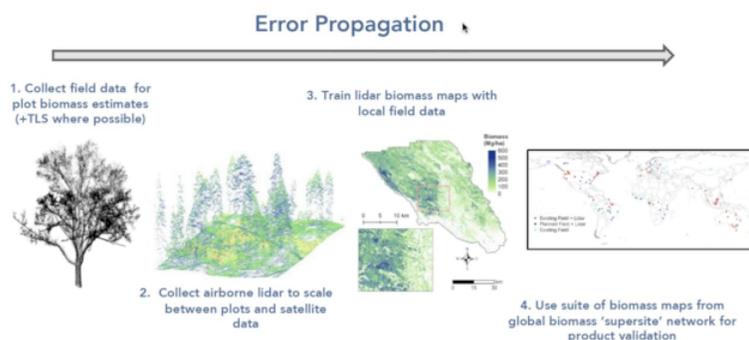
- Akihiko Kuze (JAXA) noted that JAXA is preparing a case study on measurements for various large cities in cooperation with NIES.
- Simonetta Cheli (ESA, Acting Principal) regretted being unable to give the full report from the ESA Ministerial on the many new or proposed European missions that are planned to contribute to the ECVs, in particular the Copernicus High Priority Candidate Missions (HCPMs) such as the CO₂ Sentinel mission. The presentation will be available among the SIT-35 materials.
- Selma Cherchali (CNES, Principal) noted that CNES has been pleased to support the contribution of Carole Deniel to the CEOS-CGMS WGClimate GHG Task Team, and hopes to make additional contributions including on the modelling aspects.

CEOS Biomass Protocol [PPT]

Presenter: Laura Duncanson (University Maryland), CEOS Biomass Protocol Team Lead Author

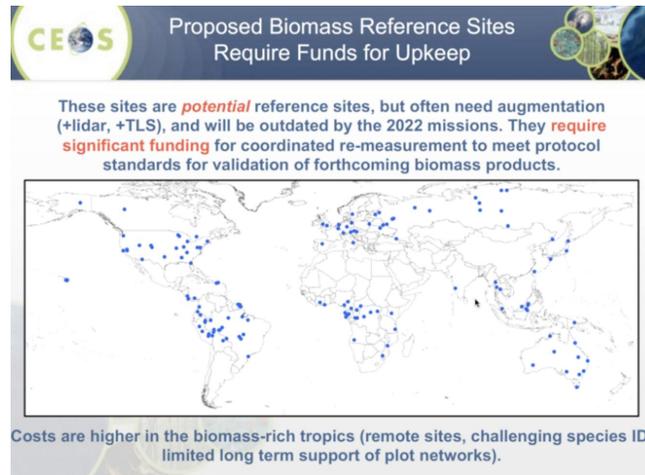
Main points:

- The CEOS Work Plan captures this deliverable as CARB-16: Cal/val and production of biomass products from CEOS missions. The Protocol document is anticipated in the middle of 2020.
- Many upcoming missions will provide data used to map above ground woody biomass, filling an existing data gap. Including NISAR, GEDI, BIOMASS, and MOLI.
- The team has been looking at data fusion to reduce errors and increase map resolution. Availability of all this data presents the potential of misuse and of overwhelming users. Users need guidance on how to use these data streams, which can be complex.
- The Protocol is a good practice guide for biomass model calibration and product validation at a global scale. It covers field measurements, and linking these measurements to EO data and to airborne lidar (critical for multi-mission validation and fusion).



- The Multi-mission Biomass Cal-Val Group is informal (not within CEOS structure) and meets monthly by telcon.

- To bring the Protocol 'to life', we need updated reference datasets and validation tools. CEOS can hopefully address the need for updated reference datasets.
- The Multi-mission Biomass Cal-Val Group has come up with a proposed network of potential biomass reference sites, and new data acquisitions are needed for these sites.
- The recent biomass workshop in Canberra asked agency representatives how to address these needs and various opportunities and challenges were identified. Laura shared ESA, JAXA, and TERN/Australia inputs, noting that airborne lidar data features as a common need.



- Conclusions and recommendations from biomass community:
 - The magnitude of new biomass data and products could reduce product uptake by the user community unless validation activities are user-friendly, transparent, and well-coordinated.
 - Significant funding for new and updated reference datasets is required: new field plot, terrestrial laser scanning and airborne lidar measurements over global biomass reference sites. These measurements must follow consistent protocols.
 - Biomass reference data should be *free and open* to enable transparency in product validation.
 - No space agency alone can fund the work required to establish a global network of biomass reference sites, but each agency could make a contribution, e.g. by funding national supersites or by 'adopting' a supersite (a commitment to finance the collection and delivery of ground data over a certain period).
 - Space agencies are encouraged to collaborate with established networks (e.g. ForestGEO, Rainfor, NEON, TERN, Afritrion, AusCover, TMFO, IIASA, etc) and their local collaborators.

Main discussion points:

- Laura Frulla (CONAE) noted the correct launch date for SAOCOM-1A is Oct 7, 2018. The SAOCOM team hopes to collaborate with the biomass community.
- Osamu Ochiai (JAXA) thanked the team for the excellent work and noted that JAXA hopes to continue to contribute using L-band SAR, with ALOS-4 expected to launch in 2021. Osamu suggested that a simplistic version or summary of the Protocol be made available so that it is accessible to a large audience. Ideally it would be maintained online as a living document.
- Ivan Petiteville (ESA) asked for clarity around how a coordinated response should be managed and how to direct requests to specific agencies.
- Mark Dowell (COM) suggested that the CEOS Biomass Protocol and the strategy around the supersites envisioned should become an integral part of a broader CEOS Biomass/AFOLU Roadmap, making it easier for Agencies to understand the context and to judge where and when to engage.
- Douglas Cripe (GEO Secretariat) noted that perhaps the GEO Knowledge Hub could serve as an authoritative voice to provide guidance on the myriad biomass products.

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| Decision 03 | SIT recognised the significance of the CEOS Biomass Protocol work and thanked the many CEOS Agency contributors. SIT looks forward to publication of the Protocol document in the next few months and to further discussion at the SIT TW and Plenary. |
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| SIT-35-06 | SIT Chair Team to work with WGCV LPV Biomass Protocol team to prepare a simple business case to gauge support from CEOS Agencies at the SIT TW. | SIT TW 2020 |
| | <i>Rationale: Biomass protocol aimed at ensuring policy relevance of many new missions of CEOS agencies. The SIT TW can prepare Principal discussion at Plenary.</i> | |

UNFCCC Relationship [PPT]

Presenter: Jörg Schulz (EUMETSAT), WGClimate Chair

Main points:

- CEOS (and CGMS) has been very effective over the last 8 years in establishing a positive and proactive dialogue with UNFCCC/SBSTA largely due to the symbiotic relationship with GCOS and the Climate Monitoring Architecture as a guiding framework.
- The creation of the Joint WGClimate established an unambiguous entry point for the discussion between SBSTA Research and Systematic Observations (RSO) and the space agencies.
- In recent years our support has been visibly expanding: Climate Data Records, Climate Services and support to Climate Adaptation, CEOS Carbon Strategy, GHG monitoring, CEOS GFOI support and evolution to biomass, other AFOLU etc.
- Parts of this we have reported in statements to SBSTA Assemblies and messages found their way to the Parties through the SBSTA Chair reports.
- At COP-25 we were prominently present at the Earth Information Day with the GHG constellation architecture as one part of the Architecture for Climate Monitoring from Space.
- Jörg stressed the need for a **long-term strategy** for the multitude of contributions CEOS, and space agencies more generally, can make to the Convention.
- The CEOS Carbon Strategy can play a central role on carbon-relevant aspects and can be used to give greater visibility to GFOI/Biomass aspects as well as Agriculture not only through REDD+ but also RSO.
- Jörg suggests maintaining the effective focal point established through WGClimate, but increasing communication on contributions from other parts of CEOS (in SBSTA statements, SBSTA Briefings, Earth Information Day, etc).
- CEOS could apply for an observer status with SBSTA, which could serve as a stable basis to deliver messages.
- **All these suggestions can be brought to the planned dedicated discussion at the SIT TW with all CEOS entities, GCOS and the UNFCCC Secretariat.**

AFOLU Roadmap [PPT]

Presenter: Osamu Ochiai (JAXA)

Main points:

- Osamu presented some heritage around the Paris Agreement and its reporting regimes around Nationally Determined Contributions (NDCs) and the Global Stock Take (GST) process. There is an

opportunity for a much more focused and coordinated effort by space agencies targeting the policy contribution from satellite EO.

- Given: the Paris Agreement and its first Global Stocktake (2023) ahead; the release of the IPCC Special Report on Climate Change and Land; significant new capabilities in CEOS agencies’ programmes; and, noting the inspired model of the GHG Roadmap - it is the right moment to discuss a space agency strategy for consistent contributions to GHG fluxes on land.
- A CEOS AFOLU roadmap could provide better linkages between CEOS contributions to related GEO Flagships and initiatives (GFOI, GEOGLAM, GEO LDN, GEO Wetland and others).
- Per the GHG Roadmap model, it is suggested to have a strong focus on what we can provide for Global Stocktake #1 (2023) and #2 (2028), and identifying which products to deliver.
- A dedicated volunteer team would be needed (e.g. from GFOI Leads, LSI agencies, biomass specialists).
- It would require leadership and effort and we should confirm we have both the will and capacity to see it through. We would need to decide ASAP however based on the stocktake schedule (first GST in 2023). **Reflecting this, a strong draft would be needed by the time of the SIT TW and refined for Plenary review in October.**

Main discussion points:

- Kerry Sawyer (NOAA, CEO) noted that CEOS unsuccessfully applied for UNFCCC observer status about a decade ago but likely worth revisiting.
- Bertie Archer (UKSA) noted UKSA willing to provide a biomass specialist to this project.
- Mark Dowell (COM) strongly welcomed the proposal and noted the workshop at JRC (July 2020) planned to bring together the GHG and AFOLU communities. CEOS needs to look at all aspects of the carbon cycle, to revisit CEOS efforts around AFOLU and ensure they fit with the overall approach to the Convention.
- Raj Kumar (ISRO, CEOS Chair Team) noted ISRO would like to provide support for CEOS biomass activities as offered in the recent Canberra workshop.
- Douglas Cripe (GEO Secretariat) noted that a GEO Climate Change Working Group (CC-WG) is being convened to implement a comprehensive GEO CC action strategy, supporting climate adaptation & mitigation.

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| SIT-35-07 | <p>JAXA and ESA will lead the development of the proposed CEOS AFOLU Roadmap. First, they will assess the will, direction, and capacity of the relevant CEOS Agencies. The SIT Chair team will support communications with Principals and help to identify team nominees. A mature Roadmap will be presented to the SIT TW for discussion and a final version will be presented to the CEOS Plenary for consideration of endorsement.</p> | SIT TW 2020 |
| | <p><i>Rationale: UNFCCC Global Stocktake Process is a major opportunity for CEOS and its agencies to demonstrate the value of EO. GHG Roadmap model seen as an inspiring example for land and ocean carbon to follow if feasible. Significant effort is entailed so SIT Chair will help volunteers determine if the critical mass is assembled to justify proceeding.</i></p> | |

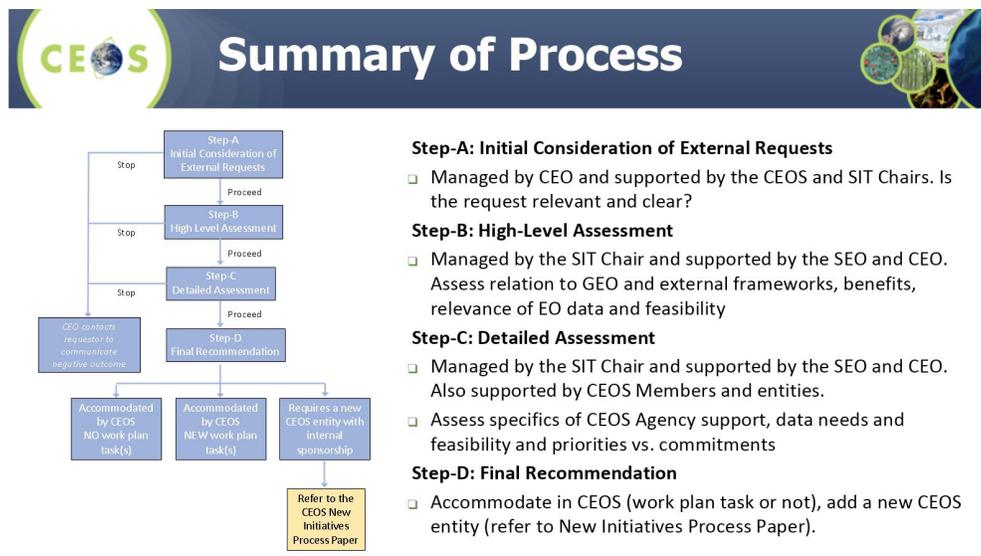
2.2 CEOS External Requests Process Paper [PPT] [DRAFT CEOS External Requests Process Paper]

Adam Lewis (GA, SIT Co-Chair) recalled the background of this effort.

Presenter: Brian Killough (NASA), CEOS SEO

Main points:

- Brian noted he is presenting on behalf of the writing team, including: CEO, SIT Chair Team, SIT Vice Chair Team, CEOS Chair Team, CEOS Future Chair Team, EC, and JAXA.
- Why do we need a new External Request Process Paper (ERPP)? The previous New Initiatives Process Paper (NIPP, March 2014) does not contain sufficient information to guide the assessment and decisions regarding external requests as it was focused on requests with existing CEOS "internal" sponsorship.
- The new ERPP is meant to supplement the NIPP and provide a detailed process to address requests that originate outside of the CEOS organization and do not currently have CEOS sponsorship. In addition, a broader spectrum of users are bringing increasing numbers of requests to CEOS for data and information products to address their specific project needs.
- The CEOS ERPP team has had four telecons, and has actively engaged in discussions and developed the first draft paper (released for review). The draft is now approximately 80% complete, with a final version to be ready for endorsement at the CEOS Plenary.



Main discussion points:

- Steve Volz (NOAA) asked if a timeline was considered for these responses/steps/process? Some of these steps could take a while. Brian noted this is addressed in the paper. The CEO will be responsible for responses and keeping the requestor informed of the overall process, expected response times, decision dates, etc.
- Brian noted that decisions don't need to be made only at plenary, and that 'smaller' requests could be covered by the CEOS SEC. Kerry noted that the NIPP operates on a 6 month cycle, if the request gets to that point.

Brian noted the next steps are to provide an updated draft for the SIT TW, and a final version for CEOS Plenary endorsement.

Thursday March 26th

Session 3: Analysis Ready Data; CEOS-GEO; Working Team Engagement

3.1: CEOS Analysis Ready Data (ARD): Beyond Land? Beyond Government?

CARD4L Journey and Lessons Learnt [[CARD4L Journey](#)]

Presenter: Adam Lewis (GA), SIT Co-Chair

Main points:

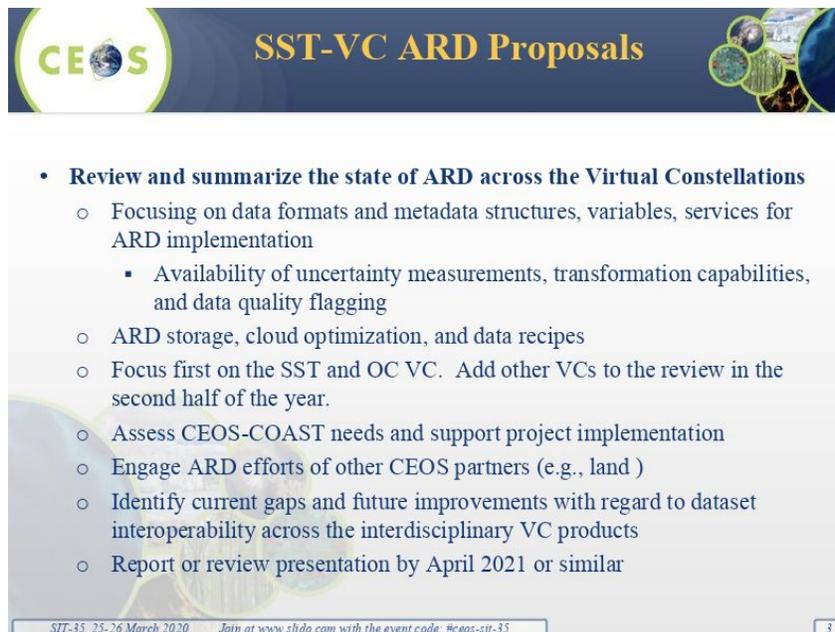
- Since 2015, the CARD4L Framework has been developed by the LSI-VC. CEOS now has three active Product Family Specifications (PFS) for Surface Reflectance, Surface Temperature, and Normalised Radar Backscatter. Product assessments against these specifications are now underway, in collaboration with WGCV (providing a peer review service). Additional PFS are also being developed, including for Synthetic Aperture Radar, LIDAR, and aquatic reflectance.
- As articulated in the [CEOS ARD Strategy](#), CEOS needs to increase engagement with those outside of the organisation, in particular the private sector, who are making their own progress on the idea of 'Analysis Ready Data'. This is the focus of the paper *CEOS Analysis Ready Data – Involving the Private Sector*, which will be presented for discussion later in this session.
- Also from the [CEOS ARD Strategy](#), LSI-VC is progressing the CEOS data interoperability topic with WGISS and WGCV IVOS.

Opportunities for ARD in The Deep (and Shallow) Blue Sea [[Opportunities for ARD in The Deep \(and Shallow\) Blue Sea](#)]

Presenter: Paul DiGiacomo (NOAA), COAST Study Team lead

Main points:

- The idea of Analysis Ready Data is important to the COAST pilots, and it will be used where possible, but not exclusively.
- Paul noted that there are challenges around making sure that everyone is consistent when talking about ARD, noting that GHRSSST has for a long time produced datasets that might be considered ARD.



The slide features the CEOS logo on the left and a title 'SST-VC ARD Proposals' in the center. The background includes a globe and satellite imagery. The main content is a bulleted list of tasks for reviewing ARD across virtual constellations.

- **Review and summarize the state of ARD across the Virtual Constellations**
 - Focusing on data formats and metadata structures, variables, services for ARD implementation
 - Availability of uncertainty measurements, transformation capabilities, and data quality flagging
 - ARD storage, cloud optimization, and data recipes
 - Focus first on the SST and OC VC. Add other VCs to the review in the second half of the year.
 - Assess CEOS-COAST needs and support project implementation
 - Engage ARD efforts of other CEOS partners (e.g., land)
 - Identify current gaps and future improvements with regard to dataset interoperability across the interdisciplinary VC products
 - Report or review presentation by April 2021 or similar

SIT-35, 25-26 March 2020 Join at www.slido.com with the event code: #ceos-sit-35

Presenter: Vardis Tsontos (NASA), COVERAGE

Main points:

- Vardis presented the following perspective:



Conformance to Earth Science data interoperability standards is a foundational element

- Self-describing file formats (nc, HDF), metadata standards (CF, ACDD), common vocabularies (e.g. GCMD, CF-standard names)
- COVERAGE targets range standards compliant, inter-agency satellite products for the 4 ocean VCs
- The interoperability challenge is greater with *in situ* data, biological datasets in particular (*ad hoc* formats, limited metadata)

Emphasis on higher level data products that share common structural characteristics

- Minimize the extent/complexity of transformations needed to get data in a more consistent ARD form
- COVERAGE baseline dataset: coherent set of global, L4 (gap-free), inter-agency products from the 4 ocean VCs, on a common 0.25 deg. resolution grid, available near real-time (where possible)
- Consistent spatial feature resolution by use of a common L4 interpolation/gridding algorithm for SST and CHL (based on NASA/MUR-MRVA; other agency products) being explored by COVERAGE

ARD implies high quality, validated data

- Systematic and random sources of measurement error are understood
- Uncertainty is quantified and represented in the data product

Systems & value-added services facilitating access to ARD in support of applications

- Key challenge faced by non-expert remote sensing communities: product selection & mechanics of data access/manipulation
- COVERAGE Platform: hosted in NASA/AWS and EUMETSAT/WEKEO cloud environments
 - Integrated access to a curated set of higher-level interagency data products
 - Value added services accessible via GUI & APIs: search, visualization, subsetting/extraction, analytics, Jupyter notebooks
- Performant Analytics services enabled by “AR-Storage” – i.e. cloud optimized storage.

Main discussion points:

- Adam stressed that CEOS’ advancement into ARD beyond land needs to be user driven. He noted that we are seeing strong interest from the ocean and coastal community. He added that there is likely a lot that could be learned for CARD4L from the ocean community, given their experience (e.g., GHRSSST).
- Steve Volz (NOAA) asked whether there is any work being undertaken to improve the resolution of the 0.25-degree Level-4 COVERAGE baseline dataset. Vardis noted that this is only the starting point, the lowest common denominator across the VCs, and doesn't preclude the use of higher resolutions for specific applications down the road. Paul noted that COAST will likely be a requestor of higher resolution products as 1 km resolution is needed.
- Alex Held (CSIRO, SIT Co-Chair) asked about the target users for COAST and COVERAGE products. Both Paul and Vardis said that they are targeting both ends of the spectrum, from lower-level data for expert users to high-level products (multi-sensor L3 or L4 products). Vardis noted that data systems need to be flexible and able to accommodate both types of user/product.
- Adam asked about the prospect for collaboration across the CEOS ocean community and LSI-VC. Paul noted that LSI-VC (represented by Steve Labahn of USGS) is involved in COAST, and that the Aquatic Reflectance CARD4L PFS proposal is taking shape.
- Douglas Cripe (GEO Secretariat) asked to what extent is COAST / Blue Planet using Copernicus Climate Data Store ocean and atmosphere ARD products. The reanalyses being produced by ECMWF, hosting the CDS.
- PG Diwakar (ISRO) noted ISRO’s Oceansat missions, which provide a long heritage of data. He signalled interest in applying the ARD concept to these products and asked how to get involved. Paul noted that the COVERAGE team is working to integrate numerous products and would welcome contributions from ISRO. Vardis added that this process can be aided by conformance to the particular standards referenced by COVERAGE.
- Marc Paganini (ESA, SDG-AHT) questioned the logic of having different approaches to ARD for land and marine products. Ivan Petiteville (ESA) agreed that CEOS needs harmonised approaches

between ARD for land and oceans, especially when it comes to their combined use for coastal applications.

- NASA suggested that before expanding efforts perhaps CEOS could prototype with one VC/Earth property.
- Mark Dowell (COM) suggested a demonstration using moderate resolution surface reflectance products across the land-ocean coastal interface (also for inland water bodies). Paul agreed, noting that this is one of the activities that the COAST team intends to pursue. Astrid-Christina (COM) added that products from the Copernicus Marine Environment Monitoring Service can help and should be taken into account.
- Ake Rosenqvist (JAXA) stressed the importance of clear terminology, noting that we must be careful to distinguish between ARD and CEOS ARD (CARD) – we only have the mandate to define the latter.

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| Decision 04 | SIT acknowledged the interest conveyed from user communities with an interest in oceans and coasts, in relation to expansion of CEOS ARD activities beyond land. The importance of engaging the private sector early before ARD standards are defined, to promote complementarity between government and private sector activities, was also highlighted. |
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| SIT-35-08 | The SIT Chair Team to consider the potential for an activity to prototype the CEOS ARD approach for one exemplar ocean variable and one exemplar atmospheric variable. CEOS Agencies and Working Teams to indicate their interest in supporting such prototype work to the SIT Chair Team. | SIT TW 2020 |
| | <i>Rationale: Discussions have revealed preliminary interest in the ARD concept beyond land variables, but practical exemplars would provide more evidence to support CEOS Agency consideration of further investment.</i> | |
| SIT-35-09 | All to review the CEOS Analysis Ready Data – Involving the Private Sector paper and provide feedback to the SIT Chair Team by April 17. | 17 April |
| | <i>Rationale: The ARD team is seeking agency feedback and experience with the private sector.</i> | |

CEOS ARD Strategy: Working with the Private Sector [[Working with the private sector](#)]

Presenter: Adam Lewis (GA), SIT Co-Chair

Main points:

- The SIT Chair Team and LSI-VC have been considering how to work with the private sector on the concept of Analysis Ready Data. The [CEOS Analysis Ready Data – Involving the Private Sector paper](#) presents the objectives of this proposed engagement as well as the following recommendations for CEOS:
 - o Establish mechanisms for constructive and appropriate engagement with the private sector;

- Avoid unnecessary barriers to participation (from industry) in the CEOS ARD discussion and processes;
 - Provide appropriate documentation on the various aspects of the CEOS ARD initiative;
 - Identify a CEOS ARD framework process for assessing private data products for compliance with the Specifications;
 - Move CEOS concepts into the broader standards realm to include the private sector.
- This paper is presented to SIT-35 for information and discussion. The paper has also been distributed via email for feedback, which is welcomed by April 17. The paper will be presented again at SIT Technical Workshop ahead of its presentation for endorsement at CEOS Plenary 2020.
 - Adam reported that the CEOS-Industry ARD Workshop that was planned for September in Europe has been postponed. The SIT Chair Team and LSI-VC will consider the options and inform CEOS in due course.

Lessons from Landsat Collection 2 [Lessons from Landsat Collection 2]

Presenter: Steve Labahn (USGS), LSI-VC Co-Lead

Main points:

- Landsat Collection 2 (global Level-2 Surface Reflectance and Surface Temperature) features various improvements over Collection 1 such as increased geometric accuracy, incorporation of the Sentinel-2 Global Reference Image (GRI), an improved Digital Elevation Model, improved radiometric calibration, consistent quality assessment bands, updated and consistent metadata files, and is also available in Cloud-Optimised GeoTIFF (COG) format.
- Collection 2 will also be available on Amazon Web Services (AWS). USGS is expecting public collection data availability around June, with Collection 2 tiled US ARD available in September.
- Collection 2 is greatly improved over Collection 1 in terms of CARD4L compliance.
- USGS has undertaken large-scale tests on AWS. In one test, 180,000 Landsat 8 scenes were able to be processed to Level-2 for around \$5700 USD (full 2013-2019 coverage of Africa). Steve presented some other findings from this large-scale testing – see slides for details.

Main discussion points:

- Ivan Petiteville (ESA) noted industry's growing interest in ARD. Ensuring adoption of the CEOS ARD concept and products by not only CEOS Agencies but also industry is key. To do this, CEOS needs to make sure that CEOS ARD products are fit for purpose (by industry and users) before the specifications are implemented at large scale and at significant cost. Jonathon Ross (GA, SIT Chair Team) agreed, adding that ARD products should be in a 'sweet spot' where one product can be provided that supports, and makes life easier, for many users.
- Debajyoti Dhar (ISRO) asked Steve whether Resourcesat-2 and Landsat 8 are being harmonised at USGS. Steve reported that this has not been done on the USGS side, but he knows some work is ongoing on the ISRO side. He had hoped to learn more with ISRO's attendance at LSI-VC-9. This will be followed up through LSI-VC, and Steve noted that he hopes for updated processing capability at USGS EROS to explore this.

Wrap-up and Next Steps

Adam Lewis summarised the key next steps for CEOS ARD: finalisation of the [CEOS Analysis Ready Data – Involving the Private Sector paper](#), reorganisation of the CEOS-Industry ARD Workshop in Europe, engagement with CEOS-COAST and COVERAGE around new specifications for coastal zones and inland water bodies, and piloting CEOS ARD and capturing feedback from a wide range of users (CEOS-COAST, Digital Earth Africa, GFOI, GEOGLAM, etc.).

3.2: GEO Flagships/Initiatives and CEOS-GEO Coordination

GEO Secretariat Report [[PPT](#)]

Presenter: Douglas Cripe (GEO Secretariat)

Main points:

- Doug identified some of the key actions needed to address the Canberra Declaration, noting that the Secretariat has identified 12 items that suggest either new actions or increased effort in certain areas ([outlined in Doug’s slides](#)).
- **Areas where GEO Member action key on:** engagement with pacific islands; engaging national statistical offices and international development agencies; and, increased support for delivery of GEOSS.
- **Areas where a broader strategy may be needed:** encouraging use of EO in the digital economy; a strategy for *in situ*; GEO best support to its members to develop institutional capacity for use of EO.

Debrief from 2020 CEOS-GEO Bilateral [[CEOS-GEO Bilateral](#)]

Presenter: Kerry Sawyer (NOAA), CEO

Main points:

|  Key Takeaways, Actions, Outcomes |  Requests for CEOS and Follow-up Actions |
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| <ul style="list-style-type: none"> • CEOS needs to fully support the Canberra Declaration, specifically Declaration 12 – <i>Recognize and further encourage the proactive efforts of the GEO community, including space agencies, to make Earth observations collected from space ready for analysis and easier to use through artificial intelligence, data analytics, and visualization technologies.</i> • Work with GEO Secretariat to explore a definition of a “well-managed collection of Analysis Ready Data (ARD) in the commercial cloud” and expand ARD beyond land in the context of the broader CEOS ARD Strategy. • Contribute to the GEO Secretariat’s planned workshop on Data Cubes and Interoperability. • CEOS noted we will be taking a much more proactive approach to engaging with UNFCCC and IPCC to promote changes to frameworks and protocols to ensure new satellite data can be used in national reporting. • Participate in a workshop on Land Degradation Neutrality (hosted by the Secretariat of the UN Convention on Desertification) to highlight the value of ARD. • There is still a disconnect between the GEO 2020-2022 Work Programme and the CEOS 2020-2022 Work Plan Deliverables, evidenced by the lack of identification of connections in the recent call to CEOS entities for new Deliverables. • GEO Secretariat agreed GEOSS Water Strategy was now defunct and there was little value in CEOS continuing to respond to it. • GEO Secretariat welcomed CEOS’s focus on coasts, noting complex issues around stakeholders in coastal zones. | <ul style="list-style-type: none"> • CEOS and GEO Secretariat to identify connections to the GEO Work Programme and CEOS Deliverables • GEO requested CEOS to consider CEOS representative to participate in the GEO Climate Working Group • GEOGLAM Expert/Jarvis asked CEOS to consider participating again the the GEOGLAM Advisory Committee • GOS4M/Perroni asked CEOS to participate in the GOS4M workshop tentatively scheduled for June; need to determine who would be best suited within CEOS to participate • Killough/SEO is coordinating with GEO Secretariat on Google Earth Engine Proposals |

Based on recent communications from GEO, the Working Groups include:

The Capacity Development Working Group (CD-WG) facilitates GEO's efforts on capacity development, promoting the principle of co-creation and providing conceptual support to the design, development, implementation and evaluation of capacity development activities. With a focus on end-user engagement, this group aims to strengthen the capacity of organisations and individuals to fully utilize open Earth observations data and tools.

The Climate Change Working Group (CC-WG) is convened to develop and implement a comprehensive GEO climate change action strategy to advance the use of Earth observations in support of climate adaptation and mitigation including, as relevant and appropriate, actions related to the pillars of the Paris Agreement adopted under the United Nations Framework Convention on Climate Change (UNFCCC).

The Disaster Risk Reduction Working Group (DRR-WG) will develop and implement a coherent and cross-cutting approach within GEO to advance the use of Earth observations in support of countries' disaster risk reduction and resilience efforts. These efforts include those related to the provisions of multilateral agreements such as the Sendai Framework for Disaster Risk Reduction.

The Data Working Group (Data-WG) is working with the GEO community and with external stakeholders to address data policy, data ethics and data governance issues related to the collection and use of Earth observations. Recognizing the value of open Earth observation data, GEO Principals endorsed the GEO Data Sharing Principles which promote 'Open Data by Default.' This group will help GEO advance open data policies, thereby improving the uptake of Earth observations for the benefit of all stakeholders.

Main discussion points:

- Jörg Schulz (EUMETSAT, WGClimate Chair) suggested penciling in the WGClimate leads for the CC-WG. He also asked for Terms of Reference for the group to help aid in determining who from WGClimate should join. Kerry as CEO will circulate the Terms of Reference, and help to coordinate CEOS in these groups.
- Jonathon Ross (GA, SIT Chair Team) noted the 1:1 mapping between CEOS Working Teams (WGs, VCs, AHT), and GEO's new Working Groups. He suggested that Kerry work with the Working Team leads to consider the representatives from CEOS to the GEO WGs.
- CEOS should work with GEO Secretariat to ensure cross-references across GEO and CEOS Work Plans, ensuring the CEOS contribution to GEO objectives is reflected.
- Nancy Searby (NASA, WGCapD) noted that WGCapD Chair should be a member of the CD-WG, and that she has already engaged with CD-WG.

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| Decision 05 | Noted that the GEO Water Strategy is no longer an active strategy, nor therefore is the CEOS Response to it. Relevant activities will be removed from the CEOS WP. |
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| SIT-35-10 | CEO to consult CEOS Agencies & Working teams to identify possible representatives to the four new GEO Working Groups (noting relevance to WGClimate, WGCapD, LSI-VC and WGISS in particular). CEOS Agencies requested to identify any individuals they, or their governments, are nominating in parallel. | 30 April |
| | <i>Rationale: GEO has asked CEOS to support the new WGs. CEOS Agencies would appreciate a broader understanding.</i> | |
| SIT-35-11 | CEO to coordinate with GEO Secretariat to ensure both the GEO and CEOS Work Plans fully reflect and acknowledge the CEOS contribution to GEO objectives | Plenary |
| | <i>Rationale: As the space arm of GEO, a significant quantum of CEOS investment supports the GEO Work Programme. It is important this is clear to stakeholders.</i> | |

GEO and SDGs [PPT]

Presenter: Douglas Cripe (GEO Secretariat)

Main points:

- Considering ways to realise GEO Co-Chair Objective 1.1: *GEO makes available tools and platforms to support country achievement of the SDGs and reporting against commitments.*
- This is being done principally through GEO Work Programme Flagships (GEO BON, GEOGLAM, GFOI, GOS4M) and Initiatives (e.g. EO4SDGs, GEO Blue Planet, AquaWatch, GEOGLOWS, GEO LDN).
- Key point: *Open Data Cubes essential for community to make progress on SDGs.* This is a firm belief of GEO Secretariat Director, Gilberto Câmara, who sees Open Data Cubes as a critical tool, and suggests GEO and CEOS continue to work together on deployments, e.g. CEOS Data Cube instances implemented by SEO, Digital Earth Africa, etc.

CEOS Support to GEOGLAM [GEOGLAM]

Presenter: Ian Jarvis (GEOGLAM Project Office), LSI-VC GEOGLAM subgroup

Main points:

- GEOGLAM is working in a complex policy landscape, and the need for data sources and products to address multiple policy targets is driving a need for a common approach across science communities to enable integration and information sharing.
- In order to address this challenge, GEOGLAM is pursuing the concept of *Essential Agricultural Variables (EAV) for GEOGLAM* seeking to define, “...a minimum set of fundamental variables required to characterize state and change...”, to serve as a communications device, reduce

complexity, focus activities, and communicate outputs. This is being driven by an EAV working group who are scheduled to meet again next in June in Ottawa.

- EAVs are relevant for CEOS as they drive data needs, R&D priorities, have potential overlaps with ARD, and can support SDGs.
- Ian stressed that GEOGLAM requirements are expected to grow, and in this growth would benefit from broader space agency representation in the LSI-VC GEOGLAM subgroup.

CEOS Support to GFOI [GFOI]

Presenter: Frank-Martin Seifert (ESA), LSI-VC Forest & Biomass Subgroup

Main points:

- CEOS contributes to the GFOI Data Component through the LSI-VC Forests & Biomass Subgroup (formally through the *ad hoc* Space Data Coordination Group for GFOI). The new Subgroup has created a new Work Plan, with biomass and convention engagement tasks added.
- CEOS Agencies providing global systematic observations and a free and open data policy is key to operationalization and sustainability of National Forest Management Systems.



Discussion within CEOS

1. **Operationalization and sustainability of NFMS:**
→ global systematic observations and a free and open data policy are key
2. **REDD+ and beyond: Not only forest area but as well emission factors and carbon stock changes** → biomass links to GHG Roadmap and Global Stocktakes a high-level and worthy goal. CEOS-GFOI cooperation with UNFCCC
3. **Broader landscape level monitoring:**
→ AFOLU Roadmap
4. **Address country needs:** → improved data uptake, tools and platforms, ARD, capacity building ...

All tasks need adequate capacity and cooperation with other CEOS groups like WGClimate and WGCV

CEOS Support to GEO-LDN [GEO-LDN]

Presenter: Neil Sims (CSIRO)

Main points:

- Neil highlighted where he sees CEOS best contributing.
- Measuring land degradation under SDG Indicator 15.3.1 involves the calculation of three sub-indicators, though carbon stocks above and below ground are not included. This may be an area where CEOS could support a full assessment.
- The Good Practice Guidelines (GPG) for 15.3.1 are currently being revised, and CEOS inputs would be welcome. One of the challenges for the GPG is defining methods that are usable by every country. Rather than prescribing specific data sets, the GPG is seeking to define data quality standards to give countries flexibility.
- This includes the development of data decision trees to help countries identify their datasets, and contribution to these decision trees is another opportunity for CEOS to help ensure decisions recommended to countries are reasonable and best available for their purposes.
- There may be additional datasets and product needs that CEOS agencies could help with. In particular, in some cases for some countries GPG methods are giving counter intuitive outcomes. In

these cases, CEOS may be able to help link Earth observation datasets to other data to help predict areas vulnerable to land degradation.



Potential CEOS support

- **Carbon stocks above and below ground**
 - SOC stocks in soils
 - Root-to-shoot ratio models modified by species, climate, soils etc
 - Plant height, cover, wood density, condition, growth phase etc
- **Contribute to GPG review**
 - Guidance on dataset availability at local, regional and global scales
- **Formal response on decision trees**
 - Specify datasets for particular regions/circumstances using decision tree approach
- **Predicting degradation**
 - Linking EO with social datasets – viewing land from a human use perspective (land use to supplement land cover)
 - Land potential vs condition

Main discussion points:

- Ivan Petiteville (ESA) asked whether those working on Indicator 15.3.1 and the GEO Land Degradation Neutrality (LDN) team have looked at the GEO SDG Toolkit concept introduced by Marc Paganini. Neil noted there are linkages via the GPG writing team, and the lead of the LDN team, though there is also some parallel development which needs to be monitored.
- Raj Kumar (ISRO) asked Ian Jarvis whether crop stress indicators were also a consideration for the crop monitor reports being supported by GEOGLAM, and Ian confirmed they were. The contributing agencies bring various data sources, and many use crop stress indices. They bring the best information available and then sit together to iron out discrepancies to reach a consensus map of crop conditions every month.
- Raj noted to Neil that his understanding was that within the UNCCD Land Degradation activity, Carbon Stock above and below ground is not available.
- Mark Dowell (COM) noted with reference to the EAVs that based on experience with ECVs, it is not just a list of variables and their associated requirements, but the whole process and supporting structure that existed with GCOS, the GCOS IP, and the actions to be taken to improve the data over time.
- Cindy Ong (CSIRO, WGCV Chair) noted that WGCV could potentially help Neil and the LDN group on issues related to data quality.
- Marc Paganini (ESA, SDG-AHT Co-Lead) noted that the SDG AHT had started to work directly with the GEO LDN Data Quality Standard WG on the satellite data requirements.

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| SIT-35-12 | CEO, in liaison with the SIT Chair Team, to work with CEOS Working Teams to identify which specific | End May |
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| | aspects of the 2020 Work Programme (once endorsed) require further analysis before and during the SIT TW. | |
| | <i>Rationale: The SIT Tech Workshop is the next major opportunity to address implementation of the CEOS Work Plan, particularly for items that would benefit from Principal consideration and support at Plenary.</i> | |

3.3: Working Team Status and Engagement

SIT Chair Presentation [[PPT](#)]

Presenter: Adam Lewis (GA), SIT Co-Chair

Main points:

- Adam summarised the SIT Chair Team approach to Working Teams (WTs), which are the ‘engine room’ of CEOS activity, consisting of Working Groups, Virtual Constellations, and *Ad Hoc* Teams.
- The SIT Chair Team has sought to differentiate the various meetings on the annual calendar, focusing SIT on strategic issues, the Technical Workshop (TW) focused more on reporting and interaction between Working Teams, the introduction of All Hands calls for WT 3-4 times a year to provide an opportunity for sharing and cross-Working Team cooperation, and continuation of direct calls with the VCs, and with CEOS Chair, the introduction of regular reporting from one VC on each CEOS SEC telecon. The Team is committed to learning from experience, and reflecting lessons learned in future meetings and interactions.
- In part as a result of this approach, the number of VC tasks and engagement via the CEOS Work Plan has increased.
- Outcomes from the first round of VC informal calls and outcomes from the first WT All Hands Call was reviewed. ([P-VC](#) provided a set of slides for reference.)
- A brief review of thematic observing strategy reference documents was presented. These documents are not consistent across CEOS groups, and while it’s clear that one size doesn’t fit all, there may be scope for gap filling.

Main discussion points:

- Ivan Petiteville (ESA) asked with OSVW-VC has not been very active, and whether there was a need for it to continue.
- Ivan asked about OCR-VC, noting that it is active, but at SIT TW we heard a request for additional support.
- Adam noted that on both of Ivan’s points, the SIT Chair Team has been gathering information and is now considering which actions to take.
- Raj Kumar (ISRO, CEOS Chair Team) noted that the action OSVW-VC/VC-14 had been planned to be covered in the International Ocean Vector Surface Winds Science Team (IOVWST). On VC-15: deferring to WGCV, and have initiated discussions with them. Paul Chang: OSVW-VC continues to be active in its original activities, including user outreach and working with different partner agencies to better coordinate the constellation and coverage.
- On VC-14 it was noted that working to engage IOVWST hasn’t resulted in a report yet as originally envisioned but something that needs to be done, and perhaps it needs to be led outside IOVWST. Paul Chang (NOAA, OSVW-VC Co-Lead) noted IOVWST is a core part of the VC, and that IOVWST provides the critical mass for the community.
- Riko Oki (JAXA, P-VC Co-Lead) expressed appreciation of the SIT Chair’s effort to communicate with P-VC. She noted that the GPM activity is the embodiment of the P-VC and is making a large impact

to both the science community and society in general. The low level of visibility of P-VC at the CEOS level is just a result of the amount of work the precipitation community is doing elsewhere. The precipitation community is busy operating the current constellation and planning future missions. P-VC shared a [set of slides](#) for reference.

- Jörg Schulz (EUMETSAT, WGClimate Chair) welcomed the effort in summarising the WG calls. He suggested CEOS should make an effort to set up a Digital Object Identifier (DOI) system to index the various observing strategy documents produced, and also consider consistent branding. Mark Dowell (COM) agreed, noting in the past he has promoted a more standardised approach (including DOIs and templates, and enabling citation).
- Stephen Ward (SIT Chair Team) noted a key result of the last round of VC calls was increasing representation and recognition of activities in the CEOS Work Plan, in particular OCR. He also noted the informal approach to engaging with working teams is seemingly effective.
- Kerry Sawyer (NOAA, CEO) confirmed that there has been a significant increase in VC representation in the CEOS Work Plan. She also noted that NOAA as past SIT Chair also did in depth consultations with working teams and would be happy to share notes from these calls.
- Jonathon Ross (GA, SIT Chair Team) noted that VCs are being invited by CEOS Chair and SIT Chair to join CEOS SEC calls and report (one per call). We are approaching the point of having all VCs reported at least once.
- Neil Sims (CSIRO) suggested a good way for CEOS to engage with initiatives like GEO is to work together on specific projects, e.g. the four in GEO LDN. The SDG AHT is doing a good job, but like to be more integrated, and further target CEOS efforts to support GEO Flagships.
- P G Diwakar (ISRO, CEOS Chair Team) noted that ISRO has a lot to offer on LDN, and has provided data consistently to UNFCCC. He suggested he discuss it with Neil offline.
- Marc Paganini (ESA, SDG-AHT) agreed with Neil regarding a more GEO-CEOS integrated approach on LDN, and that this is one of the key drivers for the SDG AHT LDN sub-team.
- Jerome Benveniste (ESA, CEOS-COAST) suggested adding the OST-ST annual meeting reports, including the "25 Years of Progress in Radar Altimetry: Summary and Recommendations", and the Coastal Altimetry Workshop series be listed as thematic reference documents for OST-VC

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| Decision 06 | SIT Chair Team will continue with its engagement plan for CEOS Working Teams via: Working Team All-Hands calls; the new VC reports to CEOS SEC; and informal working telcons with VC Co-Leads. Updates will be provided and issues addressed at SIT TW and Plenary. |
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| SIT-35-13 | NOAA will provide the SIT Chair Team with the questionnaires compiled during the NOAA SIT Chair term, and facilitate a discussion on the content. | ASAP |
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| SIT-35-14 | <i>Rationale: NOAA recalled the questionnaires they had completed during the 2018-2019 SIT term and suggested that they may have enduring value.</i> | |
| | CEO and SEO, in consultation with the SIT Chair, to consider consistent templates and DOIs for CEOS publications and their representation on the CEOS website. | SIT TW 2020 |
| | <i>Rationale: A number of agencies have noted scope for improvement in consistency of CEOS thematic coordination strategies and their documentation, and also identified the need to make CEOS publications easier to reference and cite externally.</i> | |

Session 4: Work Plan; Chair Business; Closing

4.1: CEOS Work Plan Deep Dive

[CEOS Work Plan 2020-2022 \[PPT\]](#)

Presenter: Kerry Sawyer (NOAA), CEO

Main points:

- The CEOS Work Plan 2020-2022 is delayed. The CEOS entities are still accomplishing their activities in the absence of a CEOS Work Plan, and Kerry commended their dedication and hard work.
- The updated Work Plan is expected to capture details of 149 deliverables, with 64 existing and 85 new.
- Kerry is implementing two ideas for a refined CEOS Work Plan:
 - o Updating the numbering convention to better facilitate year-to-year tracking. Deliverables will take the form XX(XX)-YY-01 (2 to 4-character identifier; 2-digit year; 2-digit number, beginning at 01 for each year).
 - o Adding a separate category for CEOS Services e.g., routine actions and services of CEOS such as the CEOS Newsletter; the Missions, Instruments, and Measurements Database; the Essential Climate Variables Inventory; and, other organizational actions with annual and concrete deadlines.
- Kerry would also like to see CEOS utilizing the CEOS Deliverables Tracking Tool to full effect, so she:
 - o Encourages the CEOS community to self-update the online tool;
 - o Will prepare a user guide as an Appendix to the Work Plan detailing required actions of various users of the online tool; and,
 - o Will facilitate a streamlined Work Plan with less duplicate information.
- Kerry noted that the observations for water and observations for agriculture sections of the Work Plan each have 1 existing Deliverable, with no new entries. She added that WGCapD have identified 24 new Deliverables for 2020-2022. Kerry also thanked the SIT Chair Team for working with the VCs to improve their representation in the Work Plan – which has seen a marked improvement.
- A draft Work Plan for entity review is expected by 15 April 2020, with virtual endorsement by 15 May 2020.

[CEOS Water Strategy: Its future in the context of an obsolete GEOSS Water Strategy](#)

Presenter: Doug Cripe (GEO Secretariat)

Main points:

- Since the advent of the GEO Strategic Plan and Engagement Priorities (SDGs, Paris Climate Agreement, Sendai Framework for Disaster Risk Reduction) there has been less emphasis on the Societal Benefit Area (SBA) approach.
- As a result, the water SBA is no longer supported as a whole. There has also been a decline in secondments to the GEO Secretariat, which were key for support to specific SBAs.
- With IGOS being dissolved, the Integrated Global Water Cycle Observations (IGWCO) team transitioned to a community of practice under GEO. IGWCO still exists and is active, but is now exploring future scenarios for the group given the shift away from SBAs in GEO. Doug has suggested to them that going forward they would be well situated to help GEO with water application curation for the GEO Knowledge Hub.
- WMO is also taking a more active role in the water sector. The GEO Secretariat has been working with them to explore collaboration opportunities.
- In summary, to support water-related aspects of the SDGs, Paris Climate Agreement, and Sendai Framework for Disaster Risk Reduction, GEO relies on water-related GEO Work Programme activities (e.g., Aquawatch, GEOGLOWS, Blue Planet, GEO Wetlands).

SST-VC White Paper: Delivering on the vision [[SST-VC White Paper](#)] [[PPT](#)]

Presenter: Ed Armstrong (NASA), SST-VC

Main points:

- The SST-VC White Paper reports on the full spectrum of the SST (including descriptions of measurements, technologies, user needs, impacts, data management, etc.).
- Key challenges were identified around the provision of fiducial reference measurements; improved data management and distribution (i.e., GHRSSST data federation); sustained continuity of measurements, in particular at 6.9 GHz (covered now by AMSR3 (JAXA) and CIMR (proposed by ESA)); and promoting coordination and task sharing via GHRSSST.
- Anne O'Carroll (EUMETSAT) delivered the paper to CEOS leadership, but its publication still needs to be reflected/advertised on the CEOS website.
- Ed noted some other SST-VC goals:
 - o Review and summarize the state of Analysis Ready Data from the SST-VC perspective, in collaboration with OCR-VC and CEOS-COAST.
 - o Increase collaboration with other VCs on common themes.
 - o Data management evolution.
 - o Provide recommendations to improve search relevancy and data access across CEOS VC partners (this is ongoing work within GHRSSST).
 - o Increased search relevancy / decision trees based on GHRSSST product search. This is likely to be built on through the GHRSSST activities.
 - o Engaging early career scientists (to be a conference theme at the 2020 GHRSSST Science Team meeting).

Main discussion points:

- Alex Held (CSIRO, SIT Co-Chair) asked what is needed to implement the findings from the white paper. Ed noted that establishing a definition of SST ARD, and improving the foundational structure of datasets to make them more amenable to ARD is a key next step. Leveraging the CEOS OpenSearch specifications is also important. SST-VC would like to work more with WGISS on federation strategies.
- Jerome Benveniste (ESA) suggested the synergy between SST-VC, OCR-VC, and OST-VC should be captured under CEOS-COAST.
- Paula Bontempi (NASA) asked about how ARD requirements could be identified across VCs, and also around the timing and whether we should be aware of trying to expand across VCs before ARD requirements have matured. Ed noted they are first proposing to work with SST-VC on ARD in the

COAST context (and referred to Paul DiGiacomo’s [slides presented earlier](#)), but then the next logical partner would be OCR-VC.

- Adam Lewis (GA, SIT Co-Chair) noted that it is clear there are now multiple groups across CEOS looking at the concept of ARD. Communication across these groups is needed to avoid divergence. He asked if there is an appetite for reconvening a discussion at the SIT Technical Workshop around cross-cutting ARD. Ed supported this proposal, noting that he personally would like to drive SST-VC ARD activities primarily in a direction that supports both COAST and COVERAGE, but there is definitely a need to harmonise these efforts with existing work in the land domain.

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| SIT-35-15 | Ed Armstrong to follow-up with the CEOS SEO on the publication of the final SST-VC White Paper on the CEOS Website. | April In progress. Request sent to Kim Holloway to post; awaiting CEOS website issue resolution. |
| | <i>Rationale: Publicize and promote the SST-VC paper on the CEOS website.</i> | |

CEOS support for disaster risk reduction [[Disaster Risk Reduction](#)]

Presenter: David Green (NASA), WGDisasters

Main points:

- WGDisasters has adopted a new terms of reference, which better frames their activities to emphasise collaboration and a shift to showing the collective value of EO for disaster risk reduction (addressing the various agendas and collaborations, links to GEO, etc.).
- WGDisasters desires CEOS leadership guidance on balancing research and practical applications in the new CEOS Work Plan.
- Reviewed the projects under WGDisasters, noting their support to the full disaster cycle. The landslide pilot is transitioning to a demo, and the flood pilot is looking to integrate GEO, LEO and SAR observations, building on the work initiated by previous SIT Chairs. The Recovery Observatory (RO) is also moving from a local, single nation pilot to a more generic RO demonstrator (building on the lessons learned). See the slides for specific details of these transitions.
- Aiming to integrate the concept of ARD from the outset of the GEO-LEO-SAR Flood Pilot.
- Working to ensure the Work Plan tasks are effective, addressing user needs, and of the correct scope and balance. Also working to identify and strengthen formal/informal collaborations with other WGs, VCs, and teams.

Main discussion points:

- Astrid-Christina Koch (COM) asked how SAR will be integrated into the projects of WGDisasters. David noted that all projects for volcanoes, landslides, seismic events, and recovery projects have identified data plans, which are overseen by a data management team that works to procure the necessary data. David suggested that it would be very helpful if agencies providing the data were also able to be involved in the use phase.
- Kazuo Tachi (JAXA) stressed the importance of timeliness of data delivery to emergency entities in the immediate disaster response phase. Another key thing is forecasting (e.g., for typhoons). He asked WGDisasters to consider these types of activities.
- Selma Cherchali (CNES) suggested that the group should focus on new activities that will address both practical and science issues, noting that it is crucial to have all stakeholders involved in the

definition of future programmes. She also noted that there are clear overlaps between COAST and the work of WGDIsasters. The two groups need to coordinate to avoid overlaps and strengthen each other's work.

- Jonathon Ross (GA, SIT Chair Team) noted that WGDIsasters has some of the most developed links through to commercial data providers. He asked whether WGDIsasters has thought about engaging with industry through the ARD effort Adam Lewis (GA) mentioned earlier. Jono suggested that as some of these pilots start moving toward operations the providers are likely to start expecting them to pay for data. David agreed, noting that this is why WGDIsasters have made it a point to think more programmatically about their efforts. Whether within the ARD discussion or not, we need to give more consideration to access to commercial data.

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| SIT-35-16 | WGDIsasters to prepare material to stimulate a discussion at the SIT TW discussion on CEOS ARD, specifically on how CEOS might work with commercial data providers in support of the possible operationalisation of the 'pilots'. | SIT TW 2020 |
| | <i>Rationale: Disasters applications have a long heritage of using hi-res commercial data on a 'grant' basis in a pilot context. Operationalisation will require a different relationship.</i> | |

4.2: CEOS Plenary Session [PPT]

Presenter: Raj Kumar (ISRO), CEOS Chair Team

Main points:

- At the 33rd CEOS Plenary, the removal of two entities from the list of CEOS Associates was approved - the International Geosphere-Biosphere Program (IGBP) and Global Terrestrial Observing System (GTOS) - due to them no longer functioning. This was captured as an action on the CEO to remove the two entities but not captured as a Plenary Decision.
- Subsequent inquiries have highlighted that GTOS was never formally dissolved and has continued to exist, even though they have been inactive in CEOS.
- GTOS has requested that CEOS reconsider the 33rd Plenary action to remove GTOS as a CEOS Associate. CEOS does not typically remove Members/Associates from CEOS simply because they have been inactive for a period.
- Following Plenary, Kerry was in contact with Doug Muchoney (FAO). Doug had connected with the terrestrial and WMO communities to "re-engage" GTOS and received significant support in the revitalization. This has been captured in a paper prepared and shared with the community.
- There has been strong support from the United Nations Environment Programme (UNEP) and the UN Geospatial Network for Doug's and FAO's efforts to reinvigorate GTOS.
- The request of CEOS Principals is to reinstate GTOS as an Associate Member of CEOS as the rescinding of their status was premature based on incomplete information. CEOS Principal for GTOS is Doug Muchoney.

Main discussion points:

- The request was agreed, with NASA, ISRO, USGS, NOAA, and CNES supporting.

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| Decision 07 | GTOS will be reinstated as an Associate Member of CEOS. |
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| SIT-35-17 | CEO will take steps to ensure GTOS is fully reinstated and appropriately identified in all relevant CEOS documents and web materials and confirm the same to GTOS Principal. | ASAP |
| | <i>Rationale: GTOS was prematurely removed as a CEOS Associate at the last Plenary under the false impression GTOS no longer existed.</i> | |

4.3: CEOS Chair Update [PPT]

Presenter: Raj Kumar (ISRO), CEOS Chair Team

Main points:

- Raj reviewed the Chair priorities:
 - o Focus on Virtual Constellation (VC) with regard to EO satellites - Gap analysis in priority areas, global studies.
 - o Applications focus on SDGs for BIMSTEC Region - Vegetation, LULC, Water etc.
 - o Renewable energy assessment (Solar & Wind) from Space.
 - o Explore new tools for disasters management: Geo-Leo based solution.
- Raj noted that ISRO is assessing plans for CEOS Plenary, and will make a decision in about a month as to whether the meeting will be held virtually.

4.4: Any Other Business

CEO Continuity [PPT]

Presenter: Sandra Cauffman (NASA)

Main points:

- Sandra presented a proposal from NASA regarding CEO continuity for discussion.

| WE ARE HERE | WE ASPIRE TO | CEOS COULD |
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| <p>CEOS Executive Officers have been:</p> <p>Qualified CEOS Agency Representatives</p> | <p>Receive nominations from <u>across</u> the CEOS organization.</p> <ul style="list-style-type: none"> • CEOS Executive Officer • Deputy CEO | <p>Be open to candidates who COULD be:</p> <ul style="list-style-type: none"> • A qualified CEOS Agency Representative • A qualified Contractor |
| <p>Acceptable to CEOS</p> <p>2 - year term</p> | <p>Broaden the field of candidates <u>from more CEOS Members and Associates over time.</u></p> | <p>Over time, build a queue of 2-3 candidates allowing for a 4-year planning horizon.</p> |

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| <p>BUT NOW Personnel and Resourcing considerations are limiting nominations.</p> | <p>Mitigate the financial burden for CEOS Agencies who might otherwise propose a candidate.</p> | <p>Create a Resource Pool for sustainability. Allows for overlap among CEO and Deputy CEO for cross-training.</p> |
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The suggested path for discussion is:

- Consider Establishing a Resource Pool.
- Be open to CEOS Agency Representatives AND Qualified Contractors.
- Establish a Timeline, Communicate it, and Abide by it.
- Have a Review Process for Qualified Candidates.
- Identify 2-3 Candidates for a 4-year Planning Horizon.

Main discussion points:

- Chuck Wooldridge (NOAA) thanked NASA and ISRO for taking the initiative to move this forward. He stressed that the issue of a contractor needs careful consideration, and might necessitate rethinking the current roles and responsibilities of the position. He noted that NOAA is open to exploring ideas further with CEOS SEC.
- Ivan Petiteville (ESA) also thanked NASA, noting that we have to be careful about contractor idea, ensuring that anyone brought in has a deep and broad knowledge of CEOS Agency activities. We would need to ensure no conflict of interest and represent all agencies equally. Ivan suggested also that maybe the CEO need not be a single person, and we could split administrative and strategic tasks. Finally, on the cost sharing, he noted this is not always easy depending on contractual rules of each agency, e.g there are constraints on European agencies around non-EU contract awards.
- Sandra noted it is not clear the conflict of interest issue is exclusive to an external contractor, and that Agency-based CEOs must also separate their Agency and CEO hats. Sandra noted NASA has similar issues around awarding contracts.
- Raj Kumar (ISRO, CEOS Chair Team) noted the need to consider how the cost would be shared, and this would require a detailed breakdown. This will be discussed again at the next SEC meeting.
- Simonetta Cheli (ESA) noted they would like to pool resources, and would like to elaborate on the NASA proposal. They are open to developing this idea further.
- Christine Bognar (NASA) thanked everyone for the discussion and clarified the ‘we’ in the slides is CEOS. She agreed that credibility of the individual must rest on the person being impartial, and NASA will work with everyone to find a solution.

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| <p>SIT-35-18</p> | <p>CEOS Chair (ISRO) and Incoming Chair (NASA) to work with CEOS SEC and SIT Chair to propose a mechanism to resource and fill the CEO role, based on the “sustainability suggestions” presented at SIT-35, by</p> | <p>SIT TW 2020</p> |
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| | Plenary. The hope is to source a candidate in time for overlap with the current CEO stepping down in January 2021. | |
| | <i>Rationale: Thus far all approaches to secure a candidate by traditional methods have been unsuccessful, and different options have arisen that merit consideration.</i> | |

4.6: SIT Chair Closing Remarks

Presenter: Alex Held (CSIRO), Adam Lewis (GA), SIT Co-Chairs

Main points:

SIT Technical Workshop 2020

- Adam Lewis reported [PPT] that the SIT TW 2020 will be planned as a virtual meeting due to COVID-19 risks. This plan is being announced early to provide certainty to the CEOS community in planning their calendars and preparations. The SIT Chair Team is committed to ensuring an effective event that allows CEOS to prepare well for CEOS Plenary.

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| Decision 08 | SIT noted the decision by the SIT Co-Chairs to plan for a virtual-only SIT Technical Workshop, with the face-to-face meeting in Zagreb to be cancelled. SIT also noted the intention of the SIT Co-Chairs to schedule the Technical Workshop as a series of discrete sessions, each intended to prepare specific items for Plenary. |
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Wrap-up Discussion

- Adam and Alex thanked everyone for attending and working with us with the virtual meeting.
- Simonetta thanked the SIT Chair Team for the great meeting, organisation, and logistics. Ivan agreed, adding that this was a very constructive meeting, and well done especially as the first time to run such a large scale meeting virtually. Sandra, Raj, and Astrid agreed.
- Adam noted we are wishing Mike Freilich all the best. Sandra relayed Mike’s regards, noting that he is doing well, going through treatment and seeing improvement, and that he is now a grandfather.
- Adam thanked the SIT Chair Team for their efforts.

APPENDIX A: Attendees

| Organisation | Name | Organisation | Name |
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| Australian Space Agency | Reece Biddiscombe | NASA | Sandra Cauffman (NASA Principal for CEOS) |
| ASI | Laura Candella | NASA | Christine Bogner (NASA Contact for CEOS) |
| CNES | Selma Cherchali | NASA | Brian Killough (CEOS Systems Engineering Office (SEO)) |
| CNES | Helene de Boizzateon | NASA | Paula Bontempi (Earth Science Division, Deputy Director) |
| CNES | Aurelien Carbonniere | NASA | Jack Kaye (Earth Science Division, Associate Director, Research & Analysis) |
| CNES | Andrew Eddy | NASA | Lawrence Friedl (Earth Science Division, Director, Applied Sciences Program) |
| CONAE | Laura Frulla | NASA [WGISS] | WORKING GROUP on INFORMATION SYSTEMS and SERVICES (WGISS) () |
| CONAE | Ana Medico | NASA [WGISS] | Andrew Mitchell (Member and Past Chair of WGISS) |
| CSA | Marie-Josée Bourassa | NASA [WGISS] | Chris Lynnes (Co-Chair, Technology Exploration Interest Group) |
| CSA | Paul Briand | NASA [WGISS] | Michael Morahan (Member.WGISS) |
| CSIRO | Flora | NASA [WGISS] | Diane Davies (Member, WGISS) |
| CSIRO | Cindy Ong (WGCV Chair) | NASA [WGISS] | Minnie Wong (Co-Lead of CWIC (CEOS Integrated Catalog) Project) |
| CSIRO | Rob Woodcock | NASA [WGISS] | Valerie Dixon (Chair, IDN (International Directory Network)) (Interest Group) |
| CSIRO | Stephen Ward | NASA [WGCV] | Kurt Thome (Member, Infrared & Visible Optical Sensors Subgroup) |
| CSIRO | George Dyke | NASA [WGCV] | Jack Xiong (Member, Infrared & Visible Optical Sensors Subgroup) |
| CSIRO | Matthew Steventon | NASA [WGCV] | Garik Gutman (Member) |
| DLR | Klaus Zhener | NASA [WGCV] | Jaime Nickeson (Member, Land Product Validation Subgroup) |
| DLR | Albrecht von Bargaen (WGClimate) | NASA [WGDisasters] | David Green (Chair, WGDisasters) |
| DLR | Diego Loyola | NASA [WGDisasters] | David Borges (Lead – Geospatial Disasters) |
| EC | Mauro Facchini | NASA [WGDisasters] | Andrew Molthan (Lead – Coastal Flood Pilot) |
| EC | Zolti Szantoi | NASA [WGDisasters] | Dalia Kirschbaum (Lead – Landslide Pilot) |
| EC | Mark Dowell | NASA [WGCapD] | Nancy Searby (Chair, WGCapD) |
| ESA | Ivan Petiteville (CEOS Contact for ESA) | NASA [WGCapD] | Christine Mataya (Member, WGCapD) |
| ESA | Simonetta Cheli (CEOS Contact for ESA) | NASA [WGClimate] | Wenyng Su (Member, WGClimate) |
| ESA | Frank Martin Seifert (Forest & Biomass co-lead) | NASA [VCs] | Jay Al-Saadi (Co-Lead, AC-VC) |
| ESA | Marc Paganini (SDG AHT co-lead) | NASA [VCs] | Richard Eckman (Member and Past Co-Lead, AC-VC) |
| ESA | Marie-Hélène Rio (OCR-VC co-chair) | NASA [VCs] | David Crisp (Member, AC-VC) |
| ESA | Ben Veihelmann (AC-VC co-chair) | NASA [VCs] | Gail Skofronick Jackson (Co-Lead, P-VC) |

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| ESA | Jérôme Benveniste (CEOS-COAST member) | NASA [VCs] | Chris Kidd (Member, P-VC) |
| ESA | Ferran Gascon (LSI-VC member) | NASA [VCs] | Marissa Herron (Member, LSI-VC) |
| ESA | Mirko Albani (WGISS member) | NASA [VCs] | Brad Doorn (Co-lead, LSI Subgroup for GEOGLAM) |
| ESA | Maurice Borgeaud | NASA [VCs] | Paula Bontempi (Member and Past Co-Lead, OCR-VC) |
| EUMETSAT | Jörg Schulz | NASA [VCs] | Ed Armstrong (Co-Lead, SST-VC) |
| EUMETSAT | Kenneth Holmlund | NASA | Lawrence Friedl (Vice Chair of USGEO;) (Member, GEO User Interface Committee (UIC)) |
| EUMETSAT | Robert Husband | NASA | Argyro Kavvada (NASA Designee, SDG ad hoc Team) |
| GA | Trevor Dhu | NASA | Hank Margolis (CEOS Carbon Effort;) (NASA Terrestrial Ecology Program Lead) |
| GA | Jono Ross | NASA | Laura Duncanson (Univ. of Maryland) (Terrestrial Ecology Program) |
| GA | Emma Luke | NASA | Michael Falkowski (Colorado State Univ.) (Terrestrial Ecology Program) |
| GA | Medhavy Thankappan | NASA | David Crisp (Univ. of Maryland) (CEOS Greenhouse Gas Activities) |
| GA | Steven Sagar | NASA | Gerald Bawden (NASA Earth Science Division, Focus Area Lead –) (Water and Energy Cycle) |
| GA | Andreia Siqueira | NASA | Vardis Tsonetos (CEOS Ocean Variables Enabling Research & Applications) (for GEO (COVERAGE)) |
| ISRO | Raj Kumar | NASA | Jorge Vázquez (COVERAGE) |
| ISRO | Rajeev Jaiswal | NASA | Thomas Huang (COVERAGE) |
| ISRO | P G Diwakar | NASA | Kim Holloway (Team Member) |
| ISRO | Debajyoti Dhar | NOAA | Steve Volz |
| ISRO | Nitant Dube | NOAA | Kerry Sawyer (CEO) |
| ISRO | Rashmi Sharma | NOAA | Paul DiGiacomo |
| ISRO | Mini Raman (OCR-VC) | NOAA | Ken Casey |
| ISRO | M V Ramana | NOAA | Albert DeGarmo |
| ISRO | P K Thapliyal | NOAA | Charles Wooldridge |
| JAXA | Mr. Kazuo Tachi (Principal) | SANSA | Imraan Saloojee |
| JAXA | Mr. Takeshi Hirabayashi | UKSA | Bertie Archer |
| JAXA | Dr. Riko Oki (P-VC Lead) | UNOOSA | Coen Bussink |
| JAXA | Mr. Tsuruma Hitoshi | UNOOSA | Jorge Del Rio Vera |
| JAXA | Ms. Mariko Harada | US Dept of State | Fernando Echavarria |
| JAXA | Mr. Osamu Ochiai (Contact) | USGS | Jenn Lacey |
| JAXA | Mr. Chu Ishida (1.3 SDGs) | USGS | Tim Stryker |
| JAXA | Dr. Takeo Tadono (2.1 Climate, Carbon and Biomass, 3.1 ARD) | USGS | Steve Labahn |
| JAXA | Ms. Misako Kachi (3.1 ARD, 4.1 WP Deep Dive) | VNSC | Vu Anh Tuan |
| JAXA | Dr. Akihiko Kuze (2.1 Climate, Carbon and Biomass) | VNSC | Lam Dao Nguyen |
| JAXA | Dr. Shiro Kawakita (4.1 WP Deep Dive) | VNSC | Dr Mati |

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| | | <i>WMO</i> | Werner Balogh |
| | | <i>WMO</i> | Anthony Rea |

APPENDIX B: Decisions and Actions Record

[Link to stand alone Decisions and Actions document](#)

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| Decision 01 | SIT strongly recognised the substantial progress on the CEOS COAST study. The COAST Study Team will take on board the discussion from SIT-35, which included views on prioritisation of projects and on ARD, in preparation for the SIT TW and Plenary. |
| Decision 02 | SIT recognised the significant contribution of Carolin Richter in her role as GCOS Director for the past 11 years and will pass on best wishes for her future in a letter from CEOS. |
| Decision 03 | SIT recognised the significance of the CEOS Biomass Protocol work and thanked the many CEOS Agency contributors. SIT looks forward to publication of the Protocol document in the next few months and to further discussion at the SIT TW and Plenary. |
| Decision 04 | SIT acknowledged the interest conveyed from user communities with an interest in oceans and coasts, in relation to expansion of CEOS ARD activities beyond land. SIT also noted the importance of engaging the private sector early before ARD standards are defined, to promote complementarity between government and private sector activities. |
| Decision 05 | SIT noted that the GEO Water Strategy is no longer an active strategy, nor therefore is the CEOS Response to it. SIT agreed that relevant activities will be removed from the CEOS WP. |
| Decision 06 | SIT Chair Team will continue with its engagement plan for CEOS Working Teams via: Working Team All-Hands calls; the new VC reports to CEOS SEC; and informal working telcons with VC Co-Leads. Updates will be provided and issues addressed at SIT TW and Plenary. |
| Decision 07 | Decision of CEOS Agencies meeting in a Plenary Session: GTOS will be reinstated as an Associate Member of CEOS. |
| Decision 08 | SIT noted the decision by the SIT Co-Chairs to plan for a virtual-only SIT Technical Workshop, with the face-to-face meeting in Zagreb to be cancelled. SIT also noted the intention of the SIT Co-Chairs to schedule the Technical Workshop as a series of discrete sessions, each intended to prepare specific items for Plenary. |

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| SIT-35-01 | CEOS Agencies are invited to consider nominations for representatives and co-leads for the SDG <i>Ad Hoc</i> Team subgroups (with Water, Urban and Land degradation focus) and to share agency activities of relevance to the AHT efforts on specific indicators. | April 2020 |
| | <i>Rationale: Request from AHT to confirm level of Agency commitment and engagement.</i> | |
| SIT-35-02 | SDG-AHT to provide an update on agencies and nominees contributing to the Subgroups. | SIT TW 2020 |
| | <i>Rationale: Agencies are keen to see SDG-AHT progress towards a clear decision on its future at Plenary.</i> | |
| SIT-35-03 | Anthony Rea (WMO) to provide link to the TORs for the GCOS Study Group for CEOS reference. | ASAP |
| | <i>Rationale: Significant interest in CEOS and agencies on the process by which WMO will revise the GCOS structure and processes.</i> | |
| SIT-35-04 | WGClimate GHG Task Team to coordinate with the CEOS Chair to share the current draft of the Roadmap document with CEOS agencies and to prepare for endorsement of the Roadmap at 2020 Plenary. | April 2020 |
| | <i>Rationale: GHG Roadmap is a living document. A draft is available for review by CEOS agencies and the team has signalled its intent to complete the document by Plenary.</i> | |
| SIT-35-05 | WGClimate Chair to follow up with WMO/GCOS on participation in WGClimate#12 and interaction between the ECV inventory analysis and the GCOS Status Report update - with a report back to the SIT TW 2020. | ASAP |
| | <i>Rationale: WGClimate has indicated importance of GCOS representation at WGClimate#12.</i> | |
| SIT-35-06 | SIT Chair Team to work with WGCV LPV Biomass Protocol team to prepare a simple business case to gauge support from CEOS Agencies at the SIT TW. | SIT TW 2020 |
| | <i>Rationale: Biomass protocol aimed at ensuring policy relevance of many new missions of CEOS agencies. The SIT TW can prepare Principal discussion at Plenary.</i> | |

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| SIT-35-07 | JAXA and ESA will lead the development of the proposed CEOS AFOLU Roadmap. First, they will assess the will, direction, and capacity of the relevant CEOS Agencies. The SIT Chair team will support communications with Principals and help to identify team nominees. A mature Roadmap will be presented to the SIT TW for discussion and a final version will be presented to the CEOS Plenary for consideration of endorsement. | SIT TW 2020 |
| | <i>Rationale: UNFCCC Global Stocktake Process is a major opportunity for CEOS and its agencies to demonstrate the value of EO. GHG Roadmap model seen as an inspiring example for land and ocean carbon to follow if feasible. Significant effort is entailed so SIT Chair will help volunteers determine if the critical mass is assembled to justify proceeding.</i> | |
| SIT-35-08 | The SIT Chair Team to consider the potential for an activity to prototype the CEOS ARD approach for one exemplar ocean variable and one exemplar atmospheric variable. CEOS Agencies and Working Teams to indicate their interest in supporting such prototype work to the SIT Chair Team. | SIT TW 2020 |
| | <i>Rationale: Discussions have revealed preliminary interest in the ARD concept beyond land variables, but practical exemplars would provide more evidence to support CEOS Agency consideration of further investment.</i> | |
| SIT-35-09 | All to review the <i>CEOS Analysis Ready Data – Involving the Private Sector</i> paper and provide feedback to the SIT Chair Team by April 17. | 17 April |
| | <i>Rationale: The ARD team is seeking agency feedback and experience with the private sector.</i> | |
| SIT-35-10 | CEO to consult CEOS Agencies & Working teams to identify possible representatives to the four new GEO Working Groups (noting relevance to WGClimate, WGCapD, LSI-VC and WGISS in particular). CEOS Agencies requested to identify any individuals they, or their governments, are nominating in parallel. | 30 April |
| | <i>Rationale: GEO has asked CEOS to support the new WGs. CEOS Agencies would appreciate a broader understanding.</i> | |
| SIT-35-11 | CEO to coordinate with GEO Secretariat to ensure both the GEO and CEOS Work Plans fully reflect and | Plenary |

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| | acknowledge the CEOS contribution to GEO objectives | |
| | <i>Rationale: As the space arm of GEO, a significant quantum of CEOS investment supports the GEO Work Programme. It is important this is clear to stakeholders.</i> | |
| SIT-35-12 | CEO, in liaison with the SIT Chair Team, to work with CEOS Working Teams to identify which specific aspects of the 2020 Work Programme (once endorsed) require further analysis before and during the SIT TW. | End May |
| | <i>Rationale: The SIT Tech Workshop is the next major opportunity to address implementation of the CEOS Work Plan, particularly for items that would benefit from Principal consideration and support at Plenary.</i> | |
| SIT-35-13 | NOAA will provide the SIT Chair Team with the questionnaires compiled during the NOAA SIT Chair term, and facilitate a discussion on the content. | ASAP |
| | <i>Rationale: NOAA recalled the questionnaires they had completed during the 2018-2019 SIT term and suggested that they may have enduring value.</i> | |
| SIT-35-14 | CEO and SEO, in consultation with the SIT Chair, to consider consistent templates and DOIs for CEOS publications and their representation on the CEOS website. | SIT TW 2020 |
| | <i>Rationale: A number of agencies have noted scope for improvement in consistency of CEOS thematic coordination strategies and their documentation, and also identified the need to make CEOS publications easier to reference and cite externally.</i> | |
| SIT-35-15 | Ed Armstrong to follow-up with the CEOS SEO on the publication of the final SST-VC White Paper on the CEOS Website. | April In progress. Request sent to Kim Holloway to post; awaiting CEOS website issue resolution. |
| | <i>Rationale: Publicize and promote the SST-VC paper on the CEOS website.</i> | |
| SIT-35-16 | WGDisasters to prepare material to stimulate a discussion at the SIT TW discussion on CEOS ARD, specifically on how CEOS might work with commercial data providers in support of the possible operationalisation of the 'pilots'. | SIT TW 2020 |

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| | <p><i>Rationale: Disasters applications have a long heritage of using hi-res commercial data on a ‘grant’ basis in a pilot context. Operationalisation will require a different relationship.</i></p> | |
| <p>SIT-35-17</p> | <p>CEO will take steps to ensure GTOS is fully reinstated and appropriately identified in all relevant CEOS documents and web materials and confirm the same to GTOS Principal.</p> | <p>ASAP</p> |
| | <p><i>Rationale: GTOS was prematurely removed as a CEOS Associate at the last Plenary under the false impression GTOS no longer existed.</i></p> | |
| <p>SIT-35-18</p> | <p>CEOS Chair (ISRO) and Incoming Chair (NASA) to work with CEOS SEC and SIT Chair to propose a mechanism to resource and fill the CEO role, based on the “sustainability suggestions” presented at SIT-35, by Plenary. The hope is to source a candidate in time for overlap with the current CEO stepping down in January 2021.</p> | <p>SIT TW 2020</p> |
| | <p><i>Rationale: Thus far all approaches to secure a candidate by traditional methods have been unsuccessful, and different options have arisen that merit consideration.</i></p> | |