Welcome!

The meeting is starting soon
Since 2019 Dr Sara Venturini has been leading GEO’s work to advance the use of Earth observations in support of climate action by UN member countries and partners. She has over 12 years’ professional experience collaborating with UN bodies and advising governments and organisations on developing climate change adaptation policies, accessing climate finance, and participating in multilateral negotiations under the United Nations Framework Convention on Climate Change (UNFCCC) and the Intergovernmental Panel on Climate Change (IPCC). As a climate change advisor, she has worked with countries in the Caribbean and Indian Ocean, the Western Balkans, Central Asia, the Middle East, and Europe. She put her scientific expertise at the service of art projects, including the film anthology “Interdependence” that premiered at the Film Festival of Rome in 2019. She holds a PhD in Climate Change Science and Management from Ca’ Foscari University of Venice, Italy.
Day 2: EO for collective ambition on climate
### Day 2: Earth observations for collective ambition on climate

#### Opening of Day 2

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Speaker</th>
<th>Role/Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.00-15.05</td>
<td>Introduction&lt;br&gt; Welcome and recap from Day 1</td>
<td>Sara Venturini</td>
<td>Climate Coordinator, GEO Secretariat</td>
</tr>
</tbody>
</table>

#### Session 1: EO needs towards the global stocktake

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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</tr>
</thead>
<tbody>
<tr>
<td>15.05-15.10</td>
<td>Setting the scene: Role of EO to support the assessment under the global stocktake</td>
<td>Joanna Post</td>
<td>Programme Officer, UNFCCC Secretariat</td>
</tr>
<tr>
<td>15.10-15.15</td>
<td>IPCC assessments and EO gaps/needs in view of the global stocktake</td>
<td>Thelma Krug</td>
<td>Vice-Chair, IPCC&lt;br&gt;TOPC Chair, GCOS</td>
</tr>
<tr>
<td>15.15-15.20</td>
<td>Developing countries’ needs for collective ambition within the REDD+ mechanism</td>
<td>Federica Bietta</td>
<td>Managing Director, Coalition for Rainforest Nations</td>
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</table>
### Day 2: Earth observations for collective ambition on climate

#### Session 2: EO capabilities to support the global stocktake

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
<th>Presenter(s)</th>
</tr>
</thead>
</table>
| 15.20-15.30 (10 min) | Mapping of GHG monitoring capabilities from space | Veronika Neumeier  
Consultant, GEO Secretariat  
Aaron Davitt  
WattTime, ClimateTRACE  
Barbara Ryan  
Executive Director, WGIC |
| 15.30-15.40 (10 min) | Linking EO and the Global Efforts on Emission Reduction and Climate Ambition | David Crisp  
Greenhouse Gas Lead for the CEOS Atmospheric Composition Virtual Constellation (AC-VC), NASA JPL |
| 15.40-15.50 (10 min) | The relevance of high-frequency, global coverage for EO | Andrew Zolli  
Vice President of Global Impact Initiatives, Planet / Carbon Mapper |
| 15.50-16.00 (10 min) | Accelerating methane mitigation from the energy sector through integration of data and beyond | Giulia Ferrini  
Programme Management Officer, Oil & Gas Methane Partnership, IMEO, UNEP  
Manfredi Caltagirone  
Acting Head, IMEO, UNEP |
| 16.00-16.20 (20 min) | Q&A  
Open discussion:  
• How can the broader EO community involving public and private initiatives most effectively support the needs around the global stocktake?  
• Are there any immediate capabilities and how should these be exploited to support the global stocktake? What additional capabilities should be developed? | All speakers  
Moderator: Mark Dowell  
GEO CC-WG Co-Chair, EC JRC |

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Short break
### Day 2: Earth observations for collective ambition on climate

**Session 3: GEO WP activities supporting the global stocktake**

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>16.30-16.40</td>
<td>GEO Blue Planet: global eutrophication indicators and tool</td>
<td>Emily Smail, Co-chair, GEO Blue Planet, NOAA</td>
</tr>
<tr>
<td>16.40-16.50</td>
<td>GFOI: bridging top down and bottom up estimates to drive ambition</td>
<td>Osamu Ochiai, CEOS Lead to GFOI, JAXA</td>
</tr>
<tr>
<td></td>
<td>- An update from GFOI Lead partner CEOS on the delivery of global AFOLU products to support for the GST</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Summary remarks from the Chair of GFOI’s Advisory Group on the importance of country engagement in the GST and reconciling differences with national GHG inventories</td>
<td></td>
</tr>
<tr>
<td>16.50-17.00</td>
<td>GWIS: providing EO data on wildfires for early warning systems at the regional and global scale</td>
<td>Jesús San-Miguel Ayanz, Co-chair, GWIS, EC JRC</td>
</tr>
<tr>
<td>17.00-17.10</td>
<td>GEO Mountains: contributing to global climate impact assessments in mountain areas</td>
<td>Carolina Adler, Co-Lead, GEO Mountains, Executive Director, MRI</td>
</tr>
<tr>
<td>17.10-17.20</td>
<td>GEO BON: Essential Biodiversity Variables contributing to the global assessment of adaptation</td>
<td>Gary Geller, Senior Science System Engineer, GEO BON, NASA JPL</td>
</tr>
<tr>
<td>17.20-17.30</td>
<td>GEO Human Planet: Essential Societal Variables contributing to the global assessment of adaptation</td>
<td>Daniele Ehrlich, Co-Lead, GEO Human Planet, EC JRC</td>
</tr>
<tr>
<td>17.30-17.50</td>
<td>Q&amp;A Open Discussion: How can GEO support the global stocktake with targeted EO-based products? Are there any perceived gaps/synergies in the GEO WP to address the global stocktake? If so, how should these be addressed/exploited?</td>
<td>All speakers, Moderator: Mark Dowell, GEO CC-WG Co-Chair / EC JRC</td>
</tr>
<tr>
<td>17.50-18.00</td>
<td>Wrap-up of Day 2</td>
<td>Sara Venturini, Climate Coordinator, GEO Secretariat</td>
</tr>
</tbody>
</table>
Workshop protocol

• Change your name into ‘Organisation: Name Surname’

• Participants: use the Q&A box for questions

• Speakers: keep within time limits

• Be aware that the meeting will be recorded for workshop report

• Twitter 🐦 #EO4IMPACT and follow @GEOSEC2025
Session 1

EO needs towards the Global Stocktake
Joanna is programme management officer for research and systematic observation and leads the negotiations on this SBSTA agenda item and liaison with the science community. She also leads secretariat support for strengthening ocean-related action and engagement.

Prior to joining the secretariat, she was communications manager for a number of national and international research and educational programmes in both the UK and Germany. She holds a Ph.D. in environmental science from the University of Newcastle Upon Tyne, UK.
Setting the scene: Role of EO to support the assessment under the global stocktake

Joanna Post, UNFCCC Secretariat
22 September 2021
Paris Agreement

**INTERNATIONAL LEVEL**

- Progress reports (BTR) (every 2 y)
  - Limit global warming to +2/1.5°C
  - Enhance adaptive capacity, resilience, and low-emissions development
  - Finance compatible with resilient development and low emissions

**NATIONAL LEVEL**

- National measures (NDC + NAP)
- Revision of national measures
- Recommendations

**Global stocktake (2023 => every 5y)**
Global Stocktake - the What

Paris Agreement Article 14

- Take stock of the implementation of the Paris Agreement
- First GST in 2023 and then every 5 years
- Outcome shall inform Parties in updating and enhancing NDCs and international cooperation for climate action
Global Stocktake - the Themes

Mitigation
- Overall effect of NDCs
- State of GHG emissions and removals and mitigation efforts undertaken by Parties

Adaptation
- Observed and projected risks
- State of adaptation efforts, support, experiences and priorities

Finance flows and means of implementation and support
- Finance flows and financial support
- Technology
- Capacity-Building

Cross cutting:
- Address the social and economic consequences and impacts of response measures;
- Avert, minimize and address loss and damage associated with the adverse effects of climate change
- Fairness consideration including equity as communicated by Parties in their NDCs
Global Stocktake - the How

Katowice climate package: Decision 19/CMA.1

1. Information collection and preparation
2. Technical assessment
3. Consideration of outputs

Guiding questions for each stage

Revised non-paper by the SB Chairs (September 2021)
Information collection and preparation

1. Update sources of information
2. Technical Assessment
   - TD1
   - TD2
   - TD3
3. Consideration of outputs
   - JCG4
   - High level event(s)

May-June Sessions
- COP26/CMA3
- SB56
- COP27/CMA4
- SB58
- COP28/CMA5

ICP guiding questions
TA guiding questions
CO guiding questions

Call for inputs
Submission of inputs
Webinars

Mitigation, Adaptation, Mol
Considering relevant efforts on RM and L&D

IPCC AR6
- WG I (August 2021)
- WG II (Feb 2022)
- WG III (March 2022)

IPCC AR6 SYR (Sept 2022)

Synthesis reports

Synthesis report
Decision / declaration

in the light of equity and the best available science
Importance of the GST for the EO community and vice versa

- EO is the foundation for action on the Paris Agreement
- Provide input to the GST themes with a pledge and review approach in five year cycles
  - Mitigation – GHG and temperature trends/projections - support to Parties for their GHG monitoring and reporting
  - Adaptation – observed/projected impacts and risks – information/indicators for and on adaptation to measure progress
  - MOI – state of progress to support developing countries
  - Cross- cutting – support to NDCs/NAPs – information on loss and damage (managing risk)
- Aggregation of information, preparation of a coordinated input – via a synthesis report
  - At Party-level to improve accuracy / detail / identification of how many/who/what
  - At global level to support understanding of where we are and what is possible in the future
  - EO has a large role to play moving forward
- Deadline for inputs February 2022
Thank You!

Joanna Post / 22.09.2021
@drjpost / jpost@unfccc.int
https://unfccc.int/topics/global-stocktake

#EO4Impact
Thelma Krug is a former senior researcher at the National Institute for Space Research (INPE) in Brazil. She was elected Vice-Chair of the Intergovernmental Panel on Climate Change (IPCC) for the Sixth Cycle (October 2015 – October 2022), after having been co-chair of the IPCC Task Force on National GHG Inventories from 2002 until 2015.

Thelma is also the Chair of the Terrestrial Observation Panel for Climate (TOPC) of the Global Climate Observing System (GCOS), set up to develop a balanced and integrated system of in situ, air- and spaceborne observations of the terrestrial domain.

Throughout her career, she has held high-level positions at the Ministry of Science, Technology, Innovation and Communication (MCTIC) and at the Ministry of the Environment (MMA) in Brazil. For more than 15 years she represented Brazil in the negotiations at the United Nations Framework Convention on Climate Change (UNFCCC).

She holds a PhD on Spatial Statistics from the University of Sheffield, UK.
IPCC assessments and EO gaps/needs in view of the global stocktake

Thelma Krug, IPCC Vice-Chair and GCOS TOPC Chair
22 September 2021
Thank You!

#EO4Impact
Ms. Federica Bietta is the Managing Director of the Coalition for Rainforest Nations. Ms. Bietta is an internationally recognized expert in the development of international agreements related to climate change and specific mechanisms that include emissions resulting from tropical deforestation.

She has held a leadership role in the Coalition’s REDD Program since its inception in 2008. Previously, Ms. Bietta was actively involved in the design and implementation of both the Forest Carbon Partnership Facility of the World Bank and the UN-REDD programme. Until December 2012, she led CfRN’s activities within the REDD+ Partnership, serving as this body’s inaugural Co-Chair in 2010. Before joining the CfRN, Ms. Bietta worked for a major European bank and forged professional relationships with Fortune 500 Companies such as: Tyco, General Electric, ADP, AIG and IBM. Raised in Italy, Federica Bietta earned a Bachelor of Science degree in Economics and Finance from the University of Perugia. Ms. Bietta earned MBAs from Columbia Business School and the London Business School.
Developing countries’ needs for collective ambition within the REDD+ mechanism

Federica Bietta, Managing Director of the Coalition for Rainforest Nations
22 September 2021
The Climate Emergency requires nothing short of an emissions nose-dive

- We need to be **Net-Zero emissions** by mid-century
  - That's a **65-90%** reduction by 2050 vs. 2010
  - That's a **50-70%** reduction by 2030

Source: IPCC Special Report 2018
The REDD+ Mechanism has already reduced deforestation at scale

- **90%** of the world’s tropical forest is included in the REDD+ Mechanism
- **60+** countries are actively engaged in the REDD+ Mechanism, submitting goals and updates to the UNFCCC
- Results so far show that **9 bn** tons of carbon emissions were reduced by REDD+ from 2010 to 2018

Source: UN REDD Information Hub
REDD+ Mechanism is not currently capitalized

- >9 Billion tons have been issued since 2006
- Only countries have been able to buy*
- They’ve only purchased 4.5% of what was available

* Purchasers to date have been EU and governments of Denmark, Japan, Luxembourg, Norway, Spain and Switzerland

Source: UNFCCC REDD+ Hub, Verri, Gold Standard, Plan Vivo
Implementation challenges and needs

- We have the Global REDD+ Mechanism which could provide necessary reduction at scale if capitalized
- The Global Stock take must have reliable data
- Countries must have transparent, reliable, consistent and as accurate estimates of their emissions and removals
- Systematic collection of field data to validate satellite information are time consuming and costly
- Enormous amount of Data to be stored for many years to allow comparability is costly
- International cooperation and capacity building is key
CfRN – GEO – INPE - Mozambique Partnership

- CfRN has established a partnership with GEO to explore the use of big Earth Observation data
- Wall-to-Wall maps from 1990 until 2019 are being produced using the latest technology with spatial resolution of 30 meters
- In situ data with the spatial location references are necessary for the application of machine learning methods
- Preliminary results have been presented and currently Mozambique is using the Wall-to-Wall Method vs. Data Cubing for implementing an algorithm with the Collect Earth samples
Thank You!

For more info, please contact: federica@cfrn.org
Session 2

EO capabilities to support the Global Stocktake
Veronika is a Sustainability Professional with over 7 years of work experience in the Caribbean, Asia and Europe, and focuses on Climate Policy, SDG action and public-private collaboration. Veronika is supporting the GEO Secretariat and the Climate Change Working Group as Climate Change Consultant.

She is the Founder of Vision Analytics. She holds a MSc in Geography by FSU Jena, and a MSc in International Management by VU Amsterdam, and worked at the Helmholtz Association for Environmental Research (iDIV), and the World Business Council for Sustainable Development (WBCSD).

Veronika Neumeier
Climate Change Consultant
GEO Secretariat
Aaron is a remote sensing analyst at WattTime, where he identifies remote sensing datasets that can be used to monitor power plants emissions. As part of Climate TRACE, he supports the coalition members with incorporating remote sensing data into their monitoring efforts.

Previously, Aaron earned his Ph.D. degree at the City University of New York, New York, NY, USA. His primary research focused on combining optical-infrared, thermal and microwave satellite remote sensing to inform on crop water-use, stress, and growth of staple- and high-value crops. His other research topics included improved flood monitoring with passive microwave remote sensing and communicating science to the public.
Under Ms. Ryan’s leadership, millions of satellite images have been made publicly available, allowing policy makers to make better-informed decisions on a range of environmental issues. Barbara has held Senior positions with the USGS, WMO, GEO, and is now the Executive Director of the World Geospatial Industry Council (WGIC) – a not-for-profit trade association of private companies working in the geospatial and Earth observation sectors. She serves on several Boards, including the Jane Goodall Institute, Data4Development Insights (D4DInsights), the U.K.-based Ecological Sequestration Trust, the International Center for Remote Sensing and Environment (ISRSE), and chairs the SocioEconomic Data and Applications Center (SEDAC) Working Group and the START Board of Directors for training, education and research for sustainability challenges.
Mapping of GHG Monitoring Capabilities from Space

Veronika Neumeier (GEO Consultant) / Aaron Davitt (WattTime) / Barbara J. Ryan (WGIC)
22 September 2021
Joint Report: GHG Monitoring from Space - a mapping of capabilities across public, private and hybrid missions

- **Outcome of the virtual “Forum on Innovation in Remote Sensing Technologies for accelerated Climate Action”** on 14 December 2020, supported by former U.S. Vice President Al Gore and the UK High-Level Climate Action Champion, Nigel Topping

- **Mapping:** To strengthen the understanding of how Earth Observations can contribute to National GHG Inventories and Global Stocktake, by providing a full picture of currently available and upcoming GHG monitoring capabilities from space, provided by both public and commercial satellite missions

- **Partners:** GEO, World Geospatial Industry Council (WGIC) and WattTime (Climate TRACE)

- **Target audience:** Climate Policy Makers (UNFCCC National Focal Points and delegates), and EO Community

- **Methodology:** Comprehensive database of relevant missions supporting GHG emission monitoring, including commercial efforts
Development of the first systematic database - public, private & hybrid missions for GHG monitoring from Space

*We are presenting preliminary findings, informing the final report.

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### GHG Monitoring from Space - Public, Private and Hybrid Satellite Missions

<table>
<thead>
<tr>
<th>Country</th>
<th>Organisation</th>
<th>Mission</th>
<th>Status</th>
<th>Mission Goal</th>
<th>Scale of Application</th>
<th>Date Access</th>
<th>Further Information</th>
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<tr>
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<td>CSA/S³A/NASA</td>
<td>ScFab 1</td>
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<td>X</td>
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### GHG Monitoring Capabilities Database

**Public Sector Missions**

<table>
<thead>
<tr>
<th>Country</th>
<th>Organization(s)</th>
<th>Mission</th>
<th>GHG observed</th>
<th>Scale of Application</th>
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<td>National, Global</td>
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<td>China</td>
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<td>CO2, CH4</td>
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Day 2 - Session 2: EO capabilities to support the Global Stocktake
Findings

*We are presenting preliminary findings, informing the final report.*
EO Key Message and Inputs

1. **EO from space reduce uncertainty in GHG emission monitoring result**

2. **Public space agencies are collecting national and global baseline data**

3. **Private sector companies are increasingly entering the market with point-source monitoring**

4. **Hybrid models are increasingly emerging and leveraging strengths**

5. **Collaboration, innovation and financing are key levers for GHG monitoring from space**

6. **Open data, open science and open knowledge are essential to drive on-the-ground solutions**

Key messages for review until 1 October 2021: [Link]
Thank You!

Veronika Neumeier / Aaron Davitt / Barbara J Ryan

veronika.neumeier@outlook.com / aaron@watttime.org /
barbara.ryan@wgicouncil.org

#EO4Impact
Dr. David Crisp is an atmospheric physicist at the NASA Jet Propulsion Laboratory (JPL), California Institute of Technology.

Dave was the Principal Investigator of the Orbiting Carbon Observatory (OCO), NASA’s first mission designed to measure atmospheric carbon dioxide (CO₂) with the sensitivity, accuracy, resolution and coverage needed to quantify emissions and removals on regional scales. He is currently serving as the Science Team Leader for NASA’s OCO-2 and OCO-3 missions. He is also a member of the Science Team for the NASA Earth Ventures Geostationary Carbon Cycle Observatory (GeoCarb) and a member of the European Copernicus CO₂ Monitoring (CO2M) Mission Advisory Group.

Dave is serving as the Greenhouse Gas Lead for the Committee on Earth Observation Satellites (CEOS) Atmospheric Composition - Virtual Constellation and a member of the Working Group on Climate Greenhouse Gas Task Team.
Linking EO and the Global Efforts on Emission Reduction and Climate Ambition

David Crisp for the CEOS Atmospheric Composition Virtual Constellation (AC-VC) /Jet Propulsion Laboratory, California Institute of Technology
22 September 2021
Top-down and Bottom-up Methods for Tracking GHGs

- To support the 2023 Global Stocktake (GST), Parties to the Paris Agreement are compiling inventories of greenhouse gas (GHG) emissions and removals to assess progress toward their Nationally Determined Contributions (NDCs) to emission reductions.
  - Bottom-up inventories estimate emissions and removals of GHGs using methods specified in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories.
- GHG emissions and removals can also be estimated from top-down measurements of their concentrations using atmospheric inverse methods.
  - These methods are not as process-specific as bottom-up inventories.
  - Complement bottom-up methods by providing a transparent, integrated constraint on fluxes from all processes on sub-national to global scales.
Carbon stock changes from CO$_2$ Emissions/Removals

In situ (IS) and OCO-2 (LNLG) CO$_2$ data inform the **Net Carbon Exchange (NCE)** between surface and atmosphere.

- NCE can be further subdivided into fossil fuel emissions (FF), lateral carbon fluxes due to rivers, crop, and wood, and changes in carbon land carbon ($\Delta C$):

\[
NCE = FF + River_{lateral} + Crop+Wood_{lateral} + \Delta C
\]

- $\Delta C$ can be compared with bottom-up estimates of carbon stock changes.
CH$_4$ Emissions by Sector and Country

- Satellite based top-down observations can resolve CH$_4$ emissions by sector & Country:
  - Can resolve total emissions for about 58 countries
- Top 5 emitting countries emit about half of all anthropogenic CH$_4$ emissions
  - Consistent with bottom-up inventory data
- Most emissions are from the agricultural sector, primarily livestock

Plots by John Worden and the CMS-Flux Team (NASA/JPL)
The primary objective of these pilot top-down GHG products is to start a conversation with stakeholders and users to establish the utility and best practices for combining bottom-up and top-down methods to enable a more complete and accurate Global Stocktake.
Thank You!

David Crisp / 22 September 2021
David.Crisp@jpl.nasa.gov

#EO4Impact
Andrew Zolli oversees sustainable development and global humanitarian efforts at Planet, an Earth Observation and AI organization that has deployed the largest constellation of Earth-observing satellites in history. He also chairs the company's global AI and data ethics program.

Andrew has served as one of the Exploration Fellows of the National Geographic Society, serves on the International Board of Directors of Human Rights Watch, and is the author of *Resilience: Why Things Bounce Back*, which has been published in more than a dozen languages worldwide.
The Relevance of High-Frequency, Global Coverage for EO

Andrew Zolli
VP Sustainability and Global Impact
Planet
September 22, 2021
Carbon Mapper: accelerating local climate action, globally

LOCATING, QUANTIFYING AND TRACKING METHANE AND CO₂ POINT-SOURCE EMISSIONS FROM AIR AND SPACE
Thank you!

andrew@planet.com
Manfredi Caltagirone leads UNEP work on methane emissions in the energy sector and is acting Head of the International Methane Emissions Observatory (IMEO). In UNEP, he was previously engaged in the establishment and operations of the Climate Technology Centre and Network under the UNFCCC. Prior to joining the UN Environment Programme, Manfredi worked as policy advisor on climate technologies at the Italian Ministry for the Environment. He has been a Research Fellow at the United Nations Foundation and at the Belfer Center for Science and International Affairs at Harvard.

Manfredi holds a J.D. from the II University of Rome, and a Master in Public Administration from the Harvard Kennedy School.
Accelerating methane mitigation from the energy sector through integration of data and beyond
International Methane Emissions Observatory – IMEO

Manfredi Caltagirone, UN Environment Programme
22 September 2021
Accelerating methane emissions reductions requires knowing

1. What is being emitted
2. Where is being emitted
3. How much is being emitted

This is the role of IMEO
How will IMEO answer the methane emissions data problem?

Data flow of the IMEO

- OGMP companies’ assets data
- Science measurements studies
- Satellite data
- National inventories
The Oil & Gas Methane Partnership was launched at the UN Secretary General’s Climate Summit in New York in September 2014.

OGMP 2.0 launched on 23 November 2020

OGMP Timeline

- 6 companies from USA
- Norway and UK joined
- European Commission joined
- 74 companies
OGMP 2.0 will improve methane reporting around the world

- Countries in which OGMP member companies have operated and non-operated assets
- Countries in which OGMP member companies have non-operated assets
Direct measurement studies help better understand where and how much methane is leaking
### Satellites Are Complementary For Tackling Global Methane Emissions

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Dates operational</th>
<th>Grid size (subgrid pixel) (km²)</th>
<th>Swath (km)</th>
<th>Precision (ppbv)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GOSAT</td>
<td>2009</td>
<td>10 km dia., single</td>
<td>Sparse</td>
<td>~8</td>
</tr>
<tr>
<td>GHGSat</td>
<td>2016</td>
<td>0.05 x 0.05</td>
<td>12 x 12</td>
<td>~50</td>
</tr>
<tr>
<td>TROPOMI</td>
<td>2017</td>
<td>7 x 7</td>
<td>2600</td>
<td>~11</td>
</tr>
<tr>
<td>GOSAT-2</td>
<td>2018</td>
<td>10 km dia., single</td>
<td>Sparse</td>
<td>~8</td>
</tr>
<tr>
<td>MethaneSAT</td>
<td>2022</td>
<td>1.4 x 1.4 (&lt; 1 km raw)</td>
<td>200±</td>
<td>2-3*</td>
</tr>
<tr>
<td>GeoCARB</td>
<td>2022</td>
<td>3 x 6</td>
<td>2800</td>
<td>~18</td>
</tr>
<tr>
<td>Carbon Mapper</td>
<td>2023</td>
<td>0.03 x 0.03</td>
<td>18 km</td>
<td>~30</td>
</tr>
</tbody>
</table>

* Gradient measured over 10 – 100 km length scales.
How will IMEO answer the methane emissions data problem?

Data flow of the IMEO

COLLECT DATA
- OGMP companies’ assets data
- Science measurements studies
- National inventories
- Satellite data

Apply Big Data, data science, and machine learning

Reconcile inconsistencies and identify gaps

GENERATE FINAL PRODUCTS
- Full methane emissions dataset
- Annual methane report
- Direct measurement studies
- Science-based implementation support
The International Methane Emissions Observatory will revolutionize the global methane emissions approach.

Each element is necessary, but not sufficient to drive change.

IMEO interconnects activities across the methane ecosystem.
Thank You!

Manfredi Caltagirone / September 22, 2021
@mnfrdcltgrn/ manfredi.caltagirone@un.org

#EO4Impact
Mark Dowell is Senior Scientific Officer and Project Leader for Scientific and Technical Support to the Copernicus Programme at the European Commission’s Joint Research Centre.

His current efforts include incentivizing a scientifically sound and traceable uptake of Copernicus products and Services in European Policy and in the context of International commitments and is a co-chair of the Task Force for the proposed Copernicus Anthropogenic CO2 emission initiative. Mark has a Ph.D. in Oceanography and Earth Science from the University of Southampton (UK) in 1998. He has been engaged for many years with issues at the international level on Earth Observation, firstly as co-lead of a Virtual Constellation in CEOS then as the first Chair on the Working Group on Climate, in this context he also led the initiative established between CEOS, CGMS and WMO on the definition of a global Climate Monitoring Architecture, and currently leads CEOS activities on the CEOS Carbon Strategy and the Greenhouse Gas monitoring Task Team.

Since 2020, Mark is a Co-chair of the GEO Climate Change Working Group.
Open discussion

Guiding questions:

1. How can the broader EO community involving public and private initiatives most effectively support the needs around the global stocktake?

2. Are there any immediate capabilities and how should these be exploited to support the global stocktake? What additional capabilities should be developed?
Short break

See you in 0 minutes
Session 3

GEO Work Programme activities supporting the Global Stocktake
Emily Smail is the Executive Director of the GEO Blue Planet Initiative and a Senior Faculty Specialist at the NOAA-University of Maryland Cooperative Institute for Satellite Earth System Studies.

She specializes in utilizing marine science to support informed decision-making and has 15 years of experience building long-term collaborations with diverse stakeholders, including policymakers, government agencies, and local leaders.

She holds a PhD in marine environmental biology from the University of Southern California and a BS in biology from the Pennsylvania State University.

Contact information: emily.smail@noaa.gov, esmail@geoblueplanet.org
GEO Blue Planet: eutrophication indicators and tools

Emily Smail
GEO Blue Planet/UMD/NOAA/UMD
22 September 2021
Climate Change
A triple threat for the ocean

Burning fossil fuels, deforestation and industrial agriculture release carbon dioxide (CO₂) and other heat-trapping gases into our atmosphere, causing our planet to warm. The ocean has buffered us from the worst impacts of climate change by absorbing more than 90 percent of this excess heat and about 25 percent of the CO₂, but at the cost of causing significant harm to marine ecosystems.

CO₂

> 90% HEAT

> 25% CO₂

WARMER

LESS OXYGEN

MORE ACIDIC

SEA LEVEL

Sea level rise is accelerating, flooding coastal communities and drowning wetland habitats.

BLEACHING

Warmer water coral reefs (marine biodiversity) hotspots could be lost if the planet warms by 2°C (3.6°F).

TOXIC ALGAE

Larger and more frequent blooms are making fish, birds, marine mammals and people sick.

HABITATS

Lower oxygen levels are suffocating some marine animals and shrinking their habitats.

ACIDIFICATION

More-acidic waters harms animals that build shells, such as corals, clams, and oysters.

FISHERIES

Disruptions in fisheries affect the marine food web, local livelihoods, and global food security.

Climate Change
A triple threat for the ocean

Burning fossil fuels, deforestation and industrial agriculture release carbon dioxide ($CO_2$) and other heat-trapping gases into our atmosphere, causing our planet to warm. The ocean has buffered us from the worst impacts of climate change by absorbing more than 90 percent of this excess heat and about 25 percent of the $CO_2$, but at the cost of causing significant harm to marine ecosystems.

- **Warmer**
- **Less Oxygen**
- **More Acidic**

**Source:** IPCC, 2019 Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC)

Eutrophication
**Eutrophication**

1. Agricultural run-off and other pollutants (which contain nutrients) are flushed into the ocean by rains or drainage.

2. These nutrients can cause phytoplankton and algae to grow rapidly on the surface and reduce water quality.

3. Block sunlight

4. Algal bloom + Phytoplankton

5. The algae bloom dies and sinks to the bottom of the shallow ocean. Bacteria decompose this dead organic matter, a process that consumes oxygen.

6. This process leaves the shallow water layer with very little oxygen (a state of hypoxia). This is devastating to the ecosystem and in some cases the zones can become nearly lifeless.

**Coastal Hypoxia**

3. This bloom can block sunlight from penetrating into the water

4. This inhibits photosynthesis of the phytoplankton and other plant life below, killing them.

5. The algae bloom dies and sinks to the bottom of the shallow ocean. Bacteria decompose this dead organic matter, a process that consumes oxygen.

6. This process leaves the shallow water layer with very little oxygen (a state of hypoxia). This is devastating to the ecosystem and in some cases the zones can become nearly lifeless.
Eutrophication and Climate Change

https://edis.ifas.ufl.edu/publication/sg127

Day 2 - Session 3: GEO Work Programme activities supporting the Global Stocktake
Indicator 14.1.1a - Coastal Eutrophication Potential

- Level 1: Global Data Products
  - National contribution to the Index of Coastal Eutrophication Potential
  - Chlorophyll-a deviations and anomalies
- Level 2: Regional & National Data
  - Chlorophyll-a concentrations
  - National modeling of coastal eutrophication potential
  - In-situ concentration of nitrogen, phosphate, and silica
- Level 3: Supplementary Data
  - Other indicators
GEO Blue Planet & Climate Action

- Additional SDG 14 & 13 Interactions
- NDCs & Blue Carbon
- Adaptation Indicators

National Determined Contributions & Blue Carbon

- Coastal wetlands (mangroves, tidal marshes and seagrass meadows) hold large reservoirs of **carbon in biomass** and especially in soils.

- **Blue carbon** can be included as part of the NDCs to reduce GHG emissions.

- **EO** can be used for detection and **mapping** of coastal vegetation.

Total carbon sequestered per hectare habitat (Murray et al. 2011).
Mapping Assets

ENVIRONMENTAL RESEARCH LETTERS

LETTER • OPEN ACCESS

The global distribution of seagrass meadows

To cite this article: Len J McKenzie et al 2020 Environ. Res. Lett. 15 074041

Figure 6. Hypothetical example for mapping the world’s seagrass using hierarchical approach.
Linkage with Eutrophication:

Seagrasses, mangroves, coral reefs, saltmarshes, etc. are negatively impacted by eutrophication.
Eutrophication is bad but Blue Carbon is good – huh?

Blue Carbon
Carbon captured by the world's ocean and coastal ecosystems.

Eutrophication
Algal growth driven by enrichment by an overabundance of nutrients.

Earth Observations can be used to monitor both and other ocean/climate relationships.
Thank You!

Emily Smail / 22 September 2021
@geoblueplanet / esmail@geoblueplanet.org

#EO4Impact
Osamu has experienced for more than 25 years to develop Earth observation satellite data and information system and possesses scientific and technical expertise in JAXA. He has advocated throughout his career the use of satellite EO data in various stakeholders in Japan and internationally.

He had been seconded to the GEO Secretariat totally 7 years as an EO Architecture and Data Expert. He served a co-chair of GEO Programme Board during 2018 and 2019. He also serves the CEOS Lead role for Global Forest Observation Initiative (GFOI) as one of GEO Flagships and a co-Lead for EO4SDG as one of GEO Initiatives.

Osamu is Senior Engineer in Satellite Applications and Operation Center (SAOC), Japan Aerospace Exploration Agency (JAXA), Japan. He also serving Technical Advisor of Ministry Education, Culture, Sports and Science, Technology (MEXT), Japan.

Osamu Ochiai
CEOS Lead to GFOI
Japan Aerospace Exploration Agency
An update from GFOI Lead partner CEOS on the delivery of global AFOLU products to support for the GST

Osamu Ochiai
CEOS Lead for GFOI
Japan Aerospace Exploration Agency (JAXA)
22 September 2021
GFOI and CEOS full support of Climate Actions

- **GFOI**, as a GEO Flagship, to coordinate international support to developing countries on forest monitoring and GHG accounting for the purposes of REDD+ and related forums.

- **CEOS**, as a co-lead for GFOI, to provide Space-based data to meet the needs of GFOI providing consistent satellite observations and Analysis Ready Data and Tools.

- CEOS new challenge to support Paris Global Stocktake process have started with GHG and AFOLU areas.
# EO Land Monitoring Satellites

<table>
<thead>
<tr>
<th>Epoch</th>
<th>Radar</th>
<th>Optical</th>
<th>Lidar</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990s</td>
<td>JERS SAR</td>
<td>Sentinel-1</td>
<td>ICESAT-GLAS</td>
</tr>
<tr>
<td></td>
<td>ERS 1/2 SAR</td>
<td>MODIS</td>
<td>ICESAT-2</td>
</tr>
<tr>
<td></td>
<td>ALOS PALSAR</td>
<td>ALOS-2 PALSAR</td>
<td>MOLI</td>
</tr>
<tr>
<td></td>
<td>ENVISAT ASAR</td>
<td>PALSAR-2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TERRA-SAR</td>
<td>HRVS SAR</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TANDEM-X</td>
<td>Sentinel-2</td>
<td></td>
</tr>
<tr>
<td>2000-2018</td>
<td>ALOS-1 SAR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2018-2020</td>
<td>SAOCOM</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NOVASAR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ALOS-2 PALSAR</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PALSAR-3</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>BIOMASS</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>NISAR-L/S</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TANDEM-L</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2021 onwards</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**INTEGRATING FRAMEWORK**

- Forest: Extent and Change
- Agriculture
- Biomass
- Wetland
- Other land uses

---

Day 2 - Session 3: GEO Work Programme activities supporting the Global Stocktake
Many Upcoming Missions will Provide Data Used to Map Biomass

<table>
<thead>
<tr>
<th>Product</th>
<th>Data Type</th>
<th>Missions</th>
<th>Years represented</th>
<th>Spatial Resolution</th>
<th>Spatial Domain</th>
<th>Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>GLOBIOMASS</td>
<td>SAR, lidar</td>
<td>ALOS, ENVISAT, ICESat GLAS</td>
<td>2010</td>
<td>100-m</td>
<td>Global</td>
<td>Available now</td>
</tr>
<tr>
<td>GEOCARBON</td>
<td>Fusion of other products</td>
<td>Inputs to other products (lidar, SAR, Optical)</td>
<td>~2010</td>
<td>0.01°</td>
<td>Global</td>
<td>Available now</td>
</tr>
<tr>
<td>NASA JPL</td>
<td>Lidar, SAR</td>
<td>GLAS, ALOS</td>
<td>2015</td>
<td>10-km</td>
<td>Global</td>
<td>Available now</td>
</tr>
<tr>
<td>CCI Biomass</td>
<td>SAR and Optical</td>
<td>ALOS, Sentinel-1</td>
<td>2017, 2018</td>
<td>100-m</td>
<td>Global</td>
<td>Available now</td>
</tr>
<tr>
<td>NASA JPL</td>
<td>Lidar, SAR and optical</td>
<td>GEDI, ALOS-2</td>
<td>2020</td>
<td>10-km</td>
<td>Global</td>
<td>Available Q4 2021</td>
</tr>
<tr>
<td>NCEO Africa</td>
<td>Lidar, SAR, Optical</td>
<td>GEDI, ALOS-2, Landsat</td>
<td>2007 - 2017</td>
<td>100-m</td>
<td>Africa</td>
<td>Available now</td>
</tr>
<tr>
<td>CCI Biomass</td>
<td>Lidar, SAR and optical</td>
<td>ALOS, Sentinel-1, GEDI, ICESat-2</td>
<td>2020</td>
<td>100-m</td>
<td>Global</td>
<td>Available Q4 2021</td>
</tr>
<tr>
<td>NASA GEDI mission Product</td>
<td>Lidar</td>
<td>GEDI</td>
<td>2019-2021</td>
<td>1-km</td>
<td>+/- ~51.6° latitude</td>
<td>Available Q4 2021</td>
</tr>
<tr>
<td>NASA ICESat-2 boreal product</td>
<td>Lidar</td>
<td>ICESat-2, Landsat</td>
<td>2019-2021</td>
<td>30-m</td>
<td>Boreal (50-75° N)</td>
<td>Available Q4 2021</td>
</tr>
</tbody>
</table>
Intercomparison, validation and harmonization of these products to increase product improvement and uptake. Open science activity using new 2020 products and available reference data.
CEOS Biomass Protocol Supporting New Activities

Linked, complementary activities

CEOS AFOLU Biomass Harmonization
Land Cover Datasets

- **ESA WorldCover**

- **CCI**

- **Copernicus**

- **HILDA+**
OLU – Mangroves & Wetlands

Mangroves (Forest / OLU-Wetlands)

Activity Data – Global Mangrove Watch (JAXA K&C)
Global maps of mangrove area and annual changes at 25 m derived from L-band SAR and optical data. Open access in public domain.
Official UNEP SDG 6.6.1 mangrove dataset.

Emission Factors - LCLUC Global Mangrove Mapping (NASA JPL/GSFC)
Global maps of mangrove Height, AGB and Total Biomass at 30 m. Open access in public domain.
Baseline year 2000 derived from SRTM DEM.
New 2015 baseline at 12 m from TanDEM-X DEM available for GST1.
Agriculture

Available for COP26:
- All maps for 1 year for 5 countries
  - Argentina, Spain, France, Ukraine and Tanzania
  - Spatial resolution: 10 m

Available for Q3 2022:
- Global products
- Global system to produce the maps
### Space based datasets for AFOLU

<table>
<thead>
<tr>
<th></th>
<th>COP-26 (Nov 2021)</th>
<th>GST1 (2021-23?)</th>
<th>Beyond (2024+)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Forest - Above Ground Biomass</strong></td>
<td><strong>Synthesised biomass product providing estimates at a jurisdictional level globally</strong> Fall back is individual existing datasets</td>
<td><strong>Synthesized, jurisdictional level biomass, emission factors (and prototype biomass change)</strong></td>
<td><strong>Synthesized spatially explicit, annual biomass, emission factors and biomass change</strong></td>
<td><strong>Work plan and schedule provided</strong></td>
</tr>
<tr>
<td><strong>Land Cover &amp; Forest (Area)</strong></td>
<td><strong>- Copernicus annual global land cover</strong> <strong>- C3S/CCI Land Cover</strong> <strong>- WorldCover, HILDA+</strong> <strong>- Global Forest Watch tree cover loss and forest fluxes</strong></td>
<td><strong>Synthesised map products and estimates of land cover and change at regional, and global levels</strong> Global tree cover and forest emissions and removals</td>
<td><strong>Statistically robust activity data estimates (6 IPCC classes) at national and global levels</strong> Global annual forest emissions and removals at 30-100 m resolution.</td>
<td><strong>GOFC-GOLD coordination proposed</strong></td>
</tr>
<tr>
<td><strong>Agriculture</strong></td>
<td><strong>Demonstration WorldCereal products for at least 5 countries (Argentina, Spain, France, Ukraine and Tanzania)</strong></td>
<td><strong>Initial WorldCereal map and analytical system. On-going seasonal analysis products</strong></td>
<td><strong>Continual system improvement and production of seasonal state and change products</strong></td>
<td><strong>In coordination with GEOGLAM</strong></td>
</tr>
</tbody>
</table>

*Indicates off the shelf datasets possible. Indicates additional resources needed.*
National Inventory Test User Group

Country engagement: Improve understanding and uptake of EO data: AFOLU and Biomass

- Two objectives:
  i) demonstrations of earth observations uptake
  ii) contribution of NFI data for product validation
- Update on the CEOS AFOLU engagement with countries
- Demonstrate how earth observations and global datasets (land cover and biomass) are used by countries for monitoring and reporting purposes at the COP-26
- Dialogue with 10 countries has been initiated: Cambodia, Colombia, Ethiopia, Guatemala, Madagascar, Mexico, Paraguay, Peru, Solomon Islands, Zambia
Discussion

- Links with GFOI and GEO-GLAM are already strong
- Country engagement with GFOI/SilvaCarbon
- Potential linkage with other Land related Initiatives e.g., GEO-BON, GEO-Wetland, GEO-LDN, ... and the GEO Climate WG.
  - Interesting to use/develop the space based AFOLU datasets?
  - Interesting to engage with your stakeholders with the datasets?
Thank You!

Osamu Ochiai / 22 September 2021
Ochiai.osamu@jaxa.jp

#EO4Impact
María J Sanz has more than 25 years of experience on climate change and land use sector. She was Senior Programme Officer and Team Leader, Sectoral Issues Unit of the Methods, Data and Analysis Programme, UNFCCC Secretariat and Coordinator of the UNREDD Programme MRV team at the Forestry Department in FAO; at present Scientific Director of the Basque Centre for Climate Change (BC3).

She was Lead Author of the IPCC 5ARs; Review Editor of the IPCC SR Climate Change and Land; Lead Author of the 2003 IPCC GPG, the 2006 IPCC GL and the 2014 IPCC Kyoto Supplement, Review Editor of the IPCC 2014 Wetland Supplement, and Coordinating Lead Author for the IPCC 2019 Refinement of the 2006 GL for GHG Inventories. Member of the Emission Factor Database of the IPCC Task Force GHG Inventories (2006-2007, 2016-present).

At present, she is the Chair of the Advisory Group of the MDG of the Global Forest Observation Initiative (GFOI) and co-Chair of the Transdisciplinary Advisory Board of the EU Joint Programme Initiative (JPI) on Climate.

María J. Sanz
Chair of the AG of the MDG, GFOI
Basque Centre for Climate Change
Importance of country engagement

María J. Sanz, Basque Centre for Climate Change (BC3)
Advisory Group of MGD Component, GFOI
22 September 2021
Information to be provided to countries in ND communication and
Inputs to the Global Stocktake (GST):

a) **Aggregated countries’ GHG data**, including GHG inventories (for the historical part) and NDCs (for the forward-looking part)

b) IPCC AR6 and other scientific data

These inputs will be compared to assess the “gap” toward the 2°C trajectory:
Multiple inputs…
….Not necessary comparable
Harmonization is happening naturally … But needs to be reinforced

- IPCC ARs and SRs
- IPCC GLs
- Transparency Framework NDCs
- Country experts
- Scientist of different MR aspects
- Earth Observation Scientist

Graph showing connections between these elements.
Towards constructive GST

- Clarify what forest-related emissions and removals are (and are not) included in national reporting, in particular through GHGIs;
- Compare national reporting to independent scientific studies, and provide an explanation of why and how they differ;
- Additional transparency could improve understanding of the role of forests in the global carbon budget, both from bottom up and top down.

In summary

A better collective understanding of the forest-related information available to assess progress toward delivering on the goals of the Paris Agreement, as well as potential improvements in country-level reporting.
Thank You!
Jesus San-Miguel-Ayanz is a senior researcher at the Joint Research Centre of the European Commission in Ispra, Italy. He received his PhD (1993) and MSc (1989) by the University of California-Berkeley, Berkeley, California, U.S.A. and his Forest Engineering Degree (1987) by Polytechnic University, Madrid, Spain. His research focuses on the use of remote sensing and geographic information systems in forestry and the development of early warning and monitoring systems for wildfires.

He leads the operation and further development of the European Forest Fire Information System (EFFIS) in pan-European region and the development of the Global Wildfire Information System (GWIS), under the umbrella of the Group on Earth Observations (GEO) and the EU Copernicus Programs. He has a long record of scientific research and policy support publications, some of them available at: https://www.researchgate.net/profile/J_San-Miguel-Ayanz

Jesús San-Miguel-Ayanz
Senior Researcher
European Commission JRC
GWIS Lead
Global Wildfire Information System (GWIS)

providing EO data on wildfires for early warning systems at the regional and global scale

Jesús San-Miguel, Tomas Artes & Duarte Oom
European Commission Joint Research Centre
22 September 2021
Seasonal Trends – Brazil: Weekly analysis of damage to landcover, protected areas, burnt areas, active fires, fire danger, fire emissions

GWIS: Historical analysis of wildfire regimes and impact: Analysis of burnt areas, number of fires, fire size, seasonality, fire emissions, damage to protected areas, land cover damage (e.g. Australia)
GWIS: Historical analysis of wildfire regimes and impact: Analysis of burnt areas, number of fires, fire size, seasonality, fire emissions, damage to protected areas, land cover damage (e.g. Australia)
The European Union (EU) and Latin America and the Caribbean (LAC) have a longstanding relationship based on common values and established on a legal framework with most of the 33 countries through association and trade agreements, and political and cooperation dialogues.

Both regions collaborate in numerous international fora to tackle global challenges, such as the United Nations (UN) in the context of the 2030 Agenda for Sustainable Development cooperation, or the fight against climate change through the Paris Agreement.

**Regional Achievements**

In the pan-European region, the EU, through its Joint Research Centre (JRC) - a science and knowledge centre that provides scientific advice and supports EU policies - has a wide long-term expertise on facing global challenges, such as wildfires. JRC, in collaboration with other organisations, supports joint efforts towards sustainable fire management in the region.

**Collaboration on wildfire management between the EU and Latin America and the Caribbean region**

General Objectives

• (1) Reduce the impact of wildfires in the Amazon region and neighboring countries through cooperation with LAC countries and regional organizations (ACTO, Leticia Pact, UNEP, FAO, UNDRR, etc.) by providing evidence for policies.

• (2) Share the experience of the EC on the establishment of the Expert Group on Forest Fires (EGFF)\(^1\) and the development of wildfire early warning and monitoring systems in the pan-European region (i.e. European Forest Fire Information System)\(^2\) using the Global Wildfire Information System in the LAC region.

• (3) Establish a common base of information on wildfires using GWIS and support data harmonization in the region to support cooperation with fire management services in the countries and organizations operating in the region, e.g. FAO, ACTO, Leticia Pact, UNEP, etc.

\(^1\) Group made of fire managers from Ministries of Environment, Agriculture or Civil Protection from 43 countries in Europe, Middle East and North Africa.

\(^2\) European Forest Fire Information System (EFFIS), developed by JRC and currently operating under the EU Copernicus Regulation.
Thank You!

Jesús San-Miguel-Ayanz / 22 September 2021

jrc-effis@jrc.ec.europa.eu

#EO4Impact

Additional info at:

https://gwis.jrc.ec.europa.eu

Carolina Adler is an Environmental Scientist and Geographer with an international career spanning over 25 years in both research and practice in the public and private sectors. As the current Executive Director of the Mountain Research Initiative (MRI), a GEO Participating Organization, she is tasked with overseeing the work of the MRI Coordination Office, as well as connecting, coordinating, and promoting global change research and supporting regional and thematic networked collaborations in mountains worldwide. Adler is also Co-Lead for the GEO Work Programme Initiative “Global Network on Observations and Information in Mountain Environments” (GEO Mountains).

Adler is a Lead Author for the chapter “High Mountain Areas” of the Intergovernmental Panel on Climate Change (IPCC) Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC), approved in September 2019, as well as Lead Author for the IPCC Working Group (WG) II contribution on Impacts, Vulnerability, and Adaptation and Co-Lead for the Cross-Chapter Paper on Mountains for the Sixth Assessment Report (AR6), expected in February 2022 at the WGII contribution to AR6 approval session by the Panel.
GEO Mountains seeks to connect, collect, and make accessible transboundary and inter- and transdisciplinary data and information – from a variety of providers, including research and mountain observation networks – pertaining to environmental, ecological, and societal change in mountainous regions globally. In so doing, the ease with which the scientific research community, local, national, and regional decision makers, and other interested parties can access and use such data and information will be greatly enhanced.

www.geomountains.org/
IPCC Reports in the Sixth Assessment Cycle

- SR Global warming of 1.5 °C (SR15) - Sept. 2018
- SR Oceans & Cryosphere (SRCCC) - Sept. 2019
- WGI: The Physical Science Basis - April 2021 (tbc)
- WGI: Climate Change Impacts, Adaptation and Vulnerability - October 2021 (Early 2022 tbc)
- The Synthesis Report - April 2022 (tbc)
- SR Climate Change and Land (SRCCL) - Aug. 2019
- WGII: Mitigation of Climate Change - September 2021 (Early 2022 tbc)

IPCC Special Reports

IPCC Main Working Group Reports
NEW: Cross-Chapter Papers (CCP)

- Biodiversity hotspots (land, coasts and oceans)
- Cities and settlements by the sea
- Deserts, semi-arid areas, and desertification
- Mediterranean region
  - Mountains
- Polar regions
- Tropical forests

- Expanded treatment of particular systems or regions
- Integrative across chapters
- Allow updates since the Special Reports
- Follow broad scheme and structure of chapters
- Same audience as chapters
- Need to develop high level policy-relevant messages
Reflections based on experiences in AR6

Thornton et al. (in prep.) “A reproducible analysis of human populations in the world’s mountains: spatio-temporal patterns and topo-climatic controls”.

Day 2 - Session 3: GEO Work Programme activities supporting the Global Stocktake
Reflections based on experiences in AR6

**EO needs that should be prioritized and addressed by specific EO products in view of the Global Stocktake:**

- **Focus not only on the products as ends in themselves, but also on the key processes and ‘facilitators’ that help bring about those products.** Recognise the valuable function that (coordinating) networks fulfil in connecting individuals, initiatives, data, and information that may otherwise remain scattered and underutilised, and for helping to translate and turn these ‘products’ into actionable knowledge.

- **Credibility in the substance.** Assessment relevant inputs need to be based on data, information, and analyses that are transparent and reproducible in their methods – including data disaggregated/aggregated at the relevant scales. Consistent with GEO Open EO Data statement, it is important to support open and reproducible research that follow FAIR principles (findable, accessible, interoperable, and reusable), and that allow for understanding, verification, and reuse by others in new contexts. The same applies for important inputs that are to be compiled to inform the Global Stocktake.
Thank You!

Carolina Adler / 22 September 2021
@GEO_Mountains #EO4Mountains / carolina.adler@unibe.ch

#EO4Impact
Gary has a Ph.D. in biology from the University of California, Los Angeles, where his research focused on the interaction of plants with their environment by modeling plant architectures. At NASA/JPL he combines that experience with system engineering principles and applications.

He has worked with the NASA Ecological Forecasting program for the last 15 years, including two years seconded to the Group on Earth Observations in Geneva as the Expert in Biodiversity and Ecosystem Sustainability. He has been closely involved with GEO BON since its beginning around 2008 as a member of the Steering and Management Committees and as co-lead for the Ecosystem Structure Working Group.
GEO BON Essential Biodiversity Variables

Gary Geller
NASA Jet Propulsion Laboratory
California Institute of Technology
22 September 2021
GEO BON Overview

Improve the acquisition, coordination and delivery of biodiversity observations and related services to decision makers and the scientific community.

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Current BON coverage
What are Essential Biodiversity Variables?

Set of measurements to capture the major dimensions of biodiversity and how it is changing

EBVs are:
- Biological
- State variables
- Sensitive to change
- Scalable
- Feasible
- Ecosystem agnostic
EBV Workflow

Navarro et al. 2017
## Example EBVs

<table>
<thead>
<tr>
<th>Class</th>
<th>Example EBV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic Composition</td>
<td>Genetic diversity</td>
</tr>
<tr>
<td><strong>Species Populations</strong></td>
<td>Species distribution</td>
</tr>
<tr>
<td></td>
<td>Species abundance</td>
</tr>
<tr>
<td>Species Traits</td>
<td>Phenology</td>
</tr>
<tr>
<td>Community Composition</td>
<td>Taxonomic diversity</td>
</tr>
<tr>
<td><strong>Ecosystem Structure</strong></td>
<td>Ecosystem distribution</td>
</tr>
<tr>
<td><strong>Ecosystem Function</strong></td>
<td>Primary productivity</td>
</tr>
<tr>
<td></td>
<td>Functional Diversity</td>
</tr>
</tbody>
</table>

Note: Essential Ecosystem Service Variables have also been identified
Adaptation

How do we moderate harm to ecosystems and the biodiversity they support?

1) Active management
2) Reduce other stressors, e.g.,
   • Land conversion
   • Invasive species
   • Resource extraction
   • Pollution
Adaptation: A two-way street

Adaptation for biodiversity…or biodiversity for societal adaptation?

1. Ecosystem goods and services
   - Sustainable and resilient ecosystem

2. Resilient society in face of climate change or other threats
   - Sustainable and adaptive management

Locatelli et al. 2010

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Current EBV Status

- Not fully “operationalized”
- EBV definitions
  - Completed last year
- “Production”
  - Ad hoc: no central facility
  - Workflows under development
- Downloads
  - https://portal.geobon.org/
Thank You!
We welcome your thoughts & feedback

Gary Geller / 22 September 2021
gary.n.geller@jpl.nasa.gov

https://geobon.org/
#EO4Impact
Daniele Ehrlich is a Project Officer with the Joint Research Centre (JRC) and member of the Global Human Settlement Project. He co-ordinates activities within the GEO Human Planet Initiative (HPI). He focuses on analyzing spatial urbanization patterns for use in local, regional and global sustainability assessments, in disaster risk assessments and climate adaptation. He promotes HPI data across thematic areas, targeting the scientific community as well as the community of practitioners. He is also a member of the GEO Disaster Risk Working Group.

The GEO Human Planet Initiative (HPI) generates datasets, knowledge and indicators used by practitioners, decision makers and scientists. The Initiative focuses on essential societal variables (ESV)- including population and settlements. ESV datasets are used to monitor urbanization, respond to crises, measure progress towards the Sustainable Development Goals (SDGs), and design adaptation strategies for climate change.
GEO Human Planet: Essential Societal Variables contributing to the global assessment of adaptation

Daniele Ehrlich on behalf of Human Planet Initiative
European Commission, Joint Research Centre
22 September 2021
Essential societal variables

- Global, Open, Consistent

- Global enumeration of cities and settlements and their growth

- Cities of the world and change in population over time
Exposure and Vulnerable communities

Settlements in low elevated coastal areas

Population exposure to Tropical Cyclones

Arctic
Stocks and flows

**In-flow**
- Energy
- Materials
- Food
- ...

**Out-flow**
- Waste
- Emissions
- ...

**Stocks - Materials**

**Flows: Emissions**
- CO2 emissions 1970
- CO2 emissions 2015

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HPI works and continues to develop key societal and demographic variables that are essential to understand and model future societies and the climate.

Future population

Demographics (Education, fertility, consumption patterns)

Impact Future Climates

Exposure

Vulnerabilities

Socio-economic pathways

Regional Pathways

Urbanization
Thank You!

Daniele Ehrlich / 22 September 2021
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#EO4Impact
Mark Dowell is Senior Scientific Officer and Project Leader for Scientific and Technical Support to the Copernicus Programme at the European Commission’s Joint Research Centre. His current efforts include incentivizing a scientifically sound and traceable uptake of Copernicus products and Services in European Policy and in the context of International commitments and is a co-chair of the Task Force for the proposed Copernicus Anthropogenic CO2 emission initiative. Mark has a Ph.D. in Oceanography and Earth Science from the University of Southampton (UK) in 1998. He has been engaged for many years with issues at the international level on Earth Observation, firstly as co-lead of a Virtual Constellation in CEOS then as the first Chair on the Working Group on Climate, in this context he also led the initiative established between CEOS, CGMS and WMO on the definition of a global Climate Monitoring Architecture, and currently leads CEOS activities on the CEOS Carbon Strategy and the Greenhouse Gas monitoring Task Team. Since 2020, Mark is a Co-chair of the GEO Climate Change Working Group.
Open discussion

Guiding questions:

1. How can GEO support the global stocktake with targeted EO-based products?

2. Are there any perceived gaps/synergies in the GEO WP to address the global stocktake? If so, how should these be addressed / exploited?
Wrap-up

End of Day 2