CEOS SIT-35

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Committee on Earth Observation Satellites

Carbon & Biomass Session

Day 1, Session 2

SIT-35 Virtual Meeting

25-26 March, 2020

Committee on Earth Observation Satellites

Carbon & Biomass Session

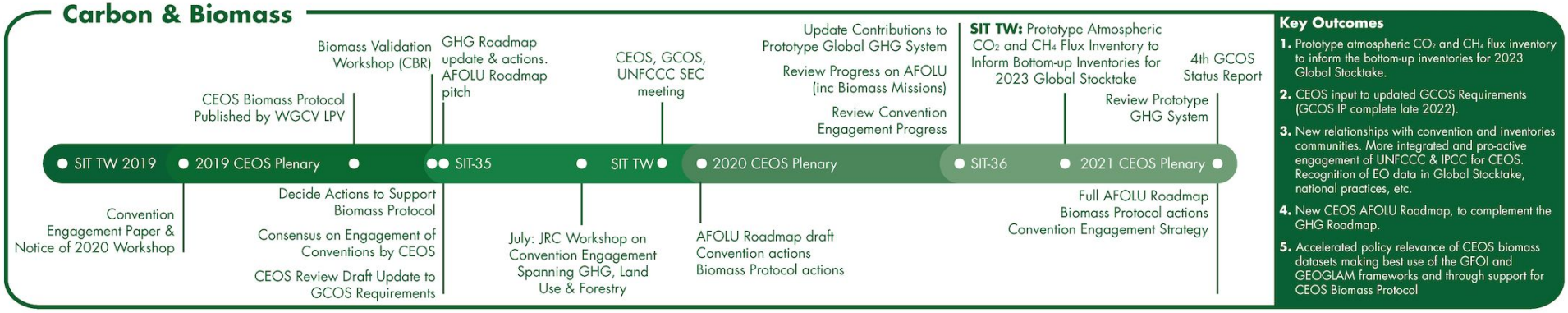
Introduction & Objectives

Australian SIT Chair Team

SIT-35 Virtual Meeting

25-26 March, 2020

A SIT term priority



- **Supporting the GHG Roadmap process** – escalating, elevating, and accelerating progress towards major milestones, including for the 2023 Global Stocktake. **2021 prototype flux products.**
- Encouraging **stronger and more systematic CEOS engagement with convention frameworks** – building on IPCC outreach
  - **And national inventory communities as our future users**
- Reflecting large investment (2018-2024) in Above-Ground Biomass missions and seeking to **accelerate the policy relevance of these new data (GFOI, GEOGLAM…)**
- **Promote uptake of biomass datasets beyond science community** – forest monitoring, inventories…

What do we hope to achieve?

- (Very) big picture… an optimally efficient and effective partnership between space data providers and the main UN and national stakeholders that use our data to make and manage policy.

- CEOS exploring more integrated and pro-active relationships with major stakeholders in conventions and national inventories - to accelerate the policy impact and application of our data

- Shine a light on the underlying technical work underway in the organisation and agencies and advocate for support from Principals for it to realise its full potential. *Elevate, escalate, accelerate.*

- Hear user voices - national inventory and major science programme **POSTPONED**

Specific objectives/agenda today

- Hear the latest from key teams and provide feedback as required
  - → GCOS (Anthony Rea, WMO)
  - → GHG Task Team & Roadmap (Mark Dowell, EC) 5 mins each
  - → CEOS-CGMS WGClimate (Jörg Schulz, EUM)
- CEOS Biomass Protocol
  - → Explained by Laura Duncanson (UMD) 15 mins
  - → Case for resources from CEOS agencies to optimise potential of the Protocol to support policy relevance of our new AGB mission capabilities
- Q&A 15 mins
- Discussion of possible measures to strengthen the CEOS-UNFCCC axis, with: 15 mins
  - → Context & heritage (Jörg Schulz, WGClimate)
  - → Suggestions for a CEOS AFOLU Roadmap (Osamu Ochiai, JAXA/GFOI)
  - → Brief example of policy-driven mission planning (Mark Dowell, EC)
- Q&A, Future activities 20 mins

Add comments and questions on sli.do (#ceos-sit-35) at any time in the session

Key Updates & Context

- **GCOS (Anthony Rea, WMO)**
  - → GCOS changes as part of WMO cost-cutting and restructuring
  - → Assurances sought that key documents and processes retained - CEOS & space agencies heavily invested
  - → Anthony Rea is Hd Infrastructure Division - responsible for GCOS

- **GHG Task Team & Roadmap (Mark Dowell, EC)**
  - → *"The GHG Roadmap is not being presented for endorsement at CEOS Plenary. Rather the team is seeking acceptance/acknowledgement of the approach. The subsequent project plan will be presented by SIT-35"*

- **CEOS-CGMS WGClimate (Jörg Schulz, WGClimate)**
  - → Progress since Plenary, including COP

GCOS – Plans

GLOBAL CLIMATE OBSERVING SYSTEM

KEEPING WATCH OVER OUR CLIMATE

WMO IOC International Science Council UN environment

WMO Strategic Plan Goals

1: ***Better serve societal needs***: delivering, authoritative, accessible, user-oriented and fit-for-purpose information and services

2: ***Enhance Earth system observations and predictions***: Strengthening the technical foundation for the future

3: ***Advance targeted research***: Leveraging leadership in science to improve understanding of the Earth system for enhanced services

4: ***Close the capacity gap on weather, climate, hydrological and related environmental services***: Enhancing service delivery capacity of developing countries to ensure availability of essential information and services needed by governments, economic sectors and citizens

5: ***Strategic realignment of WMO*** structure and programmes for effective policy- and decision-making and implementation

WMO commissions reduced to two:

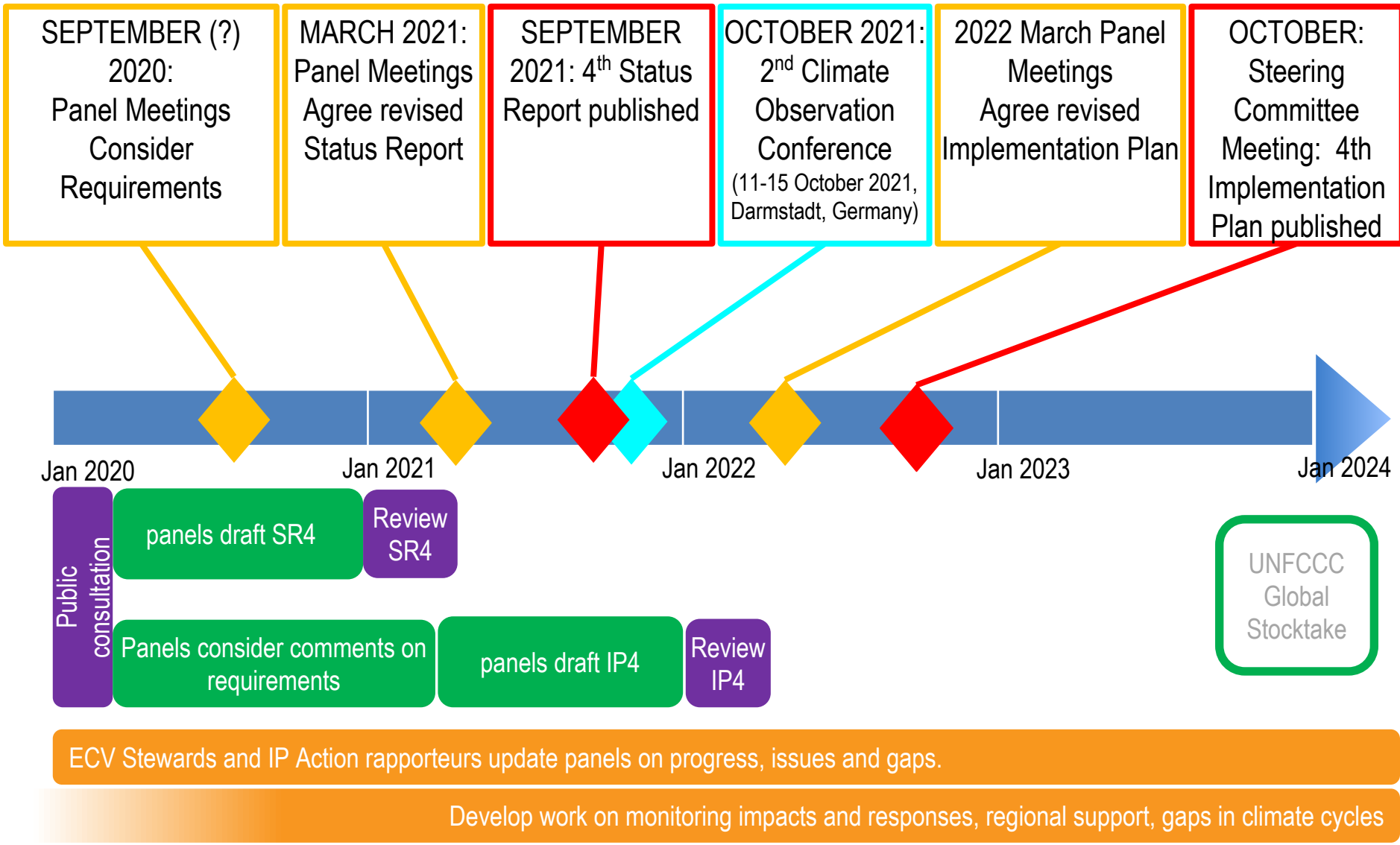
- Commission for Observation, Infrastructure and Information Systems (Infrastructure Commission)
- Commission for Weather, Climate, Water and Related Environmental Services & Applications (Services Commission)
- Research Board on Weather, Climate, Water and the Environment (Research Board)
- ALSO
  - Joint Collaborative Board (IOC and WMO)
  - Hydrological Coordination Panel

WMO Secretariat:

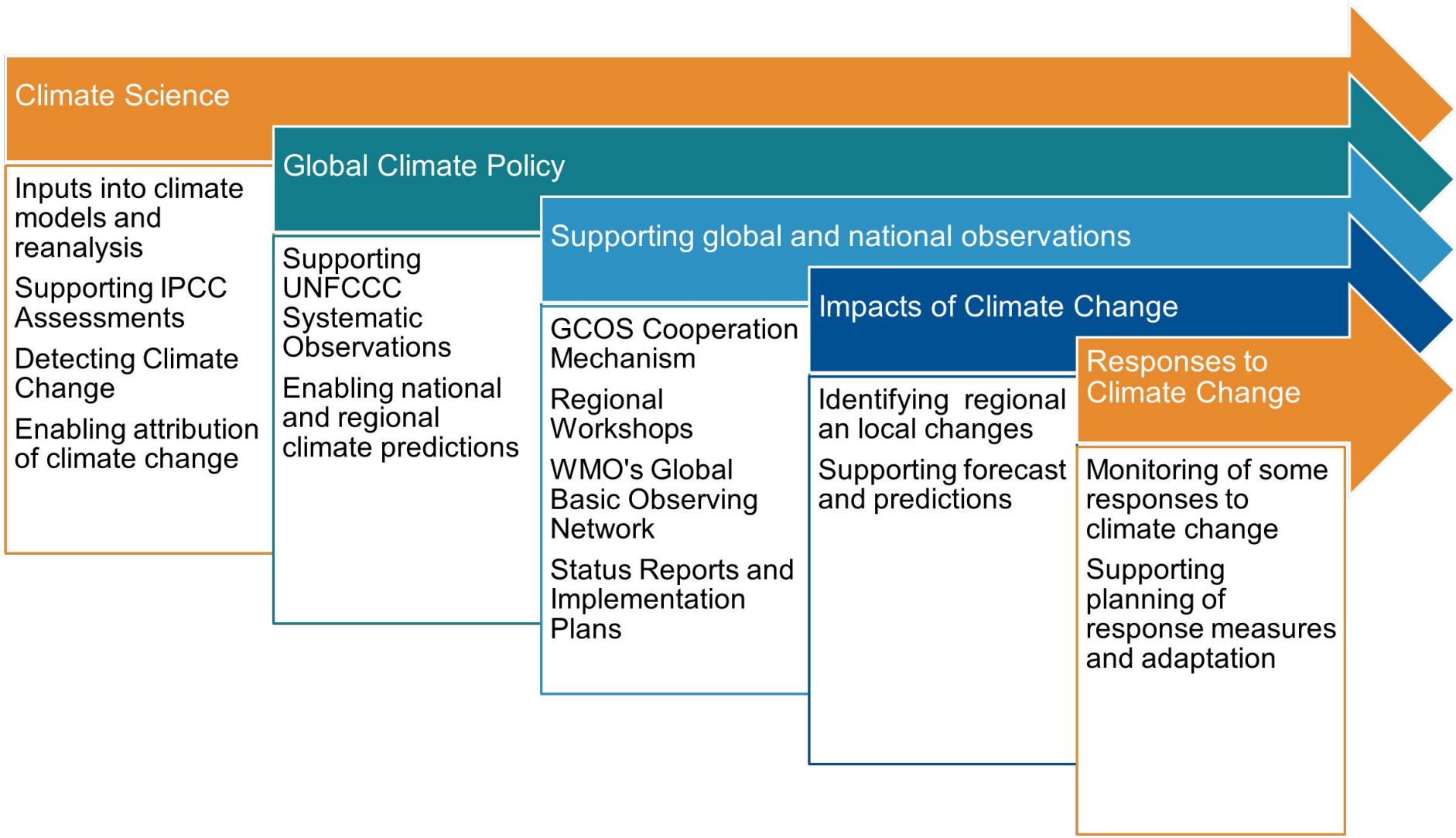
- Observation, Infrastructure and Information Systems Department (Infrastructure Department)
- Weather, Climate, Water and Related Environmental Services and Applications (Services Department)
- Science and Innovation Department
- Member Services
- Corporate Support

- Governance
  - Currently GCOS is led by a steering committee guided by its four sponsors (WMO, IOC of UNESCO, UNEP and ISC). This will continue.
  - A WMO study group including the four Co-sponsors and major partners will consider the future governance arrangements and make proposals in 2023
  - The GCOS secretariat will be based in the Infrastructure Department reporting to its director at WMO (previously it was in the Climate and Water Department)
- GCOS and WMO
  - WMO is strongly committed to GCOS and its continuing work, including
    - Reviewing and reporting on the needs for, and state of, climate observations
    - The GCOS Panels
    - The ongoing review of the ECVs, updates to the Status Report & Implementation Plan
    - The operation and integration of the GCOS networks
    - Regional activities and national support
  - WMO would also like to strengthen
    - The input of GCOS into WMO regulatory and guidance activities
    - Its consideration of ocean climate needs
  - WMO recognises the range of organisations GCOS cooperates with and the importance of this approach

Timeline for Status Report (SR4) and Implementation Plan (IP4)



GCOS WMO IOC International Science Council UN environment



New Challenges

GCOS WMO IOC International Science Council UN environment

Committee on Earth Observation Satellites

GHG Task Team & Roadmap Status Update

Mark Dowell

European Commission, Joint Research Centre

Joint CEOS/CGMS WGClimate GHG Task Team Lead

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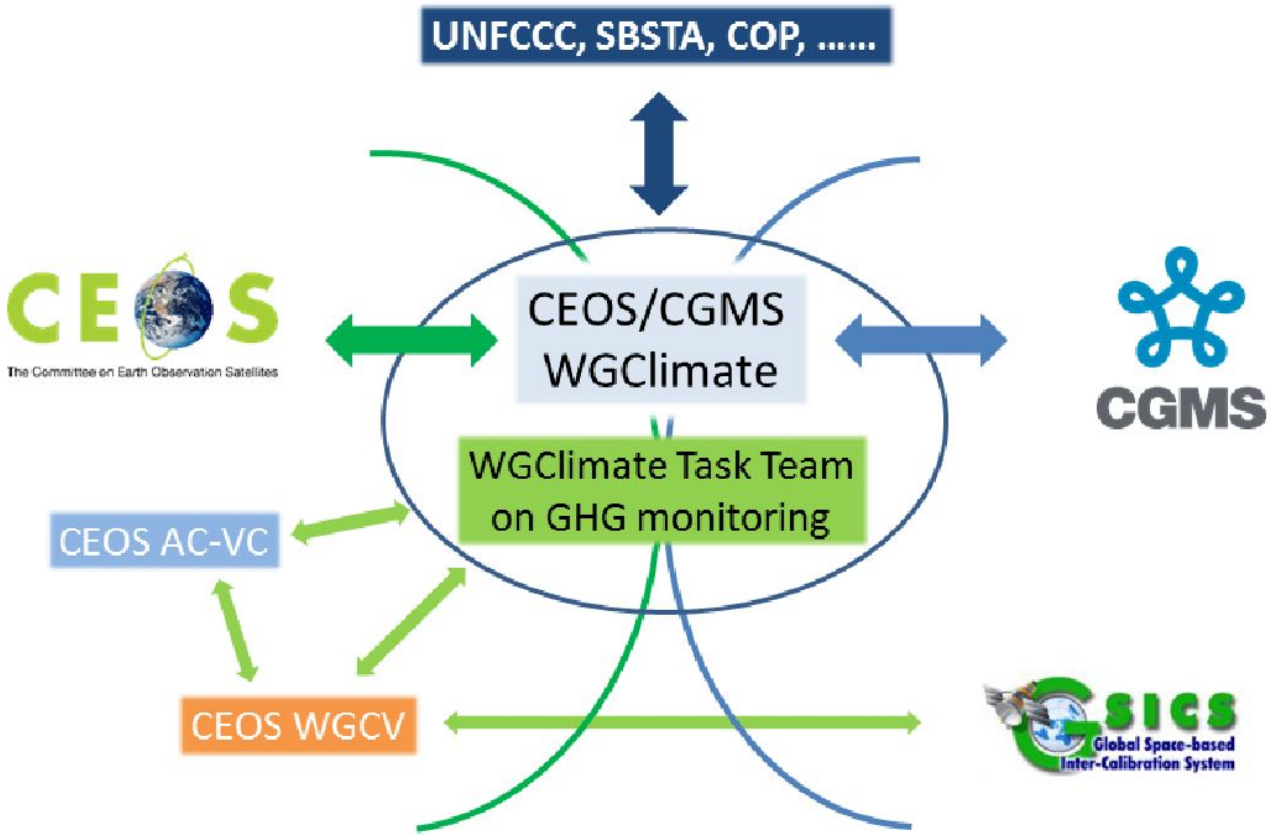
The Greenhouse Gas Roadmap Objectives

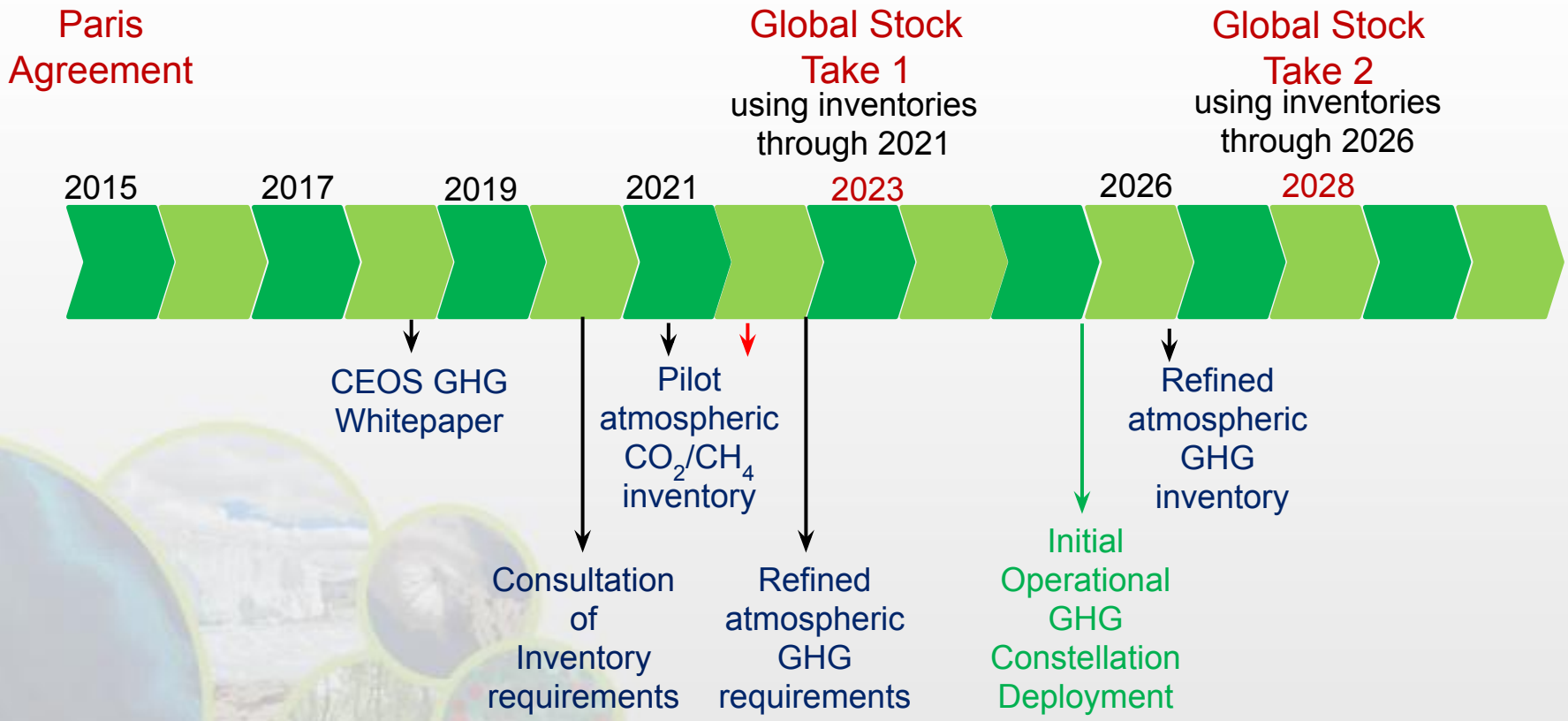
- **GHG Roadmap Objectives:**
  - A prototype end-to-end system that yields estimates of CO_2 and CH_4 fluxes supporting the first global stocktake; and
  - An Initial Operational System for producing future atmospheric CO_2 and CH_4 flux products for use in future Global Stocktakes.
- **The roadmap document has established a more rigorous approach to the terminology:**
  - "*Pilot phase providing access to targeted products from individual CEOS and CGMS Agency programs to establish appropriate relationships with stakeholders and users (e.g. National Inventory Agencies) to enhance to uptake of Earth Observation based datasets informing the national reporting needs*".
- **The delivery of each system version is accompanied by a requirements refinement process leading to the additional objective:**
  - Establishing the end-to-end requirements for a system that delivers atmospheric CO_2 and CH_4 flux products for use in stocktakes (with requirements apportioned to each system version).

GHG Roadmap Table of Contents

Key Players in the GHG Roadmap/Project Plan



GHG Roadmap Timeline
(No change since Plenary)



Status GHG Task Team Activities

- **Mature GHG Roadmap and Project Plan developed specifying deliverables, responsible organizations, schedules and resources**
- **Establishing interfaces with National Inventory community**
  - Worked with the Copernicus H2020 VERIFY Project to organize an atmospheric inventory workshop @ Global Emissions IniAtive (GEIA)
- **Establishing interfaces with stakeholders (UNFCCC/SBSTA & GCOS)**
  - Support UNFCCC/SBSTA & GCOS at COP-25 & 2nd Earth Information Day
- **Workshop on synergies and opportunities between GHG and AFOLU Earth Observation communities working in support of UNFCCC** (with HORIZON/CHE-VERIFY assembly on July 6-9th, 2020)
- **Engaged Atmospheric GHG Community**
  - Presented Roadmap to AC-VC, Jun 2019; workshop @ AGU Dec. 2019
- **Progress in Atmospheric Inventory Development**
  - ESA/CCI, Copernicus CAMS, OCO-2, NASA CMS and others
- **Progress in identification of GHG validation capabilities**

Resources Needed from CEOS/CGMS

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

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

GHG Roadmap Status and Next Steps

- **The Roadmap is a living document, we have a version available for consultation, and will continue to revise/refine it as we start to address the work required (see Annex C)**
- **We will continue efforts to:**
  - establish links to national inventory community to refine needs for atmospheric inventories
  - Enhance links with critical interfaces at GCOS, IPCC and IG3IS following WMO reorganization
  - Foster integration of CGMS Working Groups
  - Prepare for endorsement of the GHG Roadmap/Project Plan at 2020 Plenary

- Backup slides -

Establishing Interfaces: Progress Since Plenary

- **Estabishing interfaces with the National Inventory community**
  - Worked with the Copernicus H2020 VERIFY Project to organize an atmospheric inventory workshop in conjunction with the Global Emissions IniAtive (GEIA) Conference, which was originally scheduled in Santiago Chile on 6-8 November 2019
    - GEIA Conference and Workshop initally delayed due to riots
    - Now beging rescheduled due to COVID-19 travel restrictions
    - Intention is also to propose a standing working group within GEIA (G. Janssens-Maenhout EC/JRC) to provide a forum for recurrent engagement with Inventory community
    - Other opportunities now being explored to interact with this community
- **Establishing interfaces with stakeholders (UNFCCC/SBSTA & GCOS)**
  - Supported COP-21 Earth Information Day with talks and posters
    - *Space-based observation for supporting Nationally determined contributions (NDCs), national inventories and the global stocktake*
    - *A constellation architecture for space-based observations of greenhouse gases: measurement approaches, datasets, and models in support of the global stocktake*
    - *Space-based capabilities to deliver climate data records for essential climate variables*
    - *The carbon cycle and the climate: an evolving system?*

Engaging the Atmospheric GHG Community

- **Conducted a CEOS WGClimate Task Team workshop on 11 December 2019 in conjunction with the American Geophysical Union meeting in San Francisco, CA USA**
  - Described GHG Roadmap Objectives and Deliverables
  - Summarized role of space-based atmospheric GHG flux inventories and their potential role in the global stocktake process
  - Introduced the GHG Task Team participants and roles
    - CEOS/CGMS WGClimate Task Team – Overall leadership, stakeholder interface
    - CEOS AC-VC – CO_2, CH_4 inventories, constellation architecture
    - CEOS WGCV ACSG and GSICS – Cal/Val needs
    - Other CEOS and GGMS entities (CGMS WG-I, WG-II, WG-IV; CEOS WGCapD)
  - Discussed the process for developing and reviewing the GHG Roadmap and Project Plan
  - Solicited inputs and contributions from members of the ground-based and space based measurement communities and the atmospheric GHG flux inversion modeling communities

Progress in Atmospheric Inventory Development

- **Progress in Atmospheric Inventories by CEOS Agencies**
  - ESA Climate Change Initiative has integrated SCIAMACHY, GOSAT and OCO-2 data to produce a harmonized 18-year-long atmospheric CO_2 a CH_4 climate data record (*Reuter et al., AMT, 2020*)
  - Copernicus Climate Monitoring System (CAMS) is using GOSAT and OCO-2 XCO_2 estimates as well as in situ observations to create global CO_2 flux maps that could form the basis of an atmospheric CO_2 inventory (*Chevallier et al., ACP, 2019*)
  - The OCO-2 Project is conducting a Flux Multi-Model Intercomparison Project (MMIP) using multiple transport models, data assimilation frameworks, prior flux, and XCO_2 datasets assumptions to assess the relative roles of these factors on atmospheric flux uncertainties (*Crowell et al. ACP, 2019*)
  - The OCO-2 team is using an updated retrieval algorithm (Version 10) to reprocess the entire 5.5 year XCO_2 data record with increased accuracy
- **These and other ongoing efforts will form the basis of the pilot atmospheric inventories to be delivered in 2021 and 2022 to support the 2023 Global Stocktake**

GHG-AFOLU Workshop

- **Workshop on synergies and opportunities between GHG and AFOLU Earth Observation communities working in support of UNFCCC**
  - [Rescheduled] July 9-10th Varese-Italy together with H2020 CHE-VERIFY General Assembly (July 6-9th)
  - Start dialogue between the different Earth Observation communities addressing the needs of UNFCCC.
  - In particular, atmospheric GHG monitoring and those addressing aspects of the AFOLU sector (e.g. REDD+).
  - Co-organised, based on an identified gap, both at the European level through discussions in Copernicus as well as at the international level CEOS
- **The workshop plans to address:**
  - both the "soft" coordination and stakeholder engagement aspects of the interface with the Convention, the UNFCCC Secretariat and,
  - Parties (including through their inventory agencies/compilers) but also more technical aspects of reporting, outputs datasets, formats, avoiding "double-accounting" and the longer-term ambition of using diverse earth observation datasets in the modelling and data integration systems being developed.

Staff Resource Request
(No change since Plenary)

1. Agencies are asked to continue/increase support to the GHG relevant staff (time & travel) contributing to the technical implementation tasks in AC-VC and WGCV
2. For WGClimate GHG Task Team, the following "profiles" are requested:
    - Core team ensuring linkages to internal CEOS/CGMS entities (i.e. WGClimate – Dowell/von Bargen, AC-VC – Crisp, WGCV – Kuze)
    - CEOS and CGMS Agency staff representing GHG missions/programmes
    - Agency staff from "operational" agencies to ensure operational transition
    - Agency Staff/Experts with links to Inventory Community
    - Agency Staff/Experts involved in modelling aspects
3. The GHG Task Team would include ~12 members, typically dedicating 1 PM/yr of effort each with those leading specific activities dedicating closer to 2 PM/yr. Support should include necessary travel budgets for attending meetings/workshops.

Committee on Earth Observation Satellites

CEOS/CGMS Joint Working Group Climate

Jörg Schulz, EUMETSAT, WGClimate Chair

Albrecht von Bargen, DLR, WGClimate Vice Chair

CEOS SIT-35

Agenda Item 2.1

Virtual Meeting

25 – 26 March 2020

Status of WGClimate

- NCEI and NESDIS support the nomination for the Vice-Chair of WGClimate for October 2020, written nomination will follow;
- WGClimate #12 meeting planned being hosted by JAXA in Tsukuba, Japan on 31 March – 2 April 2020 has been cancelled and will be replaced by virtual meeting in late April 2020;
- The GHG Task Team has delivered first version of GHG Roadmap;
- Gap Analysis and Coordinated Action Plan documents are delayed due to lack of resources and later COVID-19. Plan is to have versions for review at time of virtual WGClimate #12;
- Delivered the space agency statement to SBSTA-51 on 2nd December 2019 in Madrid, Spain and successfully participated in the Earth Info Day. Comprehensive report from SBSTA Chair featuring architecture for space-based climate monitoring and constellation architecture for GHG as one particular part of it, is almost complete;
- Undertook a first step towards systematic collection of use cases for climate data records.

Interface to GCOS

- Joint CEOS/CGMS WGClimate is of firm opinion that GCOS remains *the single voice* for climate related requirements towards space agencies;
- Current requirements process requires closer interaction of GCOS and WGClimate to make requirements relevant for space agencies, i.e., we should work towards application specific requirements beyond the classical large scale trend estimation application;
- Current requirements setting as presented for review in January 2020 is seen as not fully adequate (coordinated response from WGClimate will follow WGClimate#12);
- WGClimate is open to support GCOS Status Report based on findings from the ECV Inventory analysis but closer coordination of the process towards the report is needed;
- Participation of leader of GCOS Secretariat in WGClimate is seen as essential, in particular for WGClimate#12.

ECV Inventory, Gap Analysis and Coordinated Action Plan

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

Committee on Earth Observation Satellites

Carbon & Biomass Session

CEOS Biomass Protocol

Laura Duncanson, UMD

SIT-35 Virtual Meeting

25-26 March, 2020

Interventions, Q&A

- **On GCOS, GHG, WGClimate?**

- **On the Biomass Protocol?**
  - → *"If data are not turned into useful, actional information in a timely fashion then our field is simply recording history rather than changing it"*
  - → Further explanation of purpose and potential needed?
  - → Do agencies consider this worthy of further development of a business case seeking support from space agencies for reference sites? so that we might optimise the policy-relevance of the new AGB missions.
  - → Ballpark costs?
  - → what benefits would agencies receive?
  - → how might we promote the Protocol, using fora like GFOI…?

- **use sli.do to log comments, suggestions and questions to add to the list**

Add comments and questions on sli.do (#ceos-sit-35) at any time in the session

Committee on Earth Observation Satellites

Carbon & Biomass Session

UNFCCC Relationship & Policy Relevance of EO

SIT-35 Virtual Meeting

25-26 March, 2020

Context

- Significant progress thanks to GCOS Framework and CEOS-CGMS WGClimate stewardship
- CEOS engagement in IPCC GPG update processes
- CEOS Plenary discussion and actions:
  - → European Commission to plan a workshop at the Joint Research Centre to support dialogue among the Greenhouse Gas and Agriculture, Forestry and Other Land Use (AFOLU) communities (July 2020?)
  - → Mark Dowell and SIT Chair Team to plan for a dedicated discussion at the 2020 SIT Technical Workshop (Zagreb, Croatia, September 2020) among relevant CEOS entities, GCOS, and the UNFCCC Secretariat on Climate Change Convention engagement by space agencies (Contacted 2 weeks ago)
- GHG Roadmap has provided an inspired model for thematic coordination of observations with a strong policy milestone focus
- CEOS Biomass Workshop (March, Canberra) discussed using the model for terrestrial carbon observations coordination - aiming for biomass product for GST 1 & 2
  - → CEOS & ESA GFOI Leads brainstormed AFOLU Roadmap presentation
  - → Some exchange with OCR-VC on oceanic carbon equivalent

Specific objectives/agenda today

- ❑ Reminder of heritage and context from WGClimate (Jörg Schulz) — 5 mins
- ❑ Thoughts on a possible CEOS AFOLU Roadmap (Osamu Ochiai, Frank-Martin Seifert) — 5-10 mins
  - → Inspired by GHG Roadmap
  - → Aiming at datasets for GST 1 & 2
  - → In collaboration with GFOI Partners
  - → Making best use of new biomass missions and CEOS Protocol
- ❑ Policy-driven mission planning - brief example (Mark Dowell) — 2 mins!
- ❑ Interventions, Q&A — ~ 15 mins

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Committee on Earth Observation Satellites

Carbon & Biomass Session

CEOS-UNFCCC Heritage

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UNFCCC relationship

Jörg Schulz, EUMETSAT, WGClimate Chair

CEOS SIT-35

Agenda Item 2.1

Virtual Meeting

25 – 26 March 2020

UNFCCC Engagement Heritage

- CEOS (& CGMS) has been very effective over last 8 years in establishing a **positive and proactive dialogue** with UNFCCC/ SBSTA largely due to the symbiotic relationship with GCOS and the Climate Monitoring Architecture as guiding framework;
- The creation of **the Joint WGClimate established an unambiguous entry point** for the discussion between SBSTA Research and Systematic Observations (RSO) and the Space Agencies;
- In recent years our **support has been visibly expanding**: Climate Data Records, Climate Services and support to Climate Adaptation, CEOS Carbon Strategy, GHG monitoring, CEOS GFOI support and evolution to biomass, other AFOLU etc.
- Parts of this we have reported in statements to SBSTA Assemblies and messages found their way to the Parties through the SBSTA Chair reports;
- At COP-25 we were prominently present at the Earth Information Day with the GHG constellation architecture as one part of the Architecture for Climate Monitoring from Space, which is nicely reflected in the upcoming report by the SBSTA Chair.

Broadening UNFCCC Engagement

- What we should discuss is what our **long-term strategy is for the multitude of contributions CEOS**, and Space Agencies more generally, can make to the Convention;
- The **CEOS Carbon Strategy can play a central role** for carbon relevant aspects and can be used to give greater visibility to GFOI/Biomass aspects as well as Agriculture not only through REDD+ but also RSO;
- Maintaining the **effective focal point established through WGClimate**, but increasing communication on contributions from other parts of CEOS (in SBSTA statements, SBSTA Briefings, Earth Information Day etc.);
- **CEOS could apply for an observer status with SBSTA**, which could serve as a stable basis to deliver messages, maybe with a delegation led by the Chair of WGClimate;
- We can take all the points up to the **planned dedicated discussion at the virtual SIT TW** with all CEOS entities, GCOS and the UNFCCC Secretariat.

Committee on Earth Observation Satellites

Carbon & Biomass Session

A CEOS AFOLU Roadmap?

Osamu Ochiai & Frank Martin Seifert

CEOS & ESA Leads for GFOI

SIT-35 Virtual Meeting

25-26 March, 2020

Why is it needed?

The 2015 UNFCCC Paris Agreement came into force on 4th November 2016. Parties have agreed to commit to nationally determined contributions (NDCs), that they intend to achieve regarding their future GHG emissions reductions, to hold global warming well below 2 °C above pre-industrial levels, and aiming to limit it to 1.5 °C.

AFOLU and the Paris Agreement:

- National Determined Contributions (NDC) (Art 3, 4)
- Conserve and enhance sinks and reservoirs of GHG including forests (Art 5)
- Transparency framework and GHG reporting (Art 13)
- Global Stocktake (GST) - assessment of collective process (Art 14)

History and Background

- GEO Carbon Report developed in June 2010 - Ciais et al. (GCP).
- *CEOS Strategy for Carbon Observations from Space* – written in response to above, completed in March 2014 – *Wickland et al.*
- Systematic Observations and the Paris Agreement (v2.0, GCOS-222, 2018)
- Statement of Space Agencies Contributions in Support of the Paris Agreement (2018)
- GHG Roadmap - a more focused and policy process driven framework for space agency coordination (draft - 2019)
- IPCC Special Report on Climate Change and Land (2019)

GEO Carbon Report – Land Chapter

- Increase the density of in-situ network, in particular stations and aircraft atmospheric observation and ocean pCO2 observing systems using Voluntary ships, and eddy covariance terrestrial ecosystem measurement networks.
- Develop spatial scaling technique for pCO2 and land flux observations for applications to wider regions, using satellite information.
- Undertake a full basin survey of ocean carbon state, together with regular inventories of forest biomass and soil carbon pools.
- Improve access to continuous supply of mid-resolution Earth observation satellite data (i.e. LAI, FAPAR, disturbance, land cover change) to monitor areas of forest.
- Develop space measurements of vegetation 3-dimensional structure to improve estimates of global terrestrial above-ground biomass and carbon stocks and continue the observational data streams started with JERS-1, ALOS PALSAR and ICESat.
- Assemble geospatial information about use of wood and food products and continuously monitored continuously dissolved and particulate carbon, if possible with age information, for related rivers.

IPCC Special Report: Climate Change and Land

- Major topics consist of “Land Climate Interaction”, “Land degradation”, “Desertification”, “Food Security”, “Inter-linkage between the topics with GHG fluxes”
- Many satellite observation references - both positive and negative
- More dialogue with report experts and UNFCCC Secretariat needed to understand the role of Earth observations (satellite and in-situ, etc) in UNFCCC’s Systematic Observations of our planet

CEOS AFOLU White Paper: Rationale

- Given:
  - the Paris Agreement and its first Global Stocktake (2023) ahead
  - the release of the IPCC SRCCL
  - significant new capabilities in CEOS agencies' programmes
  - the inspired model of the GHG Roadmap

  ... **it is the right moment to start to discuss a Space agencies' strategy of consistent contribution to GHG fluxes on Land**

Considering CEOS active contribution to related GEO Flagships and Initiatives ie. GFOI, GEO-GLAM, GEO LDN, GEO Wetland and others, a CEOS AFOLU roadmap could provide more inter-linkage between these programs

- We can start our baseline with the GEO Carbon Strategy and its CEOS response, and update using the dialogue with IPCC and UNFCCC

- Strong focus on what we can provide for Global Stocktake #1 (2023) and #2 (2028) - need to consider which products to deliver (e.g., AGB)

CEOS AFOLU White Paper – ToC

Potential Table of Contents
(modelled on GHG doc)

Chapter 1: Scope and objectives

Chapter 2: Context

Chapter 3: Roadmap objectives

Chapter 4: Implementation entities and roles

Chapter 5: Roadmap actions to 2021 and 2025

Process, Resources, Schedule

- Dedicated volunteer team per GHG model?
  - GFOI Leads
  - LSI agencies
  - Biomass specialists
  - ….
- Needs leadership and effort - do we have the will and capacity?
- Consultation process:
  - LSI-Forest, CEOS GHG , Biomass WS, CEOS SIT-35, GFOI Plenary
- Need to move NOW, as based on stocktake schedule (first GST in 2023)
- Strong draft for SIT TW, refined for Plenary review (Autumn 2020)?

Committee on Earth Observation Satellites

Carbon & Biomass Session

Policy-Driven Mission Planning

Mark Dowell

EC-JRC

SIT-35 Virtual Meeting

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Policy-driven mission planning a Copernicus example

Mark Dowell, European Commission

CEOS SIT-35

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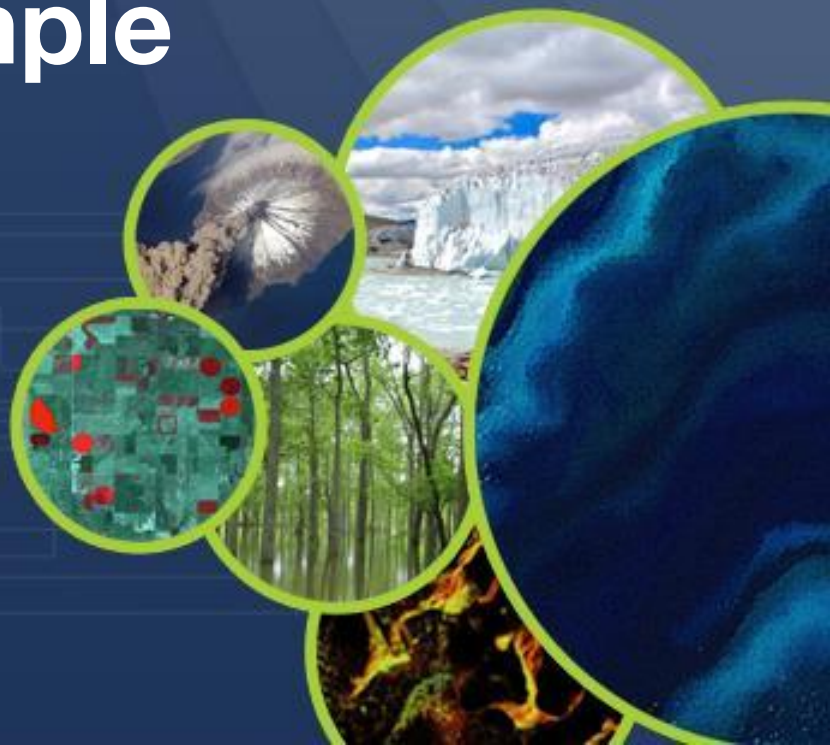
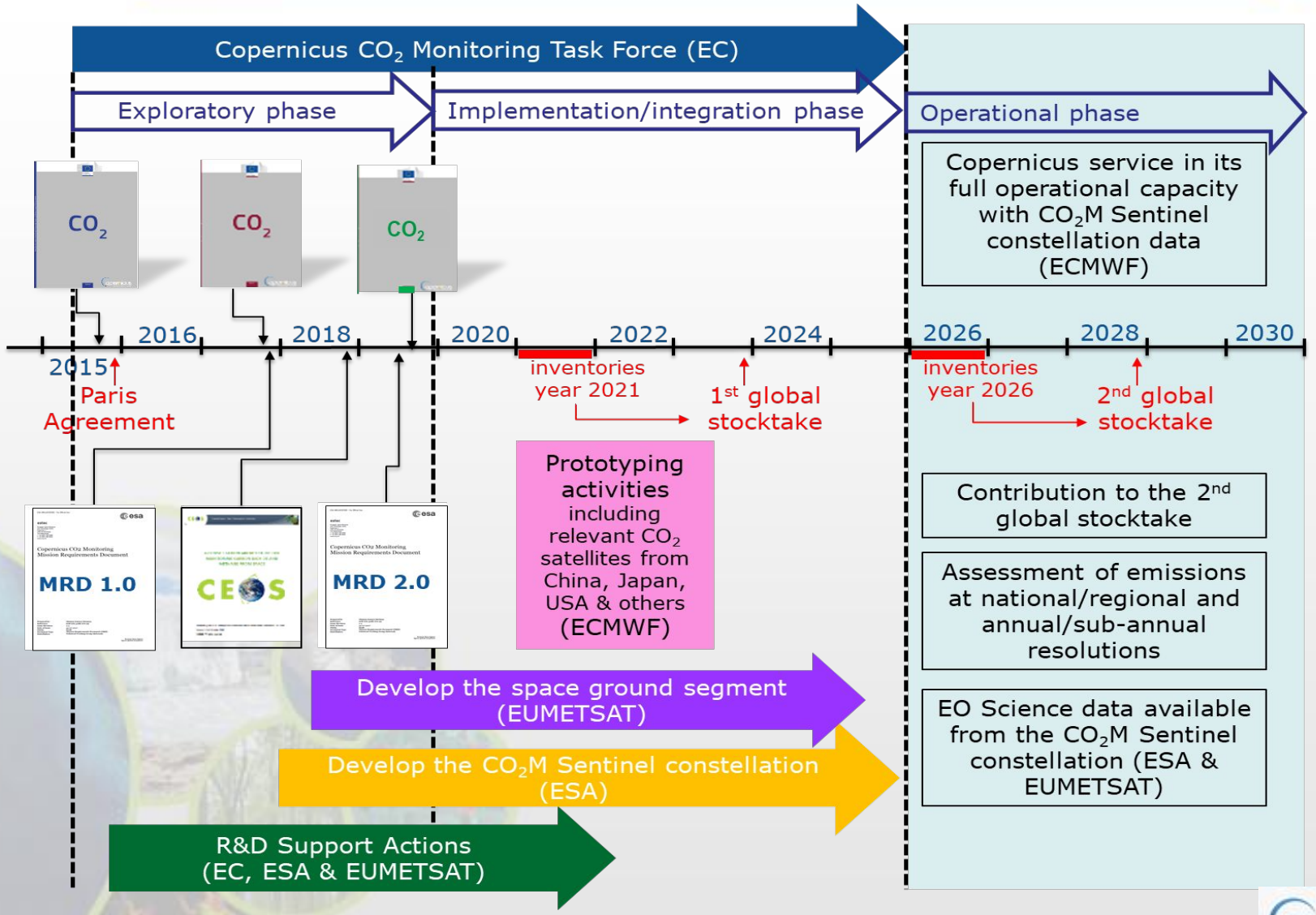
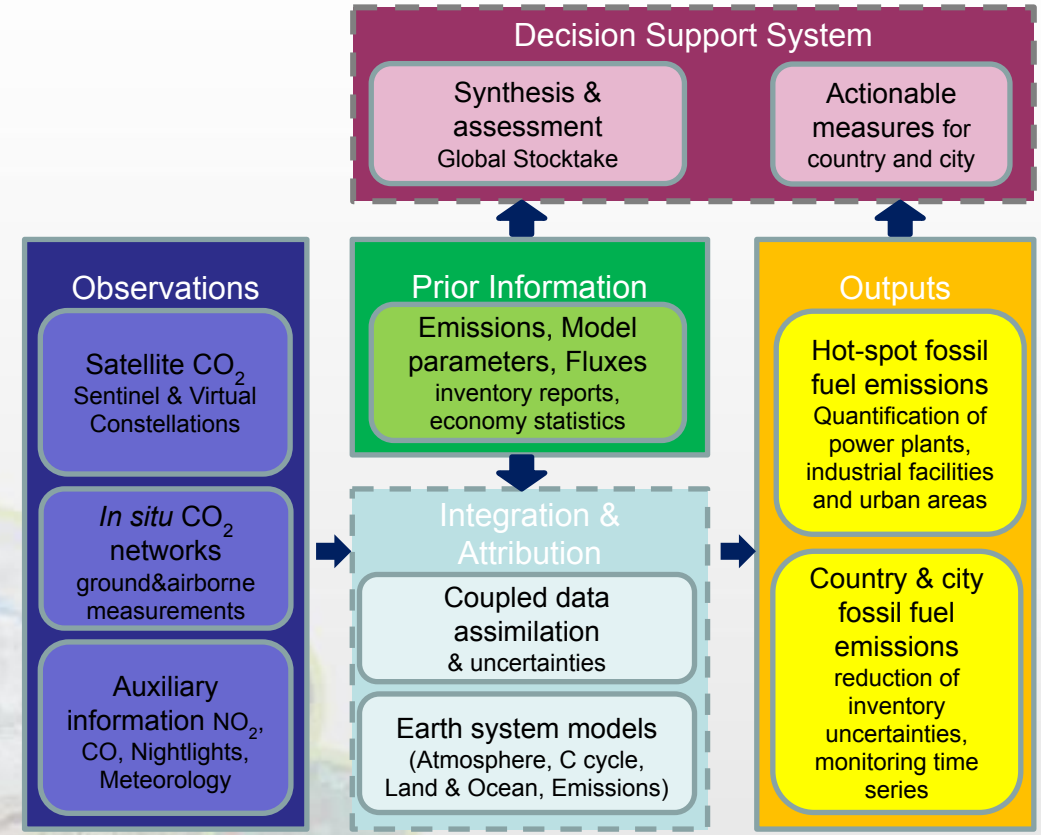
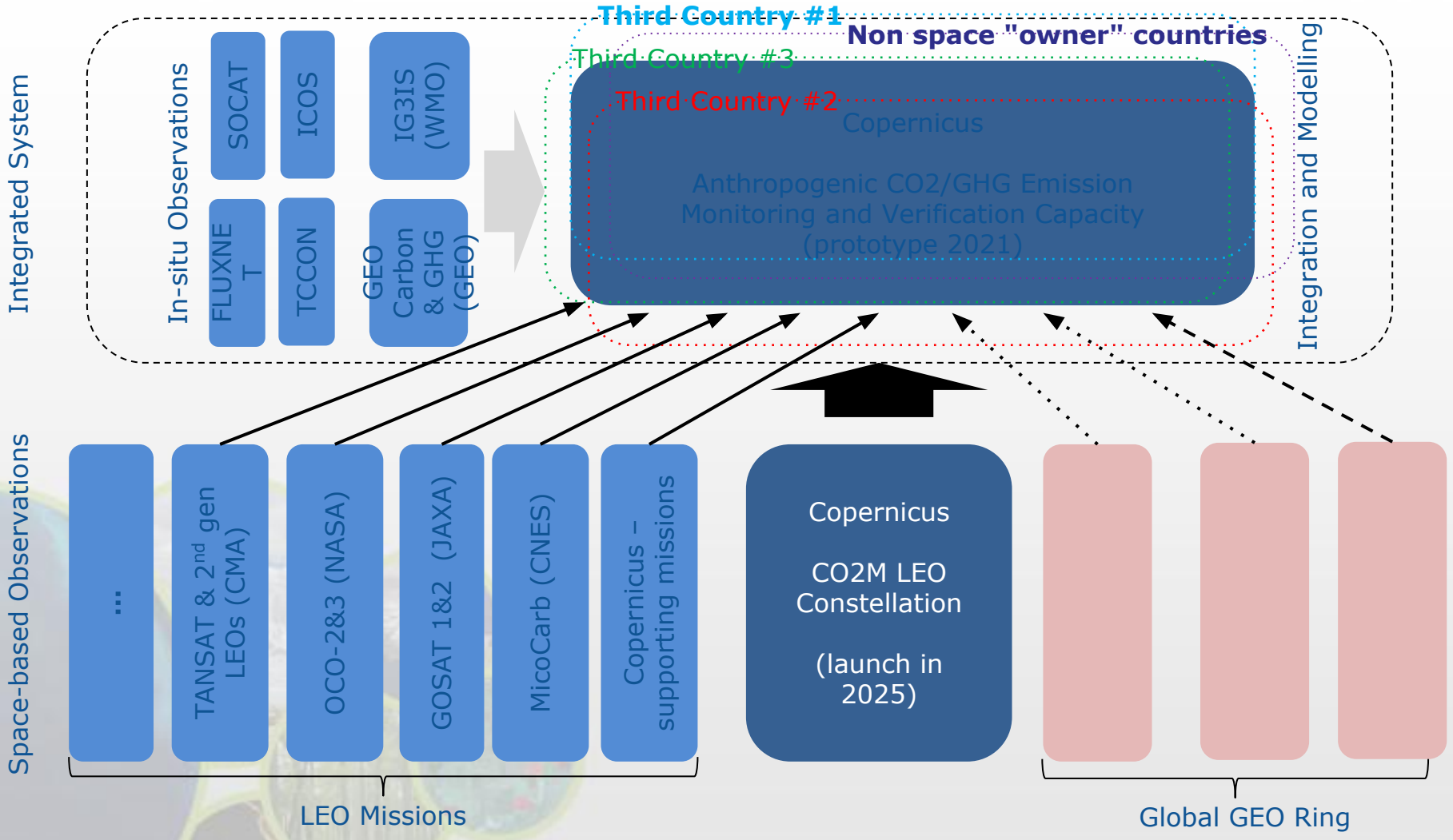
25 – 26 March 2020




Copernicus CO_2 Monitoring Task Force (EC)
Exploratory phase
Implementation/integration phase
Operational phase
Copernicus service in its full operational capacity with CO_2M Sentinel constellation data (ECMWF)
CO_2
CO_2
CO_2
2015
2016
2018
2020
2022
2024
2026
2028
2030
Paris Agreement
inventories year 2021
1st global stocktake
inventories year 2026
2nd global stocktake
MRD 1.0
MRD 2.0
Prototyping activities including relevant CO_2 satellites from China, Japan, USA & others (ECMWF)
Contribution to the 2nd global stocktake
Assessment of emissions at national/regional and annual/sub-annual resolutions
EO Science data available from the CO_2M Sentinel constellation (ESA & EUMETSAT)
Develop the space ground segment (EUMETSAT)
Develop the CO_2M Sentinel constellation (ESA)
R&D Support Actions (EC, ESA & EUMETSAT)


Decision Support System
Synthesis & assessment
Global Stocktake
Actionable measures for country and city
Observations
Satellite CO_2
Sentinel & Virtual Constellations
In situ CO_2 networks
ground&airborne measurements
Auxiliary information NO_2, CO, Nightlights, Meteorology
Prior Information
Emissions, Model parameters, Fluxes
inventory reports, economy statistics
Integration & Attribution
Coupled data assimilation
& uncertainties
Earth system models
(Atmosphere, C cycle, Land & Ocean, Emissions)
Outputs
Hot-spot fossil fuel emissions
Quantification of power plants, industrial facilities and urban areas
Country & city fossil fuel emissions
reduction of inventory uncertainties, monitoring time series


Integrated System
In-situ Observations
SOCAT
ICOS
IG3IS (WMO)
FLUXNET
TCCON
GEO Carbon & GHG (GEO)
Third Country #1
Non space "owner" countries
Third Country #3
Third Country #2
Copernicus
Anthropogenic CO2/GHG Emission Monitoring and Verification Capacity (prototype 2021)
Integration and Modelling
Space-based Observations
...
TANSAT & 2nd gen LEOs (CMA)
OCO-2&3 (NASA)
GOSAT 1&2 (JAXA)
MicoCarb (CNES)
Copernicus – supporting missions
Copernicus
CO2M LEO Constellation
(launch in 2025)
LEO Missions
Global GEO Ring

Interventions, Q&A

- Note UNFCCC SEC invited to SIT TW side meeting and TW presentation
- Questions for WGClimate or EC?
- On the suggestion of a CEOS AFOLU Roadmap?
- And prospect for Ocean Carbon?
- Do Principals see an opportunity for a significant focus by CEOS on the GST and products for it?
-
- **use sli.do to log comments, suggestions and questions to add to the list**

Add comments and questions on sli.do (#ceos-sit-35) at any time in the session

Committee on Earth Observation Satellites

Carbon & Biomass Session

Future Actions

SIT-35 Virtual Meeting

25-26 March, 2020

Future Actions

- **GCOS**
  - Attend a CEOS meeting?

- **UNFCCC SEC**
  - Follow up invitation to SIT TW
  - National inventory links?

- **Global Stocktake targets**
  - Action re AFOLU (& ocean carbon) roadmap?
  -

- **Biomass Protocol**
  - Protocol finalisation and circulation
  - Work on business case for SIT TW and Plenary?
  -