

Executive Summary

CEOS Chair Priorities

- Progress towards **CEOS Chair priorities** was reported, including: ensuring long-term sustainability of CEOS Strategies; CEOS support to the UNFCCC Global Stocktake; and, support to CEOS Cal-Val initiatives.
- SIT Chair led an initial discussion on **New Space and Future CEOS**, including presentation of case studies from CNES, COM, and NOAA on their experience. This will be a theme for the rest of the SIT Chair Term, and suggested topics to be explored during a Technical Workshop session are welcome.
- **External engagement** in SIT Chair Priorities was sought with presentations from UNFCCC, IMEO, GEO BON, and GEO Secretariat.

Climate and Carbon

- Key points from the **GHG-AFOLU Workshop** (November 2021) were reviewed, with a draft report and recommendations expected in May (final for SIT Technical Workshop in September).
- An update on the **AFOLU Roadmap** was presented, including progress on the **GEO-TREES** Forest Biomass Reference Network, the value of ground truth observations, and an example of **National Inventory User Engagement** from SilvaCarbon.
- Updates on the **CEOS Strategy for the Global Stocktake (GST)** were presented, and an update on the **GST Process and Systematic Observations Synthesis Report** was provided. It was noted the community should be working towards a **COP-level decision on Earth observation for COP-27**.
- There was an outcome at COP-26 on **strengthening ocean climate action**, and introducing an annual ocean climate science dialogue (June session).
- An initial discussion of opportunities for collaboration with the **International Methane Emissions Observatory (IMEO)** addressed CEOS support to a concept note being developed for the IMEO Scientific Oversight Committee on data intercomparison and integration.

Oceans

- Outcomes from a recent **Ocean Carbon from Space Workshop** were presented. CEOS Agencies are asked to consider their support to the development of an Aquatic Carbon Roadmap.
- A brief update was provided from the **CEOS Oceans Coordination Team**, and next steps around information gathering on ongoing activities were presented. (Added value for CEOS, beneficiaries, general context of each activity, e.g. GEO Blue Planet or CEOS Support to GST.)
- Updates on **CEOS contributions to the UN Decade** from the CEOS-COAST and COVERAGE initiative were provided.

Global Agendas

- The newly formed CEOS SDG Coordination group took stock of current deliverables status, and reviewed CEOS Support to the UN 2030 Agenda and **Sustainable Development Goals**, as well as CEOS expectations for the GEO Secretariat in relation to this support. All related CEOS deliverables are planned to be completed by the end of 2022, meaning 2023 (and forward) deliverables and future CEOS SDG support need consideration by the next Plenary.
- The **Working Group on Disasters Recovery Observatory (RO)** was recognised by the UN General Assembly in the Space 2030 Agenda. Discussion around sustaining RO activities is ongoing.

- A comprehensive overview of Biodiversity issues, and the importance of the support provided by Earth observations was presented. CEOS Principals are invited to nominate a co-lead and representatives to a **Biodiversity Discussion Group** to consider how to advance CEOS support.

Working Team Business

- Planning for a **Wildfire pilot** was presented.
- The **CEOS-ARD Oversight Group Terms of Reference were endorsed**, and SIT Chair will confirm sustainability of the arrangements and that SIT TORs are supportive (ACTION SIT-37-09).
- AC-VC is developing a whitepaper on **“Monitoring Surface PM2.5: An International Constellation Approach to Enhancing the Role of Satellite Observations”** seeking to strengthen the role of satellite missions. The paper will be provided for discussion at the SIT Technical Workshop, with the goal of presenting the paper at the 2022 CEOS Plenary for endorsement.

CEOS Leadership

- A new **Deputy Lead of the CEOS Systems Engineering Office (SEO)** has been appointed (David Borges/NASA).
- An update from the **CEOS-GEO Coordination meeting** was provided. A nominee for CEOS representation to the GEO post-2025 Working Group was agreed (Ivan Petiteville).
- The two-year tenure of the **current CEOS Executive Officer** (CEO, Marie-Claire Greening) will end in December 2022. A discussion and resolution around continuity for this role is required.
- **CSA’s Nomination for CEOS Chair 2024** was announced.

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Tuesday March 29th

Session 1: Welcome and Opening Session

1.1: Welcome and Opening Remarks

Presenters: Simonetta Cheli (ESA, SIT Chair) and Ivan Petiteville (ESA, SIT Chair Team) [[presentation](#)]

Main points:

- Simonetta welcomed all to the 37th CEOS SIT Meeting, and noted the wish for ESA to have held this event in person.
- More than ever, international cooperation is becoming a prerequisite for all activities relying on Earth observations, especially on topics like environment or food security that are increasingly impacted by climate change. They require a global coordinated response from all governments and organisations including CEOS.
- In parallel, the commercialisation of space has created a true New Space revolution supported by huge investment, and characterised by constellations of small lightweight satellites providing high revisit observations at very high resolution. End users should be the main beneficiaries of this EO revolution if both the public and the private sectors cooperate in a complementary manner to provide higher quality information products and better targeted services and information to decision-makers, to scientists and to citizens.
- There are a number of agenda items that include more than one CEOS group, this effective coordination of resources is one of the main strengths of CEOS, and is increasingly recognized by key external stakeholders. A growing number of external entities are seeking to engage with us, which is extremely motivating and rewarding.
- The agenda includes an update on the latest work on the Global Stocktake process of the UNFCCC, as well as the latest work on support to Disasters. The opportunities to evolve efforts on Biodiversity will be discussed, and there is also time for all CEOS Working Teams to bring topics to the attention of Principals.
- A number of guests are presenting at this meeting, including Joanna Post of UNFCCC SEC, and Steve Hamburg of the International Methane Emissions Observatory. CEOS is grateful to all these guests for their contributions.

Participants were invited to amend the [list of participants](#) in lieu of a full *tour de table* for the sake of timekeeping.

1.2: 2022-2024 CEOS Work Plan - Highlights

Presenter: Marie-Claire Greening (CEOS Executive Officer (CEO)) [[presentation](#)]

Main points:

- CEOS is guided by four main governing documents, the CEOS Terms of Reference, CEOS Strategic Guidance document, CEOS Governance and Processes, and the CEOS Work Plan. (Available on the governing documents page: ceos.org/about-ceos/governing-documents.)
- The CEOS Executive Officer (CEO) is the custodian of all CEOS Governing Documents, including the annual update of the 3-year CEOS Work Plan and the definition and monitoring of the deliverables it informs. The CEOS 2022-2024 Work Plan was virtually endorsed on 22 March 2022 prior to the SIT-37 meeting. The CEOS 2022-24 Work Plan can be viewed [here](#).
- The CEOS 2022-2024 Work Plan now includes 12 chapters and details the work CEOS entities plan to focus on over the coming three years. The detailed work is defined as deliverables, which are reconciled and tracked in the [CEOS deliverable tracking tool](#).

- The CEOS 2022-2024 Work Plan defines 130 total deliverables. 78 were carried over from the 2021-23 Work Plan, and 52 new deliverables were created. 45 deliverables from the 2021-23 Work Plan were completed last year and are now closed.
- Of the 130 active deliverables for 2022-2024, 81 have deadlines in 2022, 37 have deadlines in 2023, and 12 have deadlines in 2024 and beyond.

1.3: Progress on CEOS Chair Priorities

Presenter: Selma Cherchali (CNES, CEOS Chair) [[presentation](#)]

Main points:

- CNES is focusing its Chair term on three key priorities: ensuring long-term sustainability of CEOS Strategies, CEOS support to the UNFCCC Global Stocktake, and support to CEOS Cal/Val initiatives.
- Regarding the prioritisation of sustained operation and application of demonstrators, as well as the evolution of these R&D activities to services for users, key points include:
 - o Development of synergies with both GEO and other external stakeholders is key.
 - o One such candidate is the WGDisasters Recovery Observatory. This will be progressed by CNES. The CNES team will work to increase linkages to the Sendai Framework and the GEO Disaster Risk Reduction (DRR) Working Group.
 - o GEO Global Water Sustainability (GEOGLOWS) is another important activity that could be a candidate under this priority.
- Regarding the implementation of the CEOS Global Stocktake (GST) Strategy, CNES is making specific contributions to implementation of the CEOS Biomass Protocol through GEO-TREES. Other points of focus include:
 - o The AFOLU and GHG Roadmaps.
 - o CNES, with UKSA and DLR, are working to ensure planned missions provide practical support in response to GST data requirements.
 - o CNES is supporting the secretariat of the GEO Forest Biomass Reference System from Tree-by-Tree Inventory Data (GEO-TREES) and is funding two CEOS Biomass Protocol implementation sites.
 - o CNES is planning engagement with countries for adaptation and mitigation support, including via Space Climate Observatory (SCO) use cases. CNES, through SCO, is in the process of engaging with specific use cases to ensure good end user feedback to requirements.
 - o Supporting national GHG inventories through pilots.
- Support for calibration and validation includes Land Surface Temperature (LST) mission support and coordination, including exploration of a cal/val protocol and a network of ground-based measurement sites for harmonisation of methods. Specifically this includes development of a CEOS protocol to support the cross-calibration of thermal infrared measurements from future CEOS Agency missions (e.g., Trishna (CNES/ISRO), ESA (LSTM), NASA/JPL (SBG), CSIRO (AquaWatch Australia, etc.). The WGCV are taking up this topic.

Discussion

- Ivan Petiteville (ESA, SIT Chair Team) noted the harmonisation between the SIT Chair and CEOS Chair priorities and that the CNES priorities are built upon a number of ongoing activities. The idea is to elevate these activities throughout the CEOS Chair year. He also noted Selma's user engagement point – it is very important for CEOS to adapt to user needs, and user participation is critical when defining solutions.

- Mitch Goldberg (NOAA) noted that the cross-calibration of infrared instruments is a GSICS activity. He asked how this priority will be unique. Selma noted that the CNES CEOS Chair Team is relying on WGCV guidance with this activity. Akihiko Kuze (JAXA, WGCV Chair) noted that WGCV has strong links to GSICS and will coordinate with them on any work in this direction.
- Mitch offered to discuss further offline and agreed that we need to work on intercalibration of Greenhouse Gas (GHG) missions. WGCV has always been important to GSICS for maintaining the ground-based reference sites (e.g., RadCalNet, supersites, etc.).

1.4: SEO Report

Presenter: Brian Killough (NASA, SEO) [[presentation](#)]

Main points:

- The CEOS Systems Engineering Office (SEO) is a deliberate contribution by NASA to support the CEOS organisation and facilitate global space agency initiatives. The SEO work is adapted to the needs of CEOS, and the team works on a mix of technical initiatives and management initiatives.
- Noted the new Deputy Director of the SEO - David Borges from NASA.
- The CEOS Communications Team has been working since Plenary last November to improve the CEOS website, in particular the management of the CEOS News page. Brian asked participants to let the team know how they can improve CEOS Communications and advertise the work done throughout CEOS.
- The SEO has been continuing work on the Open Data Cube (ODC) Sandbox, ODC integration on the Sentinel Hub, regional data cube initiatives (Digital Earth Africa, Digital Earth Pacific Islands & Digital Earth Americas), soil organic carbon for agriculture, Earth Analytics Interoperability Lab (EAIL), and the land cover dataset assessment.

Main discussion points:

- Steve Volz (NOAA) asked if there are statistics available on the number and type of users that are working with the ODC Sandbox, and what sort of applications they are exploring. Brian noted Google Analytics has been set up, but he would have to compile the statistics. The primary users of the sandbox are researchers and students, and it is typically their initial engagement with satellite data. Brian has received great feedback regarding the use of the sandbox for educational purposes.
- Steve suggested that users who don't normally have the resources to work with satellite data are a key target audience for the sandbox. Brian noted its use for DE Americas and DE Pacific, where tools from the sandbox were mobilised for use in larger regional initiatives.
- Brian encouraged all to try the sandbox at: www.openearthalliance.org/sandbox
- Paul DiGiacomo (NOAA, COAST) noted COAST is very appreciative of the EAIL and broader SEO support.
- Jonathon Ross (GA) commented in chat: *Great presentation Brian. Your work to help bridge the 'last mile' to users, and help with realisation of the amazing variety and diversity of CEOS Agency datasets, is very impressive.*
- Mark Dowell (EC/COM) commented in chat: *I'd be interested in a dedicated presentation on the Land Cover data Assessment when that is completed. Not necessary at a SIT meeting, potentially through a specific virtual meeting.*
- Timothy Stryker (USGS) commented in chat: *There can be privacy concerns associated with detailed user metrics from commercial cloud service providers. It would be worth a further discussion among CEOS data providers on how they've addressed these challenges.*

Session 2: Climate and Carbon

2.1: Session Overview & Context

Presenters: Stephen Briggs (ESA, SIT Chair Team) [[combined session presentation](#)]

Main points:

- Climate & Carbon is one of the SIT Chair Term Priorities, which includes activities such as support to UNFCCC & COP, the Global Stocktake, GCOS, and other related CEOS projects.
- The SIT Chair Team hopes to have decisions on:
 - o The next steps regarding CEOS inputs to the Systematic Observations synthesis report with UNFCCC SEC.
 - o AFOLU Roadmap feedback, next steps, and intra-CEOS links
 - o Latest on the GST Strategy and the resulting action status

2.2: WGClimate Report on COP-26 Outcomes & Use Case Studies Progress

Presenters: Albrecht von Bergen (DLR, WGClimate) [[combined session presentation](#)]

Main points:

- WGClimate is working on addressing the observational needs of climate, and responding to the needs and requirements of GCOS. They report on progress to UNFCCC and COP.
- The objectives of the use cases are to demonstrate the value of climate data records for decision/policy making, understand the application needs, validate the top-down architecture for climate monitoring from space, optimise the use of climate data records in applications, and support capacity building. 20 use cases have been received so far, with 8 published and one declined.
- The most recent GCOS Status report was published in 2021, with an update of the GCOS Implementation Plan planned for 2022. There will be a public review of this document, originally planned for May 2022, however it has been delayed. Publication of the Implementation Plan is targeted for the 2nd Climate Observation Conference co-hosted by GCOS and EUMETSAT in October 2022. The Implementation Plan will also be presented during COP-27, and in 2023-24 CEOS will prepare their response to the plan.
- WGClimate presented at COP-26, at the Earth Information Day, with an additional presentation of the Synthesis Report of Systematic Observations, as well as 7 poster contributions by WGClimate and individual agencies.
- Pledges made at COP-26 include the Global Methane Pledge, Race to Zero campaign, Forests, Finance, The Race to Resilience campaign, and the Glasgow breakthrough agenda. These open a variety of opportunities for CEOS to provide its capabilities.
- UNOOSA / UKSA are hosting a survey with the aim of collecting information about space & climate, with the motivation to provide an overview for newcomers, and to sharpen UNOOSA's Space4Climate programme. They are investigating the gap analysis regarding the international fora looking at how space can respond to the climate emergency.

2.3: GHG Roadmap Update and GHG-AFOLU Workshop

Presenters: Mark Dowell (EC/COM, GHG Task Team) [[combined session presentation](#)]

Main points:

- Major CEOS effort in the lead up to COP26 to prepare a summary of datasets to start the dialogue with users in the context of the GST process. Noted ceos.org/gst as a resource compiling all of this information.

- The GHG constellation is increasing in scope and opportunities. Need to think about how to make best use of this variety of capabilities.
- We need a dedicated workshop on CEOS GST contribution covering emissions, reporting, and uncertainty.
- We still need to define requirements for reporting fluxes. Operationalisation of reporting of emissions requires more discussion. The next steps are TBD, though there are some thoughts on this regionally to learn from.
- We still need to increase links between science communities and other international organisations (WMO, UN).
- We have growing evidence based on the combined use of wide area missions, e.g. TROPOMI with e.g. GHGSat for high resolution.
- EM-27's up-looking spectrometers are about as accurate as a TCCON site but much cheaper. To what extent can these be used to characterise and adjust XCO₂ and XCH₄ biases in challenging areas?
- Regarding the GHG-AFOLU workshop held in November 2021, some key points include:
 - o This was a CEOS-EU-GEO joint effort.
 - o The workshop focused on systematic observations, contributions and synergies for GHG and AFOLU support to UNFCCC and starting a dialogue between these communities to identify shared priorities.
 - o Key acknowledgement: a global system supporting monitoring and verification of The Paris Agreement should be able to rely on Earth observations to provide a comprehensive picture for decades to come.
 - o It is important to address GHG and AFOLU together as we consider such a system.
 - o Goal to empower parties to use the products more. This includes active engagement with the traditional inventory communities, as well as the 'hands-on' users. There has already been some good practice of this already, such as through SilvaCarbon.
 - o A key aspect is the transition from research to operational settings.
 - o There are some key product areas that need further development and refinement, such as distinguishing managed from unmanaged lands, and looking at some of the aspects such as soil organic carbon.
 - o So far, there has been a lot of focus on "F" (forestry) in AFOLU, and more effort/development needed on A (agriculture) & OLU (other land use).
 - o The workshop report & recommendations are forthcoming, with a draft ready in May. The final document will be ready for SIT TW in September.

2.4: AFOLU Roadmap Update

Presenters: Osamu Ochiai (JAXA, LSI-VC Forests & Biomass) [[combined session presentation](#)]

Main points:

- Space agencies (CEOS & CGMS) have emphasised the Essential Climate Variables (ECVs) and Physical Climate via the GCOS framework very effectively for the past decade.
- The importance of Nationally determined contributions (NDCs) to the Paris Agreement, and specifically the Global Stocktake (GST), raises new challenges around country needs and implications for using Earth observation data with greater emphasis on mitigation and adaptation, as well as national-level datasets.
- The AFOLU Team grew out of a SIT-35 action from March 2020, with a discussion paper prepared for the October 2020 CEOS Plenary.
- The 2022 plans for the team include the expansion of GHGs to include CH₄ and N₂O, mature the data product harmonisation work workflow, national case study(s) with SilvaCarbon, and the integration of AFOLU and GHG.

- The AFOLU Roadmap scope and objectives broadly encompasses providing a framework for long-term coordination on Earth observations for AFOLU-related information, an effective means for communicating our intentions, and provides guidance to agencies and users on Earth observations for AFOLU.
- The team asked for agency support regarding agency mission contribution and continuity, supporting experts joining the Product Harmonisation Teams, and engagement with key stakeholders beyond CEOS. The team has been working virtual-only so far, however are hoping for an in-person meeting around SIT TW 2022. This is likely a multi-year endeavour, and asked for support from agencies for the expert and section leads, including for future in-person meetings.

GEO-TREES: Forest Biomass Reference Network

Presenters: Klaus Scipal (ESA, GEO-TREES) [[combined session presentation](#)]

Main points:

- The Global Forest Biomass Reference System hopes to establish equitable and sustainably-funded recurrent site-based measurements building on existing initiatives.
- Space agencies often aren't engaging enough in this area, something the team is trying to improve.
- The process began with the CEOS WGCV Aboveground Biomass Product Validation Best Practice Protocol document. This outlined that the reference sites have certain requirements, including for field plots, airborne lidar and terrestrial lidar.
- The work is building on existing networks through many partner organisations.
- The objective of GEO-TREES is to engage donor organisations and manage these donations, prioritising the site funding strategy.
- An activity was accepted in the GEO Work Programme in March 2021, and some first achievements have been completed.
- The next steps will include establishing a project structure & governance, setting up of the trust fund, and developing a narrative of why it matters.
- This work is about fostering collaboration between organisations.

Main discussion points:

- Steve Volz (NOAA) expressed his support for Klaus' point that space agencies need to advocate for ecologist contributions, and the value of ground truth for our observations.
- Stephen Briggs (ESA, SIT Chair Team) added that Klaus was also suggesting we cannot continue to lean too hard on the ecological networks without contributing.
- Karen St. Germain (NASA) commented in chat: *NASA encourages CEOS Agencies to coordinate on data collection for biomass validation following recommendations from the biomass protocol (open high-quality field data, terrestrial lidar scanning, and airborne lidar). We also recommend continued support for the biomass harmonisation activity so that it may be available in support of the first UNFCCC Global Stocktake (GST) in 2023 and beyond.*

2.5: National Inventory User Engagement

Presenters: Sylvia Wilson (USGS) & Joana Melo (SilvaCarbon) [[combined session presentation](#)]

Main points:

- The overarching goals of this project is to demonstrate uptake of satellite-based data and derived products in country reporting to the UNFCCC, validate the available biomass maps / "harmonised" map (additional NFI data), and provide national feedback on, and contribute to the refinement of, available products derived from satellite-data.

- SilvaCarbon is a US government initiative.
- Some activities include documenting the existing examples of data and products used in MRV, preliminary engagement to introduce the CEOS AFOLU initiatives and products, regional workshops, and collaboratively develop demonstrations of Earth observations uptake.
- They are focusing on four regions, Central and South America, South-East Asia, and Central Africa, with example countries including Peru, Paraguay and Guatemala.
- There has been preliminary engagement to introduce CEOS AFOLU initiatives and products to 12 Central & South American countries, 7 Central African countries, and 9 South-East Asian countries. Following this initial engagement, they can collaboratively develop demonstrations of Earth observation uptake.
- The first SilvaCarbon/CEOS Regional Workshop on Biomass measurements will be held in Paraguay in June 2022, and the team called for support from CEOS Agencies to contribute their expertise to the workshop.

SIT-37-01	CEOS agencies behind the relevant AFOLU products (inc ESA and NASA) are asked to send representatives to the first SilvaCarbon/CEOS Regional Workshop on Biomass measurements to be held in Paraguay in June 2022 as part of the National Inventory User Engagement. SIT Chair will follow up with SilvaCarbon and the product agencies.	April 2022
	<i>Rationale: The National Inventory User Engagement is a key part of our AFOLU/GST activity and the workshops seek to explain our main offerings to users. The key agencies behind the most popular products are requested to attend to support the explanation.</i>	

2.6: CEOS Strategy for the Global Stocktake

Presenters: Stephen Briggs (ESA, SIT Chair Team) [[combined session presentation](#)]

Main points:

- GST Strategy Document V3.1 was approved at CEOS Plenary in November 2021. The document contains 9 recommendations for specific actions on CEOS Agencies and CEOS bodies to support the GST.
- Actions derived from the recommendations are included in the CEOS 2022-2024 Work Plan and are complementary to those already carried out by CEOS bodies in support of the GST. The recommendations are additions/augmentations to ongoing work.

Recommendation	Updates
1, 2: Update WG Climate GHG Task Force Report Annex C	<ul style="list-style-type: none"> • Updating annex to ensure all requirements are reflected. • Gathering through a variety of workshops, e.g., WGClimate gap analysis workshop, GHG-AFOLU workshop, ocean carbon, etc. (see slides for complete list)
3: Inform the report of CEOS to UNFCCC/RSO discussion on observations to support the implementation of the Paris Agreement and should pro-actively flow into (b) the consultancy process of the UNFCCC / Ad hoc group for the Synthesis Report on	<ul style="list-style-type: none"> • Contributions by CEOS Agencies to Earth Information Day at COP26. • Representation from WGClimate, GHG Task Team and AFOLU Roadmap Team. • Major contributions from all these groups to the Synthesis Report on Systematic Observations for UNFCCC currently in preparation

Observations for the GST. CEOS should also report on this at the Earth Information Day at COP26.	and to be discussed at SBSTA in Bonn, June 2022.
4: CEOS should consider, in conjunction with modellers, setting up one or more focussed observational campaigns as a major contribution to the understanding of trends in natural GHG emissions and removals in key areas.	<ul style="list-style-type: none"> • NASA/ESA conducted the AMPAC Campaign aimed at understanding methane emissions from tundra under warming conditions. Included airborne, satellite (TROPOMI) and model data, with a training school to be held in Q3 2022. • Further work is being proposed in this area, with new AOs emerging. • Discussions on possible campaigns with both public sector and private sector in oil and gas extraction locations e.g. Permian Basin. • Further possibilities for such campaigns in e.g. Amazon Basin exist and can be considered with science community through e.g. Carbon from Space Workshop, WMO Carbon Workshop.
5: The AFOLU Roadmap Team and WGClimate GHG Task Team should work together to ensure consistency between data for emissions reported via AFOLU and for prior biogenic terrestrial emissions, and those due to changing land use, in implementing monitoring and verification systems.	<ul style="list-style-type: none"> • GHG-AFOLU workshop held at JRC in November 2021. Outcomes will feed into 1/2 above. • Continued close cooperation between AFOLU and GHG groups including on development of Systematic Observations paper for UNFCCC.
6: It is recommended that to help in ensuring the take-up of satellite-based methods for AFOLU (and indeed in the context of MVS) CEOS should work with a few selected demonstrator countries to assist them in their national reporting under AFOLU (the model of GFOI can be compared).	<ul style="list-style-type: none"> • See SilvaCarbon presentation above.
7: CEOS should work with various partners (GEO, WMO etc) to identify data requirements and actions for CEOS in relation to adaptation.	<ul style="list-style-type: none"> • Ongoing CEOS work. • Need collaboration on adaptation through GEO WG on climate change.
8: CEOS should maintain a watch over the implementation of projects funded through climate fund mechanisms to ensure that all appropriate assistance is given by agencies in their implementation and governance.	<ul style="list-style-type: none"> • Joint work on climate finance with GEO was proposed at CEOS-GEO annual meeting in January 2022.
9: CEOS must continue all efforts to provide the necessary baseline climate data records which support the long term modelling of the Earth system, its response to changing GHG emissions and other drivers, and impacts of climate change.	<ul style="list-style-type: none"> • Supported through WGClimate gap analysis • Cooperation with GCOS on GCOS IP 2022 satellite elements • Further discussion with GCOS and WMO through WMO ESS Carbon Workshop (May 2022) and GCOS Science Conference (Oct 2022) • Continued ongoing support of CEOS over many years to climate science.

2.7: GST Process & Systematic Observations Synthesis Report

Presenters: Joanna Post (UNFCCC) & Frank Martin Seifert (ESA) [[combined session presentation](#)]

Main points:

- The GST feeds directly into The Paris Agreement - Article 14. The first GST is to be completed in 2023, with future GSTs every 5 years.
- The themes of the GST include the mitigation, adaptation, finance flow and means of implementation and support, cross cutting, and response measures and loss & damages.

- There are three components involved with the GST: information collection and preparation, technical assessment and consideration of outputs.
- The Parties to the Paris Agreement (CMA) has the overall responsibility to conduct the GST, with the chairs of the SBSTA and SBI in charge of organisation.
- There have been 77 submissions to the GST so far, including from CEOS. Collection will continue over 2022.
- The Systematic Observations Community Synthesis Report for GST is part of the UNFCCC's information collection and preparation phase for the GST, and feeds into the first Technical Assessment.
- The main messages include that Systematic Observations underpin climate science and services, are vital for adaptation, and strengthen the evidence base for the climate rationale, which enables funding from the public and private sector.
- The key roles of the Systematic Observations Community include producing harmonised Earth observation datasets, ensuring free and open data, tracking slow-onset events, monitoring extreme events, and creating use cases.
- Next steps essentially involve interaction, with the Parties, and with the SBSTA.
- Joanna noted that we should be working towards a COP level decision on Earth observation for COP-27.

Main discussion points:

- Mark Dowell (EC/COM) asked whether the mechanism is clear on how we can update an existing submission if we want to do so between the different Technical Assessments. Joanna noted that as the information collection component of the GST stays open for another year, updates can be made through the submission portal and flagged as "version 2" etc.

2.8: Summary, Outlook & Coordination

[combined session presentation]

Main points:

- Stephen Briggs (ESA, SIT Chair Team) summarised the key points from the Climate and Carbon session, and noted the extraordinary work that has been done across the domain.
- He thanked all the speakers from across the session for their presentations.

Main discussion points:

- Mark Dowell (EC/COM) noted that as Joanna Post (UNFCCC) is likely not joining over the next few days, he would like to invite Joanna to say a few words on the upcoming oceans/coasts agenda items as guidance.
- Joanna noted that she has been pushing for topics on oceans and coasts under the UNFCCC process from the secretariat side, and they got to an outcome at COP-26. This outcome included strengthening ocean climate action, under all of the different work streams of the UNFCCC, as well as introducing an annual ocean climate dialogue to take place in the June session. This dialogue will be based on science, looking at decision making and action around oceans and climate. There is a strong connection with her work with the Research and Systematic Observations (RSO), which includes all territories, atmosphere, ocean, land.
- Moving forward, there are a lot of opportunities to bring in this information more directly, for example through the work of GEO.
- One of the strong focuses of the RSO this year is to hopefully have a decision specifically on Earth observation. The conversations within CEOS are important to bring into this discussion, alongside the GCOS Implementation Plan. There is a lot of work coming out of the satellite community, in terms of mitigation and adaptation of the ocean, which is really important to include in the

conversation. This includes the report on the Systematic Observations Synthesis as presented by Frank-Martin Seifert (ESA) above, which will help with increasing the value in recognition of Earth observations within the UNFCCC process.

Wednesday March 30th

Ivan Petiteville (ESA, SIT Chair Team) welcomed everyone to the second day of SIT-37 and noted a brief intervention prior to today's session in relation to the recent announcement of the first [Australian National Space Mission for Earth Observation](#). Reece Biddiscombe (ASA) exceptionally joined the CEOS meeting to share the announcement of a significant federal funding from the Australian Government for the design and development of a series of four Satellite Calibration Radiometers. Further information can be found [here](#), and the full statement is included in Appendix C. The data policy will be fully free and open, with the first launch planned for Australian FY2024-25.

Jonathon Ross (GA) - and echoed by Flora Kerblat (CSIRO) in the chat - noted that this mission was in large part made possible by the Australian interactions with the international EO community in CEOS in particular, with CEOS Agency colleagues and thanked everyone for their support.

Session 3: Global Agendas - CEOS Priorities

3.1: Sustainable Development Goals (SDGs)

Presenter: Brian Killough (NASA, SEO) [[presentation](#)]

Main points:

- The new SDG coordination group was formed following the 2021 CEOS Plenary, succeeding the SDG *ad hoc* team (SDG AHT). The main goal of this group is to liaise with GEO and internally within CEOS to communicate and coordinate our current and planned resources (e.g. analysis-ready satellite data, tools, guidance, capacity building) and align with the evolving needs of U.N. Custodian Agencies and country-based users to monitor and meet the U.N. Sustainable Development Goals (SDGs).
- During the CEOS-GEO coordination meeting, held February 8-9, and following on the previous CEOS-GEO bilateral discussions outcomes in 2020, CEOS suggested the need for 3-way communications between CEOS, GEO, and SDG custodian agencies to better understand evolving country needs related to Earth observation. It was requested that GEO directly interact with SDG Custodian Agencies and be the mechanism to rationalise and communicate those outcomes to CEOS.
- Two major actions from the meeting were: CEOS will develop a one-pager to address "What CEOS can do to support the U.N. 2030 Agenda and the SDGs". This document serves as a "guide" for future discussions between CEOS and the Custodian Agencies via GEO. ([Document here.](#))
- The second action is "CEOS will develop a one-pager to address "CEOS Expectations for the GEO Secretariat regarding support of the SDGs". This document defines the expectations of CEOS regarding GEO communications with Custodian Agencies. CEOS does not expect to have regular interactions with Custodian Agencies and will depend on GEO to maintain those interactions and represent the capabilities of CEOS. ([Document here.](#))
- Draft documents were shared for information and no formal approval is desired or needed. Any feedback from the Principals is expected by April 15.
- For the SDG communication plan, a dedicated SDG webpage has been created on the CEOS website (www.ceos.org/sdg) in addition to the existing section on [CEOS SDG activities](#). This new section summarises four specific SDGs including high-level requirements (EO Support Sheets), key stakeholders, relevant missions and tools/services/products.
- The news section of the CEOS website will feature a series of articles focused on SDGs in the coming months to stress the CEOS support to the 2030 Agenda so far (since 2016). The first article was released in December 2021 (summary of CEOS support to SDGs) and the 2nd article was released in March 2022 (SDG 6.6, Water sanitation). Three more articles and an SDG video are planned before the end of 2022.

- The CEOS deliverables related to SDGs as defined in the CEOS 2022-2024 Work Plan are on track and planned for completion by the end of 2022.
- SDG-20-04 (EO Support Sheet for 11.3.1 – Urbanisation) was completed last week. SDG-22-01 (SDG website) has released a draft version of the website and ensures the essential older content remains available.
- A capacity-building deliverable in coordination with GEO was released last month. 1200 participants from 100 countries participated, showing that a lot of people are interested in utilising the satellite data. The link to the Urban Toolkit training is [here](#).

Main discussion points:

- Ivan Petiteville (ESA, SIT Chair Team) asked about the proposal to add more SDG indicators. When considering this, we need to lean on the custodian agencies for guidance, and then ensure the External Request Process Paper is followed to assess the resources needed and that CEOS would be able to respond adequately.
- Brian Killough (NASA, SEO) noted that there are still fundamental issues, e.g. data access, that need to be resolved, perhaps before diving into new indicators. Resolving these issues will benefit all current and future indicators that CEOS work on.
- Steve Volz (NOAA) asked whether, for the CEOS deliverables, there are companion GEO activities. He would like to see the GEO and CEOS connection for Custodian Agencies, and country-specific needs. Brian noted that as CEOS it is important to get a better understanding of this, perhaps EO4SDG can be a good example.
- Lawrence Friedl(NASA) added that there is no systematic approach to reviewing custodian agencies, it is case by case. There has been extensive work with UN-Habitat which led to the toolkit. They are also looking at the country-level approach, and have discussed a broader market research type effort, but have not reached there yet.
- Marc Paganini (ESA) reminded all that there are other GEO Work Programme activities (not only through EO4SDG, the GEO Initiative on SDG) which have direct contacts with the Custodian Agencies.
- Mark Dowell (EC/COM) noted that it seems, from experience in defining baseline datasets for indicators, activities at national level on the capacity building side are of interest to the custodian agencies as well. These agencies have interest in using CEOS experience in building relationships at the national level, so they can show these as best practices - as a companion to these global datasets. Could be an additional service to custodian agencies - providing collation of all national level experiences of working with these datasets.
- Marc Paganini (ESA) commented in chat: *One of the mandates of the Custodian Agencies is also to build capacities in the countries. So Mark is fully right!*

SIT-37-02	CEOS Members to provide feedback and suggestions on the one-pager "What CEOS can do to support the U.N. 2030 Agenda and the SDGs". This document will serve as a guide for future discussions between CEOS and the Custodian Agencies (via GEO).	15 April 2022 COMPLETED and documents finalised
	<i>Rationale: Outcome from the CEOS-GEO Coordination Meeting held on Feb 8-9.</i>	

SIT-37-03	CEOS Members to provide feedback and suggestions on the one-pager "CEOS Expectations for the GEO	15 April 2022
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	Secretariat regarding support of the SDGs". This document will define the expectations of CEOS regarding GEO communications with Custodian Agencies.	COMPLETED and documents finalised
	<i>Rationale: Outcome from the CEOS-GEO Coordination Meeting held on Feb 8-9.</i>	
SIT-37-04	SEO will explore the GEO and CEOS connection for SDG custodian agencies, and country specific needs, at the next EO4SDG meeting.	EO4SDG mtg April 2022 COMPLETED developed a plan and identified the people and connections
	<i>Rationale: Ensuring good CEOS-GEO cooperation on SDG matters</i>	

3.2: Disasters

Presenters: Hélène de Boissezon (CNES, Incoming WGDDisasters Chair) & Pierric Ferrier (CNES, WGDDisasters Chair) [[presentation](#)]

Main points:

- Satellite data providers play a specific role in providing a critical role for response to disasters, including on early recovery, disaster risk assessment, and a risk recovery framework. There has been work on this disaster risk recovery assessment initiative with international stakeholders since 2016.
- The Recovery Observatory (RO) has close relations with the World Bank, UNDP, EU, UNOSAT, UNITAR, and is proposed to be a practical and efficient resource to focus on the period after the disaster. Note that the early stages following the disaster event are the most crucial phase.
- The RO Demonstrator collects specific kinds of satellite images and maps at several scales during the six months after a major disaster. Three tests have been carried out at the Beirut blaze, Eta/Iota hurricanes, and Haiti earthquake disaster sites.
- The first RO demonstrator test was in late 2020, and 3 to 5 demonstrations are anticipated 2021-2023.
- The team will report to the 2023 CEOS Plenary, as well as other partners to make recommendations for sustainable on-going use of satellites for disaster recovery.
- The recognition from the UN General Assembly in the Space 2030 Agenda from November 2021 provides context for planning. The team’s focus is now on development of sustainable RO activities.
- A specific sub-group has been created inside the RO Demo team who are in charge of reflection and propositions, that will document the requirements of a ‘basic RO’, explore linkages with existing space sector initiatives, and report back to the group by December 2022 at a face-to-face meeting.
- Synergies with GEO include participation in GEO DRR WG and developing an RO document.
- The Wildfire pilot plan’s objectives include:

- Conducting a detailed inventory and gap analysis of existing and proposed EO systems suitable for global active-fire monitoring - considering climate change driven fire regime changes and projected mission life spans.
- Conducting a detailed analysis of global stakeholders and end-users of near-real-time active-fire EO data.
- Define targeted user requirements for active-fire remote sensing systems for the disaster mitigation applications.
- Proposing a way forward in coordinating global wildfire monitoring activities.

Main discussion points:

- Ivan Petiteville (ESA, SIT Chair Team) noted that the outcomes of the RO have been based on several years of effort, and the recognition of the UN General Assembly is a great step forward. H el ene noted they are working with WGCapD on related training materials.
- Marc Paganini (ESA) shared via chat: *Some ESA activities relevant to fires:* <https://climate.esa.int/de/neuigkeiten-und-veranstaltungen/african-burned-area-and-emissions-much-larger-than-thought/> <https://climate.esa.int/en/projects/fire/>
- Wenying Su (NASA) commented in chat: *WGClimate has a Use Case on wildfire: Impact of wildfires on air quality in Sub-Saharan Africa* (<https://climatemonitoring.info/use-cases/>).

SIT-37-05	CEOS Agencies operating or planning EO missions with a capability in relation to wildfire detection are invited to send details to WGDisasters in support of their Wildfire Pilot.	June 2022
	<i>Rationale: The WGDisasters would like to fill in gaps in information collected on EO capabilities for the wildfire pilot</i>	

3.3: Biodiversity

Presenters: Gary Geller (NASA) & Marie-Jos ee Bourassa (CSA) [[Video](#)]/[[presentation](#)]

Main points:

- Biodiversity is essentially the variety of life on Earth that provides essential benefits and services to society and our planet.
- Some of the key organisations include UN CBD, IPBES, UNEP-WCMC and GEO BON.
- CBD is working to finalise the Global Biodiversity Framework (GBF).
- There was a presentation on Biodiversity Developments at the 2021 CEOS Plenary. There were interventions by CSA, AEM, CNES, CSIRO, ESA and ISRO to suggest forming a discussion group related to Biodiversity. These Agencies were subsequently contacted regarding forming a "Biodiversity Discussion Group". AEM, CSIRO, and ESA have provided POCs; CNES, ISRO, and CSA are still welcome to provide POCs for the group. There have been productive individual consultations with CSIRO & ESA POCs.
- Regarding action CEOS-35-04, there has been an introductory call with CBD Head of Monitoring, Review and Reporting (30 November).
- The CBD - CEOS discussion group telecon slated for a future date, as there was an insufficient quorum and CBD bandwidth constraint. The team is developing needs based on existing information. A "touch base" call with CBD is scheduled for April.

- The team welcomes additional agency participation in the Biodiversity Discussion Group. A second co-lead for the CEOS Biodiversity Activity is needed.

GEO BON and the UN CBD Global Biodiversity Framework

Presenter: Andrew Gonzalez (GEO BON Co-Chair)

- Across 65% of the terrestrial surface, land use and related pressures have caused biotic intactness to decline. Biodiversity loss is a systematic risk and the global business team has woken up to preserve the biodiversity ecosystem.
- Their goal is to transform the acquisition, coordination and delivery of biodiversity observations and related services to users including decision makers and the scientific community.
- GEO BON falls into one of the eight priorities of GEO and is a flagship of GEO, and has been working with the CBD for well over a decade. In the context of CBD's new Global Biodiversity Framework GEO BON is:
 - o Developing and proposing stable indicators
 - o Supporting parties to track and guide progress to national targets by providing guidance so that parties can easily identify appropriate indicators and access to user-friendly indicator methodologies.
 - o Providing guidance for the sustained production, delivery and use of biodiversity data via Biodiversity Observation Networks (BONs).
- Essential biodiversity data are available from portal.geobon.org
- Earth observation is essential for many key products needed by the CBD, however data must first be transformed into higher-level products and many needed higher level products are not routinely produced by space agencies.
- Ecosystem distribution data is particularly important, and are usually manifested as land cover (human drivers) and nearly ubiquitous for all biodiversity products.
- CEOS agencies are invited to identify POCs to join the Biodiversity Discussion Group, put forth a co-lead for the Biodiversity Activity, and join the discussion at the Technical Workshop in September.
- The Biodiversity Discussion Group will continue to explore where EO can help address biodiversity user needs

Main discussion points:

- Susanne Mecklenburg (ESA) commented in chat: *To the biodiversity community: at the Biodiversity Conference 2019 in Davos the discussion on EBV started (and earlier), has this been formalised more by now?*
- Gary noted there is an initial list of EBVs, here: <https://geobon.org/ebvs/what-are-ebvs/>. For many, there are peer-reviewed publications.
- Mark Dowell (EC/COM) commented in chat: *As mentioned at CEOS Plenary last year, in the context of the EC Knowledge Centre on Earth Observation we are starting a deep dive assessment of the EU policy needs for biodiversity information (at both European and Global scale). The new monitoring needs for the GBF will definitely be a part of this. We are happy to feed the outcome of that assessment into this discussion into these efforts and will definitely involve Gary in the later discussion with external stakeholders. BTW: We will follow an approach very closely to the indicator workflow you described in the presentation, in assessing needs and translating these into EO requirements.*
- Marc Paganini (ESA) commented in chat: *We should also mention the new statistical standards that has been adopted under the System of Environmental economic Accounting: the SEEA Ecosystem Accounting which can underpin the development of ecosystem related indicators from*

other international agreements (post-2020 GBF and SDGs). GEO BON is also strongly involved in the development of the Ecosystem accounts on ecosystem extent, conditions and services and the thematic biodiversity accounts. In Europe there will be this year a new regulation on ecosystem accounting with a number of mandatory ecosystem accounts that all countries will need to produce and which will serve to monitor the GBF indicators.

- Stephen Briggs (ESA) commented in chat: *The box diagrams in this presentation are excellent models of how EO data can be related to policy through intermediate products and services (Slides 14-17).*

SIT-37-06	CEOS Principals are invited to name a representative to participate in the Biodiversity Discussion Group.	May 2022
	<i>Rationale: The engagement of CEOS agencies is needed to bring sufficient capacity to the group.</i>	
SIT-37-07	CEOS Principals are invited to offer a second co-lead for the CEOS Biodiversity Discussion Group.	June 2022
	<i>Rationale: Securing an additional co-lead would provide the level of leadership needed to further the activity, and is a priority.</i>	

Session 4: New Space & Future CEOS

Ivan Petiteville (ESA, SIT Chair Team) noted the objective of this session is to reflect on the new geometries in the satellite Earth observation sector, including the increasing proportion of commercial missions, and CEOS agency arrangements for commercial data buy and partnerships - hearing agency experiences and examples and strategising how public programmes and CEOS must adapt in the decade ahead with this new context.

4.1: Scene Setting

Presenter: Ivan Petiteville (ESA, SIT Chair Team) [[background paper \(v1\)](#)][[presentation](#)]

Main points:

- The share of on-orbit EO satellites belonging to public EO programmes is shrinking rapidly. During the 2012 calendar year, CEOS agencies launched 14 EO missions (data taken from CEOS MIM Database).
- The only identified commercial sector launches in 2012 were SPOT-6 and Pleiades 1B.
- By 2020, more than 50 companies had announced their intention to develop Earth observing missions or constellations, representing roughly 1,800 small satellites, the majority of which are under 50kg.
- Meanwhile, in 2021, CEOS Agencies launched 8 satellites, while there were 80+ commercial EO missions launched (mostly Planet). These commercial companies raised around \$US5Bn in each of 2020 and 2021, up from \$1Bn in 2019.
- The space value chain is evolving, with the traditional upstream driven technology push transitioning into a market demand pull.
- Generally, the EO domain remains geared towards defence and security markets, but an increasing demand from a diversified pool of customers is leading a rapid evolution - with more

supply from new entrants, and innovative delivery models for data and analytics to support situational awareness

- Cloud computing is bypassing the need for hardware and software ownership, opening up the market to start-ups and allowing companies to provide ground stations as well as full turnkey solutions as a service. Machine learning is facilitating the extraction of actionable insights from large amounts of data, automation of repetitive processes, and extending the use of space-based applications to new markets
- ESA has a number of New Space companies working for them, developing satellites for ESA, with their role identical to that of established companies but with new development methods.
- With both public and commercial satellite data playing key roles in assessing progress on climate action, ESA and GHGSat are supporting the United Nations Environment Programme's new International Methane Emissions Observatory, announced at COP26.
- CEOS has spent decades investing in data standards for interoperability, ARD, catalogues etc. If we anticipate an explosion in diversity of data streams and sources, including through space agency data buys, now is the time to seek uptake of those standards. We also have a huge investment by CEOS agencies in legacy infrastructure for Cal/Val that can benefit New Space missions.

4.2: Case Studies from CEOS Agencies

New Geometries in the Satellite EO Sector: CNES Experience

Presenter: Selma Cherchali/CNES [[presentation](#)]

Main points:

- Since 2016, there has been a drastic change in the satellite EO landscape. The sector has matured, with increasing investment capacity in Earth observation, from space infrastructure to services, as well as the development and operation of services using Earth observation data.
- CNES is constantly adapting to this rapidly changing environment by changing its relationship with the space industry, developing relations with many companies, including new actors, and providing easy access to space technology for all – as outlined in the *Connect by CNES* initiative.
- The objectives of *Connect by CNES* include stimulating national economic development through the innovative use of satellite data and systems, and contributing to the social and environmental development of France, thanks to the use of satellite technologies. The three priority sectors are mobility, health, and environment, and the five key targets are: international, start-ups, SMEs, large groups, and communities.
- Public-Private Partnerships (PPP) are a familiar mechanism for collaboration with the private sector. Starting in 2022, the four small satellites in the CO3D constellation (Constellation Optique en 3D) are set to map the globe in three dimensions from low Earth orbit, serving the needs of both the public and private sectors. CO3D will support industry with the development of low-cost 0.5m imagery and provide access to a DEM at global scale. CNES owns the rights to all data acquired in the initial demonstration phase, and beyond this initial phase, CNES and their institutional partners will be provided low-cost access to all data. In parallel with CO3D development, several initiatives have been established to promote the use of CO3D products (e.g., AIGEO).
- *EO Lab* was created in 2018 to support *Connect by CNES* in the promotion of space solutions for public institutes, local authorities, start-ups and SMEs. *EO Lab* provides technical support to users on the choice of space data depending on user needs, data processing, access to data and processing platforms, and training sessions.
- CNES raised some questions regarding working towards a CEOS strategy to better work with commercial initiatives, including:

- As each CEOS Agency develops their own strategy for supporting the commercial sector, what will the cooperation between space agencies / competition between private companies be?
- How will data policies work? Co-existence of 'Open Data' for public missions and private data ownership for commercial missions?
- How can CEOS members include private initiatives in their analysis of space infrastructure? For example, the integration of commercial missions in the Virtual Constellations?
- In relation to the CNES CEOS Chair theme of "Paths to Sustainability", interaction with the private sector is a key issue in the development of services based on demonstrators. CEOS needs to involve private companies early. What is the most efficient way to do this?
- CEOS 'standardisation' efforts are very beneficial for downstream industries (e.g., interoperability, CEOS-ARD, data quality metrics). CNES encourages CEOS to continue development of these types of activities.

COM

Presenter: Mauro Fachini (COM) [[presentation](#)]

Main points:

- The EU Space Programme includes the Copernicus missions for EO, Galileo for GNSS, EGNOS for navigational signals, SSA for surveillance and tracking, and GOVSATCOM for secure satellite communications. One focal point for their campaign "An investment in a Future Ready Europe" is to provide a competitive edge - completing current satellite constellations, and developing and launching the next generation of satellites.
- The Copernicus Expansion Missions include CO2M (CO2 Monitoring), ROSE-L (L-Band Synthetic Aperture Radar), CRISTAL (Copernicus Polar Ice and Snow Topography Altimeter), CHIME (Copernicus Hyperspectral Imaging Mission), LSTM (Land Surface Temperature Monitoring) and CIMR (Copernicus Imaging Microwave Radiometer).
- New Space is a global trend encompassing a series of technological and business model innovations leading to a reduction in costs, shorter life cycles and a bolder approach to risk taking in the space sector.
- Several trends are unfolding in the satellite industry, including the move to smaller satellites, bigger smallsat constellations, more satellites in LEO rather than GEO, use of standardised components from across sectors, improved resolution, reduction of launch costs, and the use of BigData and AI processing platforms.
- The three entities i.e. Copernicus Sentinels, New Space and Expansions should work together to contribute towards the Copernicus Hybrid constellation.

NOAA

Presenter: Steve Volz (NOAA) [[presentation](#)]

Main points:

- NOAA seeks to leverage recent innovations by the commercial aerospace industry in small satellite technology, access to space, communications and ground services (aka "New Space") in order to:
 - Improve the agility and resiliency of the architecture;
 - Shift from using large, multi-instrument satellites flown on a set cadence, toward a disaggregated architecture of smaller satellites to place observational capabilities in the desired locations when needed;
 - Allow for rapid and efficient replenishment of on-orbit assets and responsive to changes in observational needs.

- The future of LEO will validate the merits of commercially-based disaggregated architecture with a Quick Sounder mission, demonstrating how disaggregation, agility, and operational observations can be achieved through the exploitation of new business models, including revised approaches to hardware procurement, mission authorisation, and mission development oversight.
- The sample system capabilities needed to accomplish the LEO vision for 2040 includes:
 - o Rapid on-orbit asset replenishment, ATP to launch in approx. 3 years.
 - o Quality instruments calibrated and validated to meet mission science.
 - o Flexible ground system(s) to add or delete assets with little modification.
 - o Common algorithms for similar measurements, to allow for evolution and continuous improvement.
- Joint Venture Program is co-investing in technology development by government agencies and industry. The program has identified about 20 projects for FY2022 Tech Exploitation. It will also exploit observations made by other government agency satellites.
- The NESDIS Commercial Data Program (CDP) has been running since 2016. The team issued a “Request for Information” (RFI) to the general space community to determine industry capability to provide operational quality terrestrial weather and space weather observations.
- The program awarded IDIQ (indefinite delivery/indefinite quantity) contracts to two small companies to provide Radio Occultation observations for use in NOAA weather and space weather operations, and are currently executing their 4th delivery order, purchasing 6000 RO observations per day over a six month duration.
- NOAA’s commercial weather data operated by IDIQ contracts includes a range of data sharing licence options ranging from unlimited rights to distribution to NOAA only. The data sharing licence allows NESDIS to share the near-real time data with US Government Agencies, international WMO meteorology and hydrology centres, and CGMS partners for non-commercial use only. After 24 hours, NESDIS can distribute all data to any entity with no restriction on use or further distribution.
- Commercial data provides for an enhancement of our operational mission and ongoing data delivery, and information that is collected must be compatible for sustained and repeat use.

Main discussion points:

- Ivan Petiteville (ESA, SIT Chair Team) noted some commonalities across the agency presentations, including that CEOS Agencies do not want to enter into competition with the New Space sector. There are also several issues, including data policies, data continuity, data quality, and especially interoperability through standardisation.
- Brian Killough (NASA, SEO) noted the trend in use of commercial datasets. When this data is combined with CEOS data, it yields higher value data and interesting results, and we should consider further how to use this data alongside our data in some of our CEOS activities, e.g. EAIL, ARD, etc. Brian frequently sees issues with restrictions on storage and use of data, with sometimes rigid and cumbersome licence agreements.
- Tim Stryker (USGS) commented that the presentations show the broad range of issues in play, and he suggested CEOS needs to address the risks and opportunities at a corporate level. This topic needs more dedicated discussion (perhaps a full day discussion), and CEOS needs a more robust dialogue with the private sector. This could include authoritative data (provenance), standards, and fitness for purpose. Tim would recommend that we try to do that in some way as a CEOS community, with a structured dialogue based on a principle of shared value between private and public systems for different purposes
- Beth Greenway (UKSA) welcomes a wider discussion, and agrees with the proposal to look at data policies, especially from the Cal/Val side. Another aspect to consider is the long-term work

- of the virtual constellations - will CEOS have the right capability that we need in the years to come? Is that something we can plan with the commercial sector - that long term planning is key.
- Steve Volz (NOAA) noted that space agencies have significant power in the relationship when it comes to data rights. Steve agrees with the idea of a special session, noting that CEOS does speak from a position of authority.
 - John Remedios (UKSA) commented in chat: *I think this question of interoperability with New Space data is a significant one. It is growing organically, i.e. by example and by project, but perhaps lacks overall agreements on data usage/product information unlike say the Tandem projects of DLR with commercial entities.*
 - Mark Carroll (NASA) commented in chat: *Totally agree, the explosion of commercial satellite systems is really exciting but we have to take care that the data are well calibrated and well understood for interoperability and continuity of measurements.*
 - Selma Charchali (CNES, CEOS Chair) commented in chat: *The explosion of commercial satellite systems has to be assessed. How many are really delivering key data and for what purpose? For climate change issues, the quality and accuracy of data is crucial.*
 - Ed Armstrong (NASA) asked in chat: *Are we capturing any metrics with regard to CEOS services and standards being implemented in the commercial sector? For example there was an example of commercial data search. Are they implementing the CEOS Open Search spec?*
 - Steve Volz (NOAA) commented in chat: *We benefit from use of commercial data, but they benefit from our branding and calibration added value. Agree we should not sign agreements with long term use restrictions.*
 - Flora Kerblat (CSIRO) commented in chat: *Very interesting session raising issues and lessons learned that Australia is keen to take onboard, thank you all. Quick suggestion - maybe CEOS could plan a workshop/dedicated session with industry (decide on a theme) at the next GEO Plenary (Industry Track).* Tim Stryker (USGS) responded in chat: *I think a dialogue with industry will be helpful and indeed necessary, but would recommend that CEOS first have its own internal session dedicated to this topic.*
 - Mark Dowell (EC/COM) commented in chat: *On the interoperability discussion: sitting in several sessions at COP-26, including both private and public operators, it was clear that without exception they were all using public agency data to "calibrate" their observations. I would imagine that we would be interested in the outcome of those assessments, and asked on several occasions how we could find opportunities for them to provide this feedback to us.*
 - CNES agreed to have discussions on this topic at this year's Plenary.

SIT-37-08	CEOS Agencies are invited to provide suggestions to the SIT Chair Team on topics to explore at the SIT Technical Workshop and Plenary to further develop the 'New Space and Future CEOS' theme.	May 2022
	<i>Rationale: Build a list of topics to be refined and further developed for discussion at SIT Technical Workshop and Plenary.</i>	

Thursday March 31st

Ivan Petiteville (ESA, SIT Chair Team) welcomed participants to Day 3 of SIT-37, and noted a couple of changes on the agenda. Stephen Ward (SIT Chair Team) shared the updated agenda for this session.

Session 5: Working Teams Business

5.1: CEOS ARD: Oversight Group Update & General Status

Presenters: Ferran Gascon (ESA, ARD Oversight Group Lead) [[presentation](#)]

Main points:

- CEOS Analysis Ready Data (CEOS-ARD) has been broadened to be 'beyond land'.
- The Governance Framework for CEOS-ARD was endorsed at CEOS Plenary 2021, and is available [here](#). This formalises and generalises the process LSI-VC used to create CARD4L. The CEOS-ARD Oversight Group was initiated at CEOS Plenary 2021 as a result of this broadened scope to facilitate CEOS coordination on ARD, in particular across the VCs.
- Other key documents are the [Template for Product Family Specifications](#) and the [CEOS-ARD Strategy 2021](#).
- The group has prepared the [CEOS-ARD Oversight Group Terms of Reference v1.0 \(15 March 2022\)](#). This document outlines the roles and responsibilities of the CEOS ARD Oversight Group, and identifies the group as a core component of the CEOS-ARD Governance Framework. The group will act as a forum for all matters related to CEOS-ARD, with representatives from the CEOS Virtual Constellations, who will be integral to the effort going forward.
- The CEOS ARD Oversight Group comprises members from the CEOS Virtual Constellations and Working Groups, including LSI-VC, OCR-VC, OST-VC, OSVW-VC, SST-VC, P-VC, WGCV, WGISS and WGCapD.
- The Terms of Reference cover the mission statement, scope of activities, membership and leadership, and meetings.
- CEOS-ARD Oversight Group activities include CEOS coordination on ARD, maintenance of the CEOS-ARD Strategy and CEOS-ARD Governance Framework, support and guidance to data providers, coordination of CEOS-ARD Product Family Specifications (PFS), the PFS template, technical topics related to CEOS-ARD, CEOS-ARD representation to the broader community, coordination of outreach activities, championing the ARD concept and providing guidance for the community, serving as the primary external focal point for CEOS on matters related to ARD, and representing CEOS on matters related to the further standardisation of ARD in the wider community.

CEOS-ARD for Land (CARD4L) Updates

Presenter: Steve Labahn (USGS, LSI-VC Co-Lead) [[presentation](#)]

Main points:

- There have been two new products recently assessed as CARD4L: ESA's Sentinel-2 Level-2A Surface Reflectance product, and DLR's EnMAP Surface Reflectance product, which is particularly notable as this has been completed prior to launch.
- There are five products currently under development and assessment, see ceos.org/ard for details.
- The [Aquatic Reflectance \(AR\) PFS](#) was recently finalised and endorsed by the LSI-VC. This covers inland water bodies and nearshore coastal regions, and a preliminary self-assessment of the pilot USGS AR product has been completed.

- There are currently five PFSs that have been endorsed. They are Surface Reflectance, Surface Temperature, Normalised Radar Backscatter, Polarimetric Radar and Aquatic Reflectance. There are an additional four PFS currently under development: Night-time Light Surface Radiance, Geocoded Single-Look Complex (GSLC), Interferometric Radar (INSAR), and LiDAR Terrain and Canopy Top Height.
- There has been an overwhelming request for standardisation of CEOS-ARD from government and commercial sectors. Formal standardisation is likely necessary for widespread engagement with CEOS-ARD. The Oversight Group will take this discussion forward in partnership with groups such as OGC and IEEE.
- The CEOS-ARD STAC (SpatioTemporal Asset Catalogue) Sprint was held on March 1-3. There is ongoing work on a CEOS-ARD extension to STAC, which involves mapping CARD4L requirements to STAC fields.
- The CEOS-ARD Oversight Group is now revising the PFS Template. VC representative input is critical to move the effort beyond its land basis and the inputs so far have provided great insight.
- At the next meeting of the Oversight Group, a EUMETSAT team will provide a briefing on their atmospheric composition ARD.

Main discussion points:

- The CEOS-ARD Oversight Group has had a very good start with great representation across the VCs. The Terms of Reference have been written by the Oversight Group members, in coordination with the SIT Chair Team, to be lightweight and flexible. The Terms of Reference suggest reporting to the SIT Chair due to the key role of the VCs in this group.
- Steve Volz (NOAA) noted that this is a subgroup in CEOS where there are representatives of each of the VCs and some WGs. The specifics of the line of reporting for the group, and whether the SIT Chair is the appropriate focal point, were questioned. Steve also raised concern about the sustainability of the SIT Chair oversight of this group, noting that SIT Chair priorities will change every two years with the rotation of leadership. Having the CEOS-ARD Oversight Group report to the SIT Chair could introduce variability in SIT Chair resource requirements, depending on the specific objectives of the SIT Chair at the time. He asked whether this reporting structure requires a rewrite of the SIT Chair Terms of Reference as a result.
- Stephen Ward (SIT Chair Team) noted that the decision to have the group report to the SIT Chair is based on the representation, which spans most of the VCs. It was discussed whether this puts a burden on the SIT Chair, and as a result the Terms of Reference were written to give the SIT Chair the option to delegate leadership to an Oversight Group member. The current SIT Chair (ESA) and the next SIT Chair (JAXA) have agreed with this approach, so for at least four years there is agreement with the proposal.
- Ferran Gascon (ESA, CEOS-ARD Oversight Group Lead) commented regarding the suggestion of having the team as a subgroup of WGISS. The option presented here (SIT Chair oversight) is proposed because this is primarily a cross-VC activity. VC representation is key to ensuring the cross-domain expertise and input that is critical to this phase of CEOS-ARD.
- Ivan Petiteville (ESA, SIT Chair Team) added that this group could not be put in WGISS, WGCV or another Working Group because it is much broader than the focus areas of these groups, and that the most critical elements of ARD is not the format but the science-related aspects (processing, algorithms, thematic applications) so there is no expertise in WGISS to properly manage ARD matters. Expertise is required from all thematic points of view. Since broad VC representation is needed to achieve this, it makes sense to structure this group under the SIT Chair.
- Selma Cherchali (CNES, CEOS Chair) commented in chat: *CNES endorses the CEOS-ARD ToR. Great achievements, BRAVO to the Team.*

- Klaus Schmidt (DLR) supported NOAA’s feedback, noting that CEOS must maintain a close watch on resources and commitments. He recommended that CEOS take stock of its commitments at some point in the future.
- Steve Volz recommended an action for the SIT Chair Team to look at the existing rules of governance and consider if/where changes to the SIT Chair Terms of Reference might be needed to accommodate oversight of this group. He endorses the CEOS-ARD Oversight Group Terms of Reference, with the caveat that an action be recorded along these lines to make sure that the appropriate processes have been considered.
- Klaus Schmidt (DLR) commented in chat: *DLR supports this action proposed by NOAA.*
- Steve Labahn (USGS, LSI-VC Co-Lead) noted that the critical and substantial work on the CEOS-ARD Product Family Specifications (PFS) will still occur within the VCs, and the VCs have a reporting alignment with the SIT Chair. As such, he believes it is inherently part of the SIT Chair’s roles and responsibilities to oversee this work. The Oversight Group was just formed as a structure to help manage this.
- Ake Rosenqvist (JAXA) commented in chat: *On the CARD4L radar side we also have an "Ocean NRB" PFS under development, under the leadership of ESA.*
- Ivan Petiteville (ESA, SIT Chair Team) commented in chat: *ESA endorses the CEOS-ARD Oversight Group Terms of Reference. And congratulations to the whole group for the work done and the progress achieved.*
- Mark Dowell (EC/COM) commented in chat: *Great to see the Aquatic Reflectance PFS approved.*
- Takeshi Hirabayashi (JAXA, SIT Vice Chair) commented in chat: *JAXA endorses the CEOS-ARD OG TOR.*
- Laura Frulla (CONAE) commented in chat: *CONAE endorses the Terms of Reference.*
- John Remedios (UKSA/NCEO) commented in chat: *I like the structure of involving the relevant group expertise. I believe you have to have some domain insight for the group to work and this achieves that. Equally important is very good lines to relevant community discussions and part of the endorsement process should be a good report back to SIT itself. UKSA is happy with the Terms of Reference.*

Decision 01	The CEOS-ARD Oversight Group Terms of Reference were endorsed (SIT Chair will confirm sustainability of the arrangements and that SIT TORs are supportive, ACTION SIT-37-09).
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SIT-37-09	SIT Chair Team to confirm whether the SIT Chair Terms of Reference need to be updated to accommodate reporting of the ARD Oversight Group.	ASAP
	<i>Rationale: Concern expressed regarding sustainability of the arrangement proposed by the ARD Oversight Group, and that the Group reports to the SIT Chair.</i>	

5.2: Update on Aquatic Carbon

Presenter: Marie-Helene Rio (ESA, OCR-VC Co-Lead) [[presentation](#)]

Main points:

- Marie-Helene noted Aquatic Carbon is a contribution from OCR-VC to the CEOS 2020-2022 Work Plan.
- ESA hosted an [“Ocean Carbon from Space” Workshop](#) in February. This was the 2nd Workshop in the CLEO (Colour and Light in the ocean from Earth Observation) Series. A community white paper gathering the workshop’s outcome and recommendations is to be published in the Aquatic Carbon From Space Earth Science Reviews special issue.
- The schematic on the pools, fluxes and processes that form the ocean solubility and biological carbon pump was shared. Within the different agencies, the team has projects running to try to address the different parts of the schematic. They want to understand what are the challenges, gaps and opportunities to achieve an accurate and consistent description of the different components of aquatic carbon.
- The objective of the workshop was to bring together remote sensing scientists, field scientists and modellers around the common topic, and to articulate a collective view of current statuses, gaps, and knowledge, and formulate a censorship roadmap for the next decade, with an emphasis on evaluating where Earth observation may contribute.
- The workshop featured three sessions: Pools of Carbon in the Ocean, Main Processes, and Crosscutting Themes. Over 100 abstracts were submitted, which were used to build the program.
- The workshop spanned an entire week, and was held virtually to facilitate global participation.
- [Padlet](#) was utilised to foster discussions on various topics, with the platform opening one week prior to the workshop, and remaining open for a couple of weeks following.
- All the presentations and posters related to the workshop are available on the workshop [website](#), together with the synthesis provided by each session’s chair on the outcomes of the session
- There were 449 registered participants, from all over the world. A number of challenges, gaps and opportunities were identified.
- The team would like the participants to consider the development by OCR-VC of the Aquatic Carbon Roadmap in the time frame of next 2-3 years. This would summarise what is known right now about the Aquatic Carbon and its role in the global carbon cycle, identify which variables can be provided in the context of global integrated carbon monitoring, and provide a roadmap towards filling the main knowledge gaps, focusing on a few major gaps to which all agencies can contribute.

5.3: AC-VC Issues

Presenter: Ben Veihelmann (ESA, AC-VC Co-Chair) [[presentation](#)]

Main points:

- Noted the initiative of the AC-VC team on developing the whitepaper “Monitoring Surface PM2.5: An International Constellation Approach to Enhancing the Role of Satellite Observations” with the objective to strengthen the role of satellite missions with aerosol observation capabilities in monitoring particulate pollution of air.
- There are 35 authors from academia and space agencies, led by S. Kondragunta (NOAA) and B. Veihelmann (ESA).
- The white paper recommendations include recommendations for satellite products, interface with models, and validation. The details have been outlined in the [PM2.5 Monitoring White Paper \(DRAFT\)](#).
- The team will provide the white paper to CEOS for discussion and review at SIT Technical Workshop (Sep 2022), with the goal of presenting the paper at the 2022 CEOS Plenary Meeting for endorsement.

International Methane Emissions Observatory (IMEO) [[presentation](#)]

Presenter: Stephen Hamburg (IMEO)

Main points:

- Stephen gave an overview of anthropogenic methane emission sources.
- IMEO strives to interconnect better data with action on transparency, science, and implementation, by closing the knowledge gap, providing accurate, unbiased and up-to-date information, and raising awareness and increasing the capacities of governments.
- There are opportunities for CEOS-IMEO collaborations, including data integration of similar data sources, where CEOS can contribute to the remote sensing data side, while IMEO can contribute to regional empirical data. IMEO is also working on data integration across types of data, to which CEOS can also contribute.
- The Oil and Gas Methane Partnership 2.0 (OGMP 2.0) is a comprehensive, measurement-based reporting framework with global coverage and scope by 77 companies - upstream, midstream and downstream, as well as public, private and national oil companies. The assets in scope represent over 50% of global oil and gas production in over 60 countries.
- There are 5 reporting levels to the OGMP 2.0, which is considered a gold standard. The reporting level integrates “bottom-up” source-level reporting, with independent “top-down” site-level measurements for the majority assets.
- There is a lack of empirical, verified data on methane emissions limits action at the scale and speed needed to avoid the worst impact of climate change, and hence better methane emissions data are needed.
- The concurrent variation in oil and gas methane emissions with the variation in oil prices during the COVID-19 pandemic over 2020 was shared, and a correlation between the two effects is clear.
- Different methane detecting satellites can each have different features that contribute to the overall diversity of the fleet, where satellites can complement others.
- IMEO will help to tackle the methane emissions data problem through collecting data, applying big data, data science and machine learning, reconciling inconsistencies and identifying gaps. They then generate final products, including a full methane emissions dataset, annual methane report, direct measurement studies, and science-based implementations support.
- The core functions of IMEO include:
 - o collecting and verifying OCMP 2.0 company reporting;
 - o integrating and analysing methane emissions data from various sources;
 - o developing and publishing a global dataset of methane emissions at an increasing level of accuracy and granularity;
 - o holding companies accountable to methane performance goals;
 - o producing policy relevant science to support enhanced government ambition;
 - o sponsoring science studies to fill emission data gaps, validate remote sensing data and provide insight into data discrepancies.

CEOS-IMEO Cooperation Proposal

Presenter: Stephen Ward (SIT Chair Team)

Main points:

- The previous and current SIT Chair Teams (Australia and ESA) engaged in a series of ‘getting acquainted’ telcons with IMEO (UNEP, EDF) over the last year
- These telcons were focused on understanding respective capabilities and ambitions.

- IMEO also presented to AC-VC earlier this month.
- The teams have focused in on a practical plan for trial cooperation, beginning with planning and implementing a data intercomparison of GHGSat (in orbit) with a range of CEOS missions (including TROPOMI, GOSAT, S-2, PRISMA and others) as our technical experts mutually decide. When MethaneSat is launched in 2023 we would aim to do the same again, including to help its CO₂ product refinement.

Main discussion points:

- Ben Poulter (NASA) noted the opportunities for Cal/Val from Stephen Briggs' presentation on CEOS GST yesterday, alongside the GST inputs and the AMPAC proposal.
- Akihiko Kuze (JAXA, WGCV Chair) noted the commitment of WGCV and GOSAT to support the CEOS-IMEO proposal.
- NASA atmospheric composition team also supports the proposal.
- Ben Veihelmann (ESA, AC-VC Co-Chair) noted he would be happy to support the suggested writing of the note.
- Eric Laliberté (CSA) stated that CSA will endeavour to facilitate the participation of GHGSat.
- Ferran Gascon (ESA) commented in chat: Suggest the usage of Copernicus Sentinel-2 for fine-scale methane leakage monitoring, allowing identification of individual facilities/pipes. <https://amt.copernicus.org/articles/14/2771/2021/>

SIT-37-10	SIT Chair Team will engage our experts in AC-VC, WGCV, GHG and AFOLU Roadmap Teams to support the concept note required for the IMEO Scientific Oversight Committee to progress a CEOS-IMEO cooperation on data intercomparison and integration.	June 2022
	<i>Rationale: A CEOS-IMEO cooperation has great potential in support of the CEOS GST Strategy and is proposed as an exciting example of the New Space geometries we should be exploring</i>	

Session 6: Oceans and Coasts

6.1: Oceans Coordination Team

Presenter: Ivan Petiteville/SIT Chair Team [[presentation](#)]

Main points:

- There are many key stakeholders in the work of the CEOS Oceans Coordination Team, including GOOS (Global Ocean Observing System), IOC (Intergovernmental Oceanographic Commission of UNESCO), UN Decade of Ocean Science for Sustainable Development (2021-2030), UNFCCC: New ocean and climate change dialogue in SBSTA, UNFCCC: CEOS' support to Global Stocktake, Sustainable Development Goals Stakeholders incl. SDG 14 "Life below water", GEO Blue Planet, Thematic groups: GHRSSST, IOCCG, IOVWST, OSTST.
- Key CEOS internal groups dealing with oceans include but not limited to: Ocean Colour Radiometry - VC (ORC-VC), Sea Surface Temperature - VC (SST-VC), Ocean Surface Topography - VC (OST-VC), Ocean Surface Vector Winds - VC (OSVW-VC), COVERAGE & COAST and WGCV.

- The 2001 IGOS report on Ocean found that “Crucial lesson was for the key user bodies to engage and coordinate the definition of requirements”
- The team needs to consider how CEOS can respond to the IOC Decade of the Oceans, and how CEOS can align to SDGs and statistical office needs.
- The Coordination Team is considering how to better the coordination and linking of existing activities, and identifying new opportunities with respect to key external stakeholders.
- Ocean-related activities across both CEOS and externally would benefit from a strong coordination & collaboration. The Oceans Coordination Team was created as a small working team to scope options for improved coordination and communication of the full range of CEOS ocean-related activities and groups. The team is overseen by the SIT Chair team.
- The CEOS Coordination team has 18 members in total from COAST, COVERAGE, OCR-VC, OST-VC, OSWV-VC, SST-VC, WGClimate, WGCV, the SIT Chair Team and the CEO.
- The team held their first meeting on 9 March, with 10 participants. The next meeting will be held after SIT-37.
- Each CEOS group are required to fill a [questionnaire](#) to list the main activities of the group, indicating:
 - o The added value for CEOS
 - o Who are the beneficiaries (external or internal to CEOS)
 - o The general context of each activity (e.g. GEO Blue Planet or CEOS Support to GST)
- Each group is also asked to identify the main external stakeholders and initiatives to serve in priority. Priority schema based on a list of metrics is to be established.
- The “CEOS Ocean Coordination Group” shall collectively identify the commonalities, synergies and gaps, and agree on a set of priorities for CEOS and issue a study report with the findings and recommendations.

6.2: Update on Contributions to the UN Decade

Presenter: Paul M. DiGiacomo (CEOS-COAST) [[presentation](#)]

Main points:

CEOS-COAST

- The CEOS-COAST’s progress supports the UN Ocean Decade, and following the upcoming stakeholder engagement workshops, the group can begin advertising the benefits of CEOS COAST to the UN Ocean Decade stakeholders.
- The team’s progress since SIT-36 includes:
 - o 3 successful stakeholder outreach programs introducing COAST; 2 sessions in collaboration with GEO, using the WGCapD outreach guidance and 1 talk in May 2021 at the 2nd International Operational Satellite Oceanography Symposium.
 - o 4 stakeholder workshops are planned for 2022 which will be regional in nature to engage in co-design and co-development.
 - o There has been exceptional strides to train and work on product development in the CEOS EAIL.
 - o Discussions to have wider outreach through webinars and updates on website/brochure
 - o Continued work advancing thematic products in project areas such as flooding, coastline mapping, coastal eutrophication, especially in the Chesapeake Bay, Bay of Bengal and West Coast Africa. This includes emerging opportunities to pursue in coastal bathymetry as well as Blue Carbon with GEO.

Main discussion points:

- Both CEOS and SIT chair congratulated Paul for the broad coalition of efforts.
- Mark Dowell (EC) noted with satisfaction the increased emphasis on Blue Carbon both in GEO Blue Planet and CEOS COASTS, as this is getting increased attention in UNFCCC with the now mandated Ocean Climate Dialogue.

CEOS COVERAGE Initiative

Presenter: Jorge Vazquez (JPL/CalTech, COVERAGE) [[presentation](#)]

- CEOS COVERAGE is a cross-cutting, multidisciplinary, interagency collaboration involving the CEOS Ocean Virtual Constellations, GEO-MBON and GEO-Blue Planet.
- COVERAGE serves as a cumulative CEOS contribution to the UN Decade of Ocean Science for Sustainable Development, as well as joint CEOS liaison points with the IOC on the UN Decade process.
- The team is working on the “Ocean Shot” concept. The concept proposal was submitted to Ocean Decade U.S. (National Academy of Science committee) in December 2020: “Next Generation Data Service Infrastructure for a Digitally Integrated Ocean Observing System in Support of Marine Science and Ecosystem-Based Management”.
- This has linkage to the UN-SDG 14: “Life Below Water”, emphasising the role of Earth observations and improved data infrastructures in supporting ecosystem-based management.
- The team presented at the Ocean Decade U.S. launch meeting in February 2021, and have [published](#) in a special edition of Marine Technology Society Journal in June 2021.
- The COVERAGE concept of digitally integrated, interoperable ocean observing data systems was adopted by Decade US program and announced in April 2022 as one of five core themes entitled “Ocean of Data” to be developed and advanced to funding agencies.
- They have also aligned and coordinated with relevant Decade U.S. and IOC efforts.

Session 7: Closing

7.0: EnMAP Status Update

Presenter: Klaus Schmidt (DLR) [[presentation](#)]

- The EnMAP Next Generation Hyperspectral Mission is ready for launch with SpaceX on Friday April 1st 18:24 MEZ (12:24 EDT). The livestream can be viewed [here](#).
- The mission has a six month commissioning phase, and data will be freely available for scientists worldwide, via the archive and proposal for new acquisitions; check out <https://www.enmap.org> for more details and information. Also see these articles for more on the EnMAP mission: https://www.dlr.de/content/en/articles/news/2022/01/20220302_to-space-from-bremen-via-hanover-and-florida.html https://www.dlr.de/content/en/articles/news/2022/01/20220330_environmental-data-for-researchers-worldwide.html
- This scientific mission represents a significant step forward for hyperspectral observations from space. It is likely the first images will be made public at the ESA Living Planet Symposium.

7.1: CEOS-GEO Coordination

Presenters: Doug Cripe (GEO Secretariat) & Ivan Petiteville (ESA, SIT Chair Team) [[presentation](#)]

Main points:

- Following the SIT Chair and GEO Secretariat Director’s statements, it is clear we need a strategy to optimise capabilities between CEOS and GEO for greatest impact.

- GEO should consider exploring ways to include CEOS in strategic governance and leadership of GEO, and CEOS involvement in the GEO post-2025 process is vital.
- GEO will also consider more clearly defining a strategy for CEOS to best respond to the GEO Work Plan and user requirements, including providing the vital bridge between CEOS and stakeholders to better prioritise requests.
- GEO and CEOS will together consider ways to work together to engage with a new phase of satellite data users from diverse communities, sectors and geographies.
- The CEOS-GEO Coordination Meeting was held 7-8 February 2022, where they discussed a number of topics relevant to both entities, including:
 - o Urban Resilience and the New Urban Agenda
 - o Space-based Earth Observation Data for Open Science and Decision Support
 - o Biodiversity: UN Convention on Biological Diversity and the Global Biodiversity Framework
 - o Climate and Carbon
 - o Sustainable Development Goals (SDGs)
 - o Disaster Risk Reduction and Response
 - o Marine-related activities in support of the UN Decade of Ocean Science for Sustainable Development
- Following a discussion earlier this week on the process to become involved in the GEO Post-2025 Working Group, it was clarified that CEOS should nominate an individual, who should then reach out to the executive committee member of the country where the nominated individual's institution is located. Alternatively, the GEO Secretariat can also make nominations, however this will occur following a review of the nominations that come forth from the Caucuses themselves. The nomination deadline has been pushed back to April 4.
- It was noted that the GEO Secretariat was not invited to the recent CEOS-CGMS WGClimate meeting, and the GEO Secretariat Director would ask that this connection be re-established.

Main discussion points:

- Stephen Briggs (ESA, SIT Chair Team) emphasised that on the climate topic, there were substantive items on CEOS-GEO collaboration of adaptation and finance. These points were addressed in Stephen's earlier presentation.
- Albrecht von Barga (DLR, WGClimate Chair) apologised for missing the GEO invitation to the CEOS-CGMS WGClimate meeting and will check that Sara Venturini is on the mailing list. Sara and Laurent, members of WGClimate, are also involved in the GEO Working Group on Climate Change, so there is always a dialogue there.

7.2: CEOS Plenary Session (Discussion)

Presenter: Selma Cherchali (CNES, CEOS Chair)

Main points:

- Marie-Claire Greening's term as CEOS Executive Officer (CEO) will end in December 2022. Selma thanked NASA for their contribution by funding her as a contractor.
- The CEOS Chair has requested all CEOS Principals to consider nominations for the CEO position for 2023-2025. No applications have been received. It is ideal for an incoming CEO to have a chance to work with the existing CEO in the months ahead of the transition, so a candidate should be identified as soon as possible.
- As stated in the CEO Terms of Reference, every effort must be made to ensure the role is fulfilled by a direct-hire CEOS Agency employee (i.e., not a contractor).

- Steve Volz (NOAA) recognised the importance of the role of the CEO, noting that NOAA had reservations about hiring a contractor to take on this role when it came up two years ago, however it has worked well with Marie-Claire. NOAA is not ready to commit funding or an individual to fill the role.
- Identification of a CEO has become a recurring issue. Steve Volz suggested that perhaps the CEO could become a defined function of the SIT Vice Chair role.
- Karen St. Germain (NASA) noted that we have seen that this role can work under different models. NASA has been supporting the role for two years, and there is no option to extend, so another solution is needed. Having just completed a term as the CEOS Chair, Karen can attest to the importance of the CEO’s support. Karen suggested the CEOS Secretariat take this topic forward and personally reach out to each CEOS Principal between now and SIT Technical Workshop.
- Selma recognised the contributions of NOAA, CNES, ESA, NASA and JAXA to support the CEO position over the years, and noted that it would be appreciated if another agency could step up to take on this role.
- Ivan noted that CEOS had the discussion two years ago regarding linking the CEO role to the SIT Vice Chair. The SIT Chair is a role that requires significant funding, and there is already a large financial burden on the SIT Chair to ensure a proper chairmanship during the vice-chair and chair terms (2+2 years) as significant support is needed already during the vice-chair term to prepare the chair period. If the CEO role was attached to the SIT Vice Chair, this might stop some agencies from nominating for SIT Chair.
- Kerry Sawyer (NOAA) noted that if the CEO were provided by the SIT Vice Chair it would help prepare the agency for the SIT Chair role. The CEO term would end when the Agency becomes the SIT Chair and would therefore not be a burden on the agency during the SIT Chair term.

SIT-37-11	CEOS Chair to consider a Troika meeting, with the main objective of assuring that a CEO will be in place for 2023. CEOS Chair will first raise the topic for discussion at SEC-292.	ASAP
	<i>Rationale: No nominations for CEO have been received for the next two-year tenure period 2023-2024.</i>	

CSA Nomination for CEOS Chair 2024

- Eric Laliberte (CSA) announced that CSA would like to nominate for the CEOS Chair for 2024. This will be formally presented for endorsement at CEOS Plenary later this year.
- ESA welcomed CSA’s nomination.
- Tim Stryker (USGS) commented in chat: *USGS also fully appreciates the offer, Eric - thank you!*

7.3: Closing Discussion

Presenter: Ivan Petiteville (ESA, SIT Chair Team) [[presentation](#)]

Ivan provided a summary on each agenda item over the last three days, including the actions and decisions recorded and documents endorsed.

Main discussion points:

- Mark Dowell (EC/COM) commented in chat: *Maybe I missed it, but did we include the point Jo suggested that we could work towards a COP level decision on Earth Observation at COP-27?*

Stephen Briggs (ESA, SIT Chair Team) responded in chat: *Sorry Mark, yes you are right. We should note that formally.*

GEO Post 2025 WG

- Kerry Sawyer (NOAA) asked in chat: *Will CEOS be nominating a representative to the GEO Post-2025 Working Group? If so, we need to make a decision now because nominees are due 4 April.*
- Ivan Petiteville noted that having CEOS represented is very important, as CEOS plays a major role in GEO, and participates in the GEO Programme Board and ExCOM. It is natural that CEOS also has a representative in this Working Group.
- Marie-Josée Bourassa (CSA) noted that having served last time, she recommends someone who is already in contact with CEOS SEC and knows GEO. Otherwise it could be quite difficult to play that role.
- It was suggested that Ivan Petiteville should be nominated as the representative. Ivan will declare and clear with the European Caucus.
- Karen St. Germain (NASA), Tim Stryker (USGS), Marie-Claire Greening (CEO), Kerry Sawyer (NOAA), Flora Kerblat (CSIRO), Osamu Ochiai (JAXA), Laura Frulla (CONAE) Klaus Schmidt (DLR) and Andreia Siqueira (GA) support Ivan Petiteville as a nominee.

Decision 02	Agreed that Ivan Petiteville would be the nominee as CEOS representative to GEO post-2025 Working Group.
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7.4: Review of Draft Actions

Presenter: Ivan Petiteville (ESA, SIT Chair Team) [[draft D&A document](#)]

Main points:

- Due to time constraints, Ivan proposed to do the action review offline. No objections were raised.

7.5: Closing Remarks

Presenter: Ivan Petiteville (ESA, SIT Chair Team)

Main points:

- Ivan thanked everyone for participating in the SIT-37 meeting and noted that the SIT Chair will have follow up meetings with all the VCs in the coming months.
- Ivan asked for anyone planning on attending the SIT Technical Workshop at Frascati to contact him to assist with logistical planning.
- It was noted that LSI-VC will meet the week before, and the AFOLU roadmap team will meet on the 12th September.
- The CEOS Plenary will be held in Biarritz, France, 29 November - 1 December 2022.

APPENDIX A: Attendees

Agency/Organisation	Name	Agency/Organisation	Name
AEM	Adrian Guzman	ISRO	Muvva V Ramana
AGEOS	Aboubakar Mambimba Ndjoungui	ISRO	Atul Varma Varma
ASA	Reece Biddiscombe	JAXA	Ko Hamamoto
BoM (Australia)	Agnes Lane	JAXA	Yukio Haruyama
CEOS	Marie-Claire Greening	JAXA	Takeshi Hirabayashi
CNES	Aurelien Carbonniere	JAXA	Takuji Kubota
CNES	Selma Cherchali	JAXA	Akihiko Kuze
CNES	Helene de Boissezon	JAXA	Hiroshi Murakami
CNES	Carole Deniel	JAXA	Yuko Nakamura
CNES	Pierric Ferrier	JAXA	Makoto Natsuisaka
CNES	Dorian Groll	JAXA	Osamu Ochiai
CNES	Olivier Marsal	JAXA	Hiroshi Suto
CNES	Richard Moreno	JAXA/RESTEC	Koji Akiyama
CNES	Mireille Paulin	JAXA/RESTEC	Toshi Kamei
CNES	Aurélien Sacotte	NASA	Christine Bognar
CONAE	Laura Frulla	NASA	David Borges
CONAE	Ana Medico	NASA	Mark Carroll
CSA	Marie-Josée Bourassa	NASA	Michael Falkowski
CSA	Frederic Fournier	NASA	Lawrence Friedl
CSA	Eric Laliberte	NASA	Argyro Kavvada
CSIRO	Pep Canadell	NASA	Jack Kaye
CSIRO	Flora Kerblat	NASA	Christopher Kidd
CSIRO	Tim Malthus	NASA	Brian Killough
CSIRO	Cindy Ong	NASA	Barry Lefer
CSIRO	Andy Steven	NASA	Hank Margolis
DLR	Klaus Schmidt	NASA	Andrew Mitchell
DLR	Albrecht von Bergen	NASA	Yasha Moz
EC	Mark Dowell	NASA	Ben Poulter
EC	Mauro Facchini	NASA	Nancy D Searby
EC	Astrid Christina Koch	NASA	Karen St. Germain
ESA	Stephen Briggs	NASA	Wenying Su
ESA	Simonetta Cheli	NASA	Jean-Paul Vernier
ESA	Ferran Gascon	NASA	Diane Davies
ESA	Susanne Mecklenburg	NASA JPL	Edward Armstrong
ESA	Marc Paganini	NASA JPL	Gary Geller
ESA	Ivan Petiteville	NASA JPL / Caltech	Jorge Vazquez
ESA	Marie-Helene Rio	NASA JPL / Caltech	John Worden
ESA	Klaus Scipal	NOAA	Changyong Cao
ESA	Frank Martin Seifert	NOAA	Kenneth Casey
ESA	Ben Veihelmann	NOAA	Albert DeGarmo
ESA SIT Chair Team	George Dyke	NOAA	Mitch Goldberg
ESA SIT Chair Team	Libby Rose	NOAA	Shobha Kondragunta
ESA SIT Chair Team	Riza Singh	NOAA	Huan Meng
ESA SIT Chair Team	Matt Steventon	NOAA	Merrie Neely
ESA SIT Chair Team	Stephen Ward	NOAA	Kerry Sawyer
EUMETSAT	Paul Counet	NOAA	Steve Volz
EUMETSAT	Robert Husband	NOAA	Charles Wooldridge
EUMETSAT	Ewa Kwiatkowska	NOAA	Ludovic Brucker
EUMETSAT	Jörg Schulz	NOAA	Paul DiGiacomo
GA	Jonathon Ross	NOAA	Paul Chang

GA	Andreia Siqueira	NOAA	Kevin Gallo
GA	Medhavy Thankappan	NOAA	Jeff Privette
GEO University	BON/McGill Andrew Gonzalez	POLSAR	Oskar Zdunek
GEOSEC	Douglas Cripe	Portugal Space	Carolina Sá
GEOSEC	Laurent Durieux	SANSA	Mukosi Mukwevho
GISTDA	Pakorn Apaphant	SANSA	Christo Peter Whittle
GISTDA	Tatiya Chuentragun	SilvaCarbon	Joana Melo
GISTDA	Warinthorn Evans	UK CEOS-GEO Office, NCEO / UKSA	Svetlana Zolotikova
GISTDA	Raksina Lekthanoo	UK DEFRA	Melanie Hutchinson
GISTDA	Sitthisak Moukomla	UKSA	Beth Greenaway
GISTDA	Suwat Sreesawet	UKSA	John Remedios
GISTDA	Tanita Suepa	UNFCCC	Joanna Post
GISTDA	Watanyoo Suksa-ngiam	UNOOSA	Jorge Del Rio Vera
GISTDA	Nuttavipa Thanthawewut	USGS	Steve Labahn
IMEO	Steven Hamburg	USGS	Timothy Stryker
ISRO	Rajeev Jaiswal	USGS	Sylvia Wilson
ISRO	Manoj Kumar Mishra	USGS/KBR	Christopher Barnes
ISRO	Rashmi Sharma	WMO	Kenneth Holmlund
ISRO	Pradeep Thapliyal		

APPENDIX B: Decisions and Actions Record

DECISIONS

Decision 01	The CEOS-ARD Oversight Group Terms of Reference were endorsed (SIT Chair will confirm sustainability of the arrangements and that SIT TORs are supportive, ACTION SIT-37-09).
Decision 02	Agreed that Ivan Petiteville would be the nominee as CEOS representative to GEO post-2025 Working Group.

ACTIONS

SIT-37-01	CEOS agencies behind the relevant AFOLU products (inc ESA and NASA) are asked to send representatives to the first SilvaCarbon/CEOS Regional Workshop on Biomass measurements to be held in Paraguay in June 2022 as part of the National Inventory User Engagement. SIT Chair will follow up with SilvaCarbon and the product agencies.	April 2022
	<i>Rationale: The National Inventory User Engagement is a key part of our AFOLU/GST activity and the workshops seek to explain our main offerings to users. The key agencies behind the most popular products are requested to attend to support the explanation.</i>	
SIT-37-02	CEOS Members to provide feedback and suggestions on the one-pager "What CEOS can do to support the U.N. 2030 Agenda and the SDGs". This document will serve as a guide for future discussions between CEOS and the Custodian Agencies (via GEO).	15 April 2022 COMPLETED and documents finalised
	<i>Rationale: Outcome from the CEOS-GEO Coordination Meeting held on Feb 8-9.</i>	
SIT-37-03	CEOS Members to provide feedback and suggestions on the one-pager "CEOS Expectations for the GEO Secretariat regarding support of the SDGs". This document will define the expectations of CEOS regarding GEO communications with Custodian Agencies.	15 April 2022 COMPLETED and documents finalised
	<i>Rationale: Outcome from the CEOS-GEO Coordination Meeting held on Feb 8-9.</i>	
SIT-37-04	SEO will explore the GEO and CEOS connection for SDG custodian agencies, and country specific needs, at the next EO4SDG meeting.	EO4SDG mtg April 2022

		COMPLETED developed a plan and identified the people and connections
	<i>Rationale: Ensuring good CEOS-GEO cooperation on SDG matters</i>	
SIT-37-05	CEOS Agencies operating or planning EO missions with a capability in relation to wildfire detection are invited to send details to WGDIsasters in support of their Wildfire Pilot.	June 2022
	<i>Rationale: The WGDIsasters would like to fill in gaps in information collected on EO capabilities for the wildfire pilot</i>	
SIT-37-06	CEOS Principals are invited to name a representative to participate in the Biodiversity Discussion Group.	May 2022
	<i>Rationale: The engagement of CEOS agencies is needed to bring sufficient capacity to the group.</i>	
SIT-37-07	CEOS Principals are invited to offer a second co-lead for the CEOS Biodiversity Discussion Group.	June 2022
	<i>Rationale: Securing an additional co-lead would provide the level of leadership needed to further the activity, and is a priority.</i>	
SIT-37-08	CEOS Agencies are invited to provide suggestions to the SIT Chair Team on topics to explore at the SIT Technical Workshop and Plenary to further develop the 'New Space and Future CEOS' theme.	May 2022
	<i>Rationale: Build a list of topics to be refined and further developed for discussion at SIT Technical Workshop and Plenary.</i>	
SIT-37-09	SIT Chair Team to confirm whether the SIT Chair Terms of Reference need to be updated to accommodate reporting of the ARD Oversight Group.	ASAP
	<i>Rationale: Concern expressed regarding sustainability of the arrangement proposed by the ARD Oversight Group, and that the Group reports to the SIT Chair.</i>	
SIT-37-10	SIT Chair Team will engage our experts in AC-VC, WGCV, GHG and AFOLU Roadmap Teams to support the concept note required for the IMEO Scientific Oversight Committee to progress a CEOS-IMEO cooperation on data intercomparison and integration.	June 2022
	<i>Rationale: A CEOS-IMEO cooperation has great potential in support of the CEOS GST Strategy and is proposed as an exciting example of the New Space geometries we should be exploring</i>	

<p>SIT-37-11</p>	<p>CEOS Chair to consider a Troika meeting, with the main objective of assuring that a CEO will be in place for 2023. CEOS Chair will first raise the topic for discussion at SEC-292.</p>	<p>ASAP</p>
	<p><i>Rationale: No nominations for CEO have been received for the next two-year tenure period 2023-2024.</i></p>	

APPENDIX C: Australian Space Agency announcement of National Space Mission for Earth Observation

About 26hrs ago the Australian Government announced it would invest \$1.2 billion to establish a National Space Mission for Earth Observation.

I would like to play a short video to introduce you to this initiative.

This whole-of-government effort is coordinated by the Australian Space Agency with partners the Bureau of Meteorology, CSIRO, the Department of Defence, and Geoscience Australia.

The Mission provides a long-term framework allowing Government to assess opportunities that secure Australia's access to critical satellite Earth observation data and take action on those opportunities.

A key component of the program is to develop, launch and operate four Australian satellite cross-calibration radiometer (SCR) land imaging satellites.

These satellites have been designed to play a unique role in the global observing system.

They will fly in an orbit designed to maximise co-incident collects with both CEOS Agency and commercial systems. The SCR missions will collect high-quality, consistent and comparable hyperspectral data.

These satellites will act as a bridge between highly calibrated 'gold standard' systems and other systems which are less well calibrated but provide important data. This will enable us to support users to more easily quality assess, compare and combine data from the many different systems already on orbit or planned for launch. They will be an important enabler of CEOS's efforts to generate interoperable Analysis-Ready Data, and will help build connections between government and commercial programs.

These Australian satellites will be relatively small with an expected weight around 100 kg but the final size and design will be a function of the mission needs, refined and confirmed as the program progresses.

The Australian Space Agency will be responsible for satellite development, launch and commissioning. Geoscience Australia will operate the satellites and process the data, with CSIRO providing on-ground calibration support.

As well as generating unique and important data, the development of these satellites will drive a substantial uplift in the capability of Australia's space industry.

Australia's participation in CEOS, and the support and collaboration we have had with the CEOS family over many years, has been critical to our nation reaching a milestone that we doubted might ever occur. Thank you all.

Although this step will see us develop sovereign missions, we very much see our future as one of cooperation and collaboration with the international community and partners. The very function of these cross-calibration satellites is to support, connect and enhance the work of all satellite operators for the benefit of an even more impactful global observing system.

The missions will collect data over the global land mass, not just Australia. Data from the missions will be provided on a full, free and open basis - consistent with the policies of our key international partners from which we have benefited so significantly.

Importantly, the process to develop the first two satellites recently passed "Key Decision Point A", and is now proceeding into the Formulation phase.

I am sure you all have many questions and we look forward to sharing further information as the project continues, thanks again.

Reece Biddiscombe, Director National Missions, Australian Space Agency

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