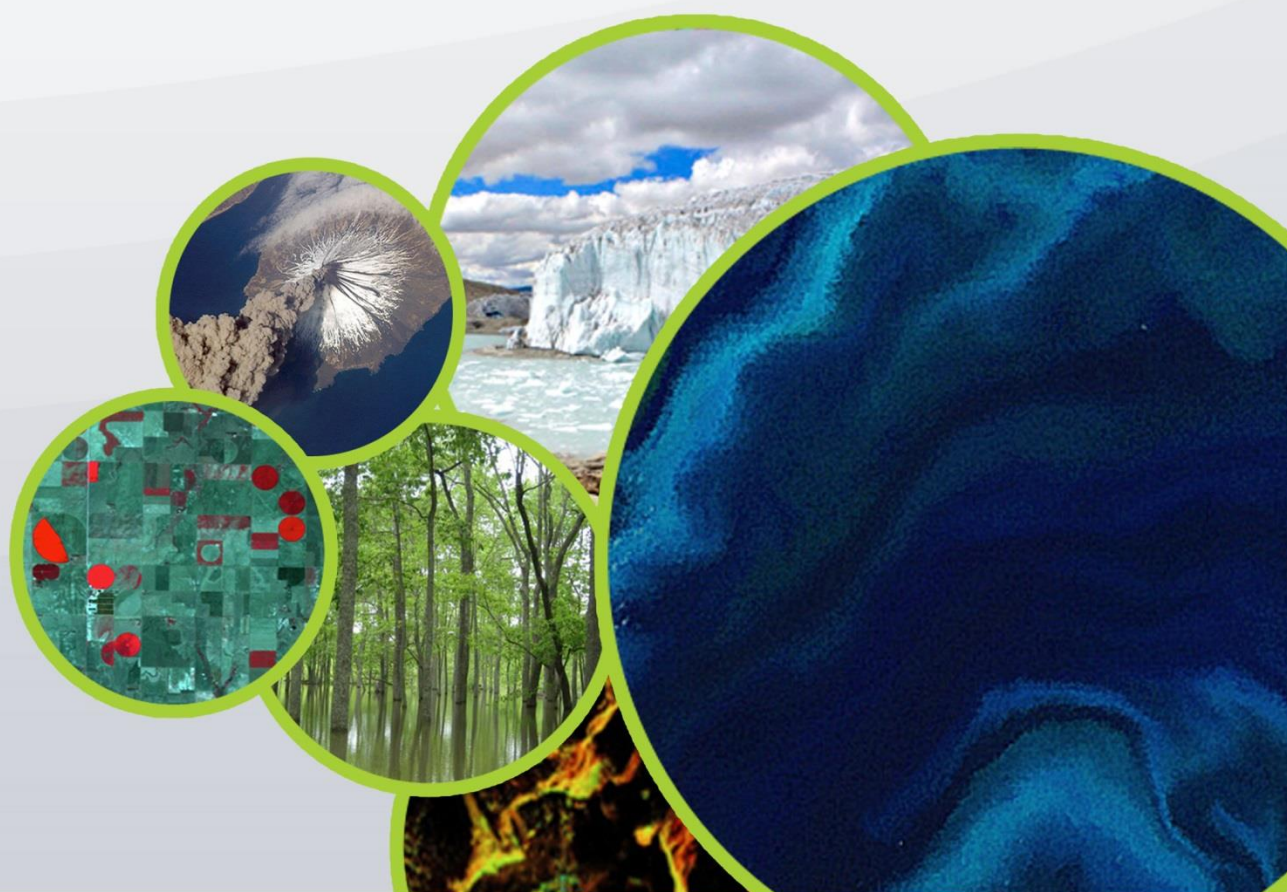# CEOS

Committee on Earth Observation Satellites

Working Group on Capacity Building and Data Democracy 9th Annual Meeting

March 10-12, 2020 (conducted virtually)

Meeting Report

April 2020

Contents

Executive summary

With the increasing availability of free and open data and the growing accessibility of operational applications, the demand for capacity building related to Earth observation (EO) is higher than ever. Global coordination and collaboration are critical to maximizing human and financial resources, leveraging lessons learned into best practices, and sustaining capacity.

Within this context, the CEOS Working Group on Capacity Building and Data Democracy (WGCapD) met virtually for its 9th annual meeting on March 10-12, 2020. Under the theme of *Identifying Opportunities for Synergies and Innovation,* participants made significant progress in assessing milestones to date, advancing collaboration on ongoing and future activities, and identifying opportunities to synergize priority technical areas.

The WGCapD-9 agenda and all presentations are available at http://ceos.org/meetings/wgcapd-9/

WGCapD-9 featured three main plenary sessions focused respectively on innovation, partnerships, and data democracy, as well as four region-specific sessions and coordinating consultations with five other CEOS bodies. This year's meeting was hosted by the National Aeronautics and Space Administration (NASA) through the current WGCapD chair, Nancy Searby. Some 57 people from 23 agencies and 19 countries participated over the course of the three days, including multiple agencies that participated for the first time.

Originally planned to take place in Sunnyvale, California with some virtual participation, the meeting was reconfigured in early March as a fully virtual gathering due to concerns over the COVID-19 pandemic.

Several WGCapD-9 participants share a goodbye at the end of the meeting.

Key take-aways

Strategic priorities

- **Addressing the growing use of cloud computing in WGCapD's strategic approach to capacity building:** As the amount of free and open data continues to grow, and cloud-based hosting and computation become the norm, WGCapD members may need to revise, adapt, or re-orient capacity building efforts to build skills related to cloud-based services and ensure their relevance to younger users seeking cutting edge, marketable skills. One specific tactic might be the use of interfaces to integrate education platforms with cloud processing platforms, e.g. Jupyter notebooks. Going forward, it will be important to ensure that datasets from various agencies can be easily combined across cloud providers.

- **Increased action in support of global development strategies and plans including the Sustainable Development Goals (SDGs) and the Sendai Framework for Disaster Risk Reduction, among others:** Through collaboration with WGCapD members, the developing Space Capacity Development Advisory Board (SCDAB) and other CEOS bodies (e.g., the working groups and the Ad Hoc Team on the SDGs (AHT-SDG), WGCapD can play a catalytic role in supporting the use of EO in mitigating global challenges. SGDs of particular interest include: 2 (Zero Hunger), 5 (Gender Equality), 7 (Affordable and Clean Energy), and 11 (Sustainable Cities and Communities), with a possible link to 4 (Quality Education). One immediate opportunity is collaboration on EO College's efforts, through EO Connect, on a new MOOC titled *SDG: Zero Hunger*.

- **Boomers to Zoomers***:* The importance of reaching across generations to engage young people in EO, first articulated by the Canadian Space Agency (CSA), resonated with many meeting participants. Practical ideas on how to do this included:
  - <u>Gamification</u>: CSA currently hosts three online games that use RADARSAT data to playfully inform users about the usefulness of EO Synthetic Aperture Radar (SAR) data. EO College is currently writing a best practice guide on gamification that may help guide WGCapD future activities in this area.
  - <u>Experiential capacity building</u>: NASA DEVELOP has found that hands-on research, internships, and practical experiences help solidify participants' interest in EO.
  - <u>Improved quality and production value of online training</u>: Dynamic, contemporary formats for video and interactive learning platforms are key to capturing the interest of young people.
  - <u>Digital badging</u>: Hearing about VLab's use of digital badging, participants suggested this as an area of interest for WGCapD, seeing it as a vehicle for improving the quality and attractiveness of training, particularly to young professionals eager to build their experience.

Strengthening capacity building methodologies

- **Advancing blended learning**: While many WGCapD members are finding that blended learning is improving training outcomes, there is a need for further research and exchange of best practices to strengthen approaches. WGCapD can play a role in facilitating research on methodologies and best practices, recommending approaches, and implementing a blended learning strategy. Consideration should be given to how these approaches function in low bandwidth environments and when trying to promote EO among targeted audiences, such as youth, women, and Indigenous populations.
- **Improving the quality and production value of E-learning activities**: In line with the points above, WGCapD can support efforts to foster higher quality E-learning products. Captivating formats and overall higher pedagogical value can improve training outcomes and also help attract and retain training participants. One participant suggested hiring a specialist in instructional design who can be shared by a few agencies to renovate WGCapD online training.

Improving coordination and information-sharing

- **Increasing collaboration at regional level**: The representation of 19 different countries at WGCapD-9 underscored the depth of interest in collaborating and coordinating on EO-related capacity building. Participants in the regional sessions suggested that dedication to understanding the capacity building needs of each region and investment in helping coordinate and maximize access to capacity building should be a WGCapD priority going forward. An outcome of the discussions was the suggestion to institute regular regional calls (perhaps quarterly) to foster collaboration.
- **Increased collaboration with other CEOS bodies**: To advance work planning prior to the CEOS Strategic Implementation Team (SIT) technical workshop in September 2020, WGCapD-9 included consultation and planning meetings with five other CEOS bodies. To strengthen collaboration, participants recommended instituting mechanisms, such as quarterly calls, to enable closer collaboration with these bodies on CEOS deliverables.
- **Increased coordination and information-sharing on Massive Open Online Courses (MOOCs)**: there is a need to consolidate information on what MOOCs (and other training resources) are available and in progress. The WGCapD calendar of events and the United Nations Office for Outer Space Affairs (UNOOSA) database of MOOCs can both host information. Course producers searching for a place to host MOOCs can contact EO College for hosting opportunities.

Technical synergies across WGCapD deliverables

- **Metadata standards**: WGCapD is collaborating on the development of metadata standards for learning objects produced within the network. EO College is conducting a related analysis on the needs of the EO education community, with the aim of recommending which standards to use. WGCapD has identified a deliverable to stand up a Metadata Standards Tiger Team to explore and address this.

- **Jupyter notebooks**: These are seen as an important technology for empowering users of all skill levels and making data access more consistent and deliverable. WGCapD support for capacity building, working with WGISS, SEO, and across member agencies, is a priority deliverable going forward.
- **Analysis Ready Data (ARD):** WGCapD can support ARD activities to increase discoverability of data by users through the CEOS ARD for Land (CARD4L) and other ARD capacity building efforts. In collaboration with LSI-VC and SEO, future workshops could promote awareness of the interoperability of CARD4L datasets.

Regional sessions

To foster knowledge-sharing on activities and needs, WGCapD-9 conducted sessions focused on Africa, the Americas, Asia-Oceania and Europe. In an effort to maximize participation, these were held at times convenient to members in the region. Each session featured presentations from WGCapD members in each region, WGCapD members from other regions who are supporting capacity building in the region, and representatives of the regional Group on Earth Observation (GEO) groups (AfriGEO, AmeriGEO, AOGEO, and EuroGEO). Contributions spanned the five continents and included targeted inputs related to capacity building activities in Brazil, China, India, Kenya, Nigeria, South Africa, and Vietnam, among other countries. Anticipated new regional WGCapD deliverables include: training in South Asia, SELPER, Copernicus in Africa, AOGEO webinar, AmeriGEO contribution, and Remote Sensing in Africa. There are an additional 10 national or subnational deliverables being discussed in the content of the next work plan, as well as six regionally focused work plan deliverables. Looking ahead, WGCapD will facilitate the continuation of these discussions by convening periodic regional capacity building coordination calls.

Consultations with other CEOS bodies

To advance work planning prior to the CEOS SIT technical workshop in September 2020, WGCapD-9 included consultation and planning meetings with five other CEOS bodies. These included the: Working Group on Disasters (WGD), Working Group on Information Systems and Services (WGISS), NASA Systems Engineering Office (SEO), AHT-SDG and Land Satellite Imaging Virtual Constellation (LSI-VC). The aim was to review progress on current deliverables and identify priorities going forward. An outcome of these consultations was a shared desire for closer collaboration, including recommended regular calls on CEOS deliverables and topics of mutual interest. Priority areas noted for future deliverables included: COVE and CARD4L webinars (with LSI-VC), Jupyter notebooks webinar (with WGISS and SEO) and a webinar on the SDG Goal 11 indicator 11.3.1 (with AHT-SDG). Looking ahead, WGCapD will participate in the other working groups' annual meetings and help facilitate conversations on shared interests.

Work planning and next steps

A key outcome of the week was brainstorming on deliverables for the next WGCapD work plan. Based on information shared during the annual meeting, the WGCapD Secretariat will continue coordination to organize ideas for deliverables into the existing deliverable idea spreadsheet and facilitate discussion and refinement on subsequent monthly calls. Other deliverable-related next steps include:

- WGCapD members will review the list of deliverables carried over from the previous work plan and identify modifications needed
- Discussion will continue around ideas and topics discussed in the WGCapD-9 meeting to see if additional deliverables should be added to the present year's work plan
- Create a shared list of the MOOCs and other training resources that are being developed / in progress to facilitate coordination and identify opportunities for collaboration in the future
- Ensure that completed deliverables' training materials/MOOCs are available on the WGCapD website

Session summaries

Spotlight on innovation

This session consisted of brief presentations from participants highlighting new technical approaches, models, datasets and best practices. Key innovations shared with the group included the following:

- **VLab** provides competency-based training, based on a combination of skills, knowledge and behavior, aligning trainings to certain standards and is considering issuing digital "badges" that verify participants' training achievements. These badges offer more technical credibility than a traditional training completion certificate. Participants expressed interest both in the badges and in expanding WGCapD's investment in competency-based training.
- **The Indian Space Research Organisation (ISRO)** has found success in blending in-person classes, interactive remote classrooms, and E-learning through MOOCs. Lessons learned: shorter classes tend to keep more students online and engaged. When classes need to be longer, quizzes, games, and other interactive activities help in retaining participants. Intensive investment in outreach delivered results: more than 126,000 participants connected to 1,047 institutions (universities, research centers, government departments at all levels, business entities, etc.) took part in 21 courses in 2019 and 15 courses and 9 workshops to date in 2020.
- **The U.S. Geological Survey (USGS)** is supporting increased access to Landsat Collection 2 data, with new products expected to be available in mid-2020. Using a tiered collection-based management system, key improvements include: improved per-pixel geodetic accuracy, improved registration accuracy, a global inventory of scene-

based surface reflectance and surface temperature data products, new algorithms, and updated digital elevation model sources for various regions to support Level-1 processing.

- Highlighting its commitment to "boomers to zoomers" -- that is, the effort to reach across generations to attract young people – **CSA** is collaborating with the European Space Agency (ESA), the University of Jena, and several Canadian partners on a September 2020 MOOC that demonstrates the practical application of SAR data in understanding winter, water, and warming. Innovations relate to the emphasis on practical user experience and outreach to new user groups, such as youth.

- **The Deutsches Zentrum für Luft- und Raumfahrt or German Aerospace Center (DLR)**, working with EO College, has made significant progress in creation of online learning materials and courses on hyperspectral remote sensing targeting student and professional users at master's level. The contents include: annotated slide presentations, tutorials, educational films, interactive graphics, and video recordings on principles, methods, and applications of imaging spectroscopy. Other innovations include an update of the data visualization tool EnMAP Box, now in Version 3, and the first MOOC on hyperspectral imagery, planned for 2021.

- **ESA** innovations include an expansive set of MOOCs and new and updated platforms targeting teachers and secondary school learners. MOOC topics include: radar remote sensing, SAR (with CSA), EO monitoring from space, and the impact of disruptive technologies on EO. Others in development focus on: atmospheric and remote sensing, land applications of remote sensing, cryosphere, EO for computer scientists, ocean remote sensing, and climate change. The education outreach includes adaptations of EO Browser to support teachers and new tool box for secondary students and beginners called the Next Generation ESA School Atlas.

- **NASA SERVIR** capacity building efforts are integrated in the program's service planning approach, which centers on co-development of EO-based services with partners in Africa, Asia, and Latin America. These services are intended to support development outcomes related to land use; climate and weather; agriculture and food security, and water and water-related disasters. Drawing on a service planning toolkit, capacity building is integrated in the design and implementation of services, aimed at sustaining partner capacity to use and eventually manage the service.

- **The South African National Space Agency's (SANSA)** EO Data Innovation Challenge, with the private sector as a partner, focuses on bringing researchers and entrepreneurs together to foster innovation, create jobs, and advance EO skills. In its fifth year, the Challenge aims to develop innovative applications using EO. Now involving more than 100 companies, primarily in the mining sector, the current focus is on finding ways to build the entrepreneurship capacity of remote sensing professionals so that they can start businesses. SANSA is committed is to delivering activities that will help address current national challenges, particularly unemployment.

- **EO College,** currently working on seven MOOCs, is innovating around the sustainability and quality of materials, engaging learners, bridging the digital divide, and using resources efficiently. Key lessons center on the importance of: metadata standards; sharing and collaborating; blending E-learning and on-site training of higher efficiency,

and strengthening skills of educators on E-learning methods. In late 2020, EO College is launching a new platform called **EO Connect**, which presents an opportunity for WGCapD to engage on EO trainings, experiences, blended learning, and materials distribution. Future activities include a MOOC entitled SDG Zero Hunger and new learning methods involving artificial intelligence and gamification.

Spotlight on partnerships

This session featured brief presentations on insights and lessons learned on cooperation and collaboration at global, regional, and national level with partner agencies, academic/research institutions, users, and others.

- The **UN-affiliated Centre for Space Science and Technology Education in Asia and the Pacific (UNCSSTEAP)** is leveraging partnerships to promote STEM among female users. Its primary formats are a 9-month train-the-trainers program and 2- to 4-week theme-based exposure programs. In terms of disciplines, a recent study showed that courses on S/T-oriented remote sensing and GIS, SATMET, SAS, and SSM attracted comparatively higher participation of women while E/M-oriented SATCOM, GNSS, and NAVSAT attracted less female participation. Recommendations to engage more women include: increased partnering with institutions in participants' countries, splitting post-graduate and Ph.D. courses into modules to minimize time away from home; promoting curricula standardization in STEM across regions; supporting periodic meetings of regional teachers to share STEM initiatives and classroom and field experience; promoting increased capacity in the English language including coaching; and increasing coordination with regional organizations on capacity building.
- **ESA:** partnerships span the globe, with more than a dozen collaborations targeting a wide variety of users. These include partnerships with: EGU/GIFT and DLR on younger students; European space agencies to create European Space Education Resource Offices (ESERO); the European Commission on train-the-trainers classes and webinars on Sentinel data; NASA partnership for long-term training courses on land use and on MAAP, the Joint Mission Algorithm and Analysis Platform model; CONAE on training courses on SAR; and with the remote sensing societies EARSEL and SELPER. ESA also has partnerships in Africa and China and with the World Bank and Asian Development Bank.
- **NASA** partnership with UN-Habitat supports fulfillment of SDG 11, which aims to improve housing and other living conditions in urban areas. Emphasis is on strengthening capacity of decision-makers to apply EO methodologies to their work. Specific activities include: supporting needs assessments and pilots and dissemination of tools and practical guidance on EO uses related to sustainable urbanization. A key milestone is the use of ARD products and Open Date Cube examples to inform SDG 11 indicators.

Selection of resources shared during WGCapD-9

RADARSAT Constellation Mission Game, shared by Janin Huard, CSA
https://www.asc-csa.gc.ca/eng/satellites/radarsat/activities/game.asp

Paper on SCDAB, shared by Nancy Searby, NASA
https://www.sciencedirect.com/science/article/pii/S0265964619300761

Flood mapping best practices, UN SPIDER Knowledge Portal, shared by Jorge del Rio Vera, UNOOSA
- http://www.un-spider.org/advisory-support/recommended-practices/recommended-practice-flood-hazard-assessment
- http://www.un-spider.org/advisory-support/recommended-practices/recommended-practice-flood-hazard-mapping
- http://www.un-spider.org/advisory-support/recommended-practices/dem-storm-surge-coastal-monitoring-airbus

SAR Handbook developed by SERVIR and NISAR Science Team, shared by Dan Irwin, NASA
https://servirglobal.net/Global/Articles/Article/2674/sar-handbook-comprehensive-methodologies-for-forest-monitoring-and-biomass-estimation

SERVIR service planning toolkit, shared by Dan Irwin, NASA
https://www.servirglobal.net/Portals/0/Documents/ServicePlanningToolkit_2017-09-19.pdf

Video presentation, shared by Robert Eckardt
https://www.youtube.com/watch?v=8V7Dyhl-v7A

Translation software, shared by Robert Eckardt
- Centralized Translation Management System, e.g. https://pontoon.mozilla.org
- COMET's Translation Resource Guide:
  https://courses.comet.ucar.edu/course/view.php?id=181

Information on MOOC indicators/statistics, shared by Robert Eckardt
Refer to chapter 5.2 and 5.3 in this article*, E-Learning in the Context of Earth Observation*:
http://bit.ly/eLearning_in_EO

- **USGS** explained that partnerships have been integral to improvements to Landsat Analysis Ready Data (ARD). These improvements include making the archive more accessible and easier to analyze and reducing the amount of time users spend on data processing for time series analysis. Partnership with the Land Surface Imaging Virtual Constellation (LSI-VC), ESA, USGS, GA and ISRO has fostered consistency on terms such as: ARD, CARD4L products, interoperable products, harmonized products, and fused products. Harmonizing Landsat data with Sentinel has led to CARD4L compliant products, which will be released later this year in Landsat Collection 2. In addition, the EROS Cal/Val Center of Excellence (ECCOE) is working to improve uncertainty.

- Efforts are underway to create **the Space Capacity Development Advisory Board** (SCDAB), which emerged from prior WGCapD discussions and was described in white paper published in Space Policy in 2019. Its goals are to coordinate the capacity building efforts across WGCapD networks, maximize the application of space science and technology to support global development agendas and share good practices and methodologies. Considering a WGCapD operating framework focused on phases of harmonization, planning, executing and delivering, SCDAB will seek to support the planning phase particularly. The board is looking to focus on SDGs 2, 5, 7, and 11 as an initial pilot. Also looking to identify board members.
- As a professional membership organization focused on advancing engineering, computing and technology, the **Institute of Electrical and Electronics Engineers (IEEE)** is interested in expanding cooperation with WGCapD on capacity building. Specifically, the Geoscience and Remote Sensing Society would be a logical partner. A key IEEE goal is to build a community of practice and establish common language and standards for remote sensing. It has thousands of global members who could be tapped potentially to support regionally-based activities. Collaboration opportunities include: MOOCs, trainings activities, online lectures, tutorials, broadcasts from conferences, student travel grants, distinguished speaker program, etc.

Expanding our work on data democracy

This session featured presentations and discussion on the current state of data democracy by theme and/or technical topic, with the aim of identifying opportunities for expanded WGCapD action.

- Among other efforts, the **CEOS Systems Engineering Office (SEO)** fosters access to data through 1) the CEOS Data Policy Portal, now part of the COVE Tool Suite, which features a list of active CEOS missions (164) and their data policies, two-thirds of which are free and open data, and 2) a new data cube sandbox tool that will facilitate access to Landsat Collection 2 from anywhere in the world. Collaboration on Digital Earth Africa, including the inclusion of its training events on the WGCapD calendar is an opportunity. The clear trend towards cloud computing away from data downloading must be a key factor shaping all capacity building efforts. A continuing challenge to data democracy is the inaccessibility of data and lack of standardization on formats; for example, how can Chinese and Russian data be put into ARD format and made accessible on the cloud?
- **ESA** EO data are accessible for free by everyone, though registration and access procedures may be required. ESA is providing extensive training and resources to facilitate EO data user uptake. Undertaking a new approach, ESA intends to provide limited access to its new Thematic Exploitation Platforms and Euro Data Cube for training and capacity building purposes via CEOS WGCapD. ESA is also increasing access to Copernicus data, such as BIOMASS products, which are now free and open, including source code for all scientific processors.
- **DLR** is increasing access to data sets. TerraSAR-X/TanDEM-X Science Portals, EOWEB GeoPortal, TanDEM-X 90 m Global DEM, TanDEM-X 10/12 m DEM, TanDEM-

X forest map, and World Settlement Footprint are either free and open or accessible with an approved scientific proposal. The data portal for the EnMAP Hyperspectral Mission will be open in late 2020. An ongoing challenge is the need to balance data sharing in the content of public-private partnerships. In the future, new models of data sharing need to be considered. There is an opportunity for greater collaboration between space agencies on such activities as calibration, acquisition planning, and scientific data exploitation.

- **GEO** and **CSA** are collaborating in providing capacity to Indigenous communities and first nations to SAR data. CSA is planning to support a mapping workshop for Indigenous peoples. There are also plans underway for a CubeSat project in the Territories. Ongoing challenges include limited bandwidth in remote areas, sometimes contentious relationships with government, language barriers, and lack of resources. Trust and data privacy are key issues, as is the need to design trainings around the needs, capabilities, and traditions of those involved. At the moment, these activities target people already using geospatial tools, seeking to increase their use of EO data.

- The **NASA-ISRO Synthetic Aperture Radar (NISAR)** mission is fostering access to SAR data, specifically through training on global L band and regional S band SAR imagery with 12-day repeat cycle, which is free and open. NASA Applied Science capacity building programs, including DEVELOP, ARSET, and SERVIR, are helping build capacity for using NISAR. Early adopters and engagers are helping provide feedback on NISAR data before it is released.

- **ISRO** has several initiatives underway to foster data democracy, including: Bhuvan, which has various capacities such as mapping, visualization, application frameworks, and disaster support; MOSDAC, the meteorological and oceanographic satellite data archival system; VEDAS, the Visualization of EO Data and Archival system, which supports artificial intelligence and Big Data Analysis; the Indian Bioresource Info Network and Air Quality Monitoring and Forecasting System, both of which support decision-making and education; and Bhoonidh, an ISRO open data access web app that provides free data access to online web users.

- Moving **Landsat data to the cloud** is a major step toward data democracy; the challenge now is to keep refining access and minimizing processing time. This includes the implementation of a new cloud-optimized Landsat data format along with prototyping new search, discovery, access, and download capabilities. Two examples of improved access relate to: 1) the SpatioTemporal Asset Catalog (STAC), which unifies metadata for programmatic access across multiple platforms and data providers for improved search and discovery utility and 2) Data Access Paradigm Shift, which allows open-source software tools such as Jupyter Notebooks to apply their science algorithms to the data.

- The **NASA Earth Science Data Systems Program (ESDSP)** promotes data democracy by: 1) thought leadership on the big data question, 2) supporting the Earth Observing System Data and Information System (EOSDIS), 3) supporting research and technology through NASA's Open Data policy, and 4) embracing the new paradigm for data system stewardship. Among the many challenges, data quantity is constantly increasing – by significant orders of magnitude – increasing the need to handle storage and computation

demands efficiently. New data management technologies and architectures are needed. Goals for EOSDIS cloud evolution include: improved efficiency of NASA's data systems operations, continuing free and open data access to data; preparing for new high-data-rate on-orbit missions; increasing opportunity for researchers and other users to access/process petabytes of data quickly without the need for complex data management capabilities; and allowing for a transparent, extendable open source processing frameworks.

- **WGCapD** continues to make efforts to make its work more discoverable and consistent through platforms such as the CEOS Training Calendar, which seeks to capture all training events across the network, and the WGCapD resources web page, which hosts useful links, best practices, and reporting templates. These include a training report template and post-training participant questionnaire, which are intended to standardize some work processes across WGCapD member activities.

Looking ahead

The WGCapD identified the following next steps during the annual meeting discussions.
- Explore specific themes in capacity building on monthly WGCapD telecons such as gamification, blended-learning approaches, digital badging, metadata standards, indigenous community engagement, analysis ready data, Jupyter notebooks, data carpentries, EO supporting entrepreneurship, etc.
- Refine and update the WGCapD 2020-2022 work plan by revisiting the deliverables being carried over from 2019 and the draft deliverables submitted in the fall of 2019.
- Convene quarterly or bi-annual regional meetings to continue the conversation around coordination and collaboration of capacity building efforts within the Asia-Oceania, Americas, Europe, and Africa regions
- Continue engagement with other working groups and ad hoc teams through regular check-ins, participation in each other's meetings, and joint deliverables
- Facilitate the establishment of the SCDAB and identify entities working within specific SDG areas to include in it.
- Continue to build awareness of, add trainings to, refine, and support use of the CEOS Training Calendar, as well as identify a format improvement to differentiate trainings/MOOCs that are available long-term and short-term
- Increase awareness and use of templates for collecting standardized information from training events and the compilation of statistics through a standardized training report, trainee tracking spreadsheet, and a sample post-training questionnaire.
- Follow up on conversations on how professional societies can be engaged and interact with WGCapD, with a first step of exploring opportunities with IEEE.

Annex 1: WGCapD-9 participants

NAME	AGENCY	TITLE
Emily Adams	NASA	SERVIR Regional Science Coordination Lead
Matthew Adepoju	National Space Research and Development Agency (Nigeria)	Deputy Director
S. P. Aggarwal	Indian Institute of Remote Sensing	Group Head
Suchith Anand	GODAN	Chief Scientist and Advisor
Byron Ananwgwe	Kenya Space Agency	Technical Adviser
Senthil Kumar Arumugam	UN-Regional Centre, Asia-Pacific	Director
Guy Aube	EO Applications	Canadian Space Agency
Chris Barnes	USGS	Landsat Science Communications Team Lead
Zachary Bengtsson	NASA	DEVELOP Fellow
Brock Blevins	NASA	Training Coordinator
Michael Bock	DLR	Progamme Officer
Dave Borges	NASA	Disasters Program
Sergio Camacho	CRECTEALC	Secretary General
Amalia Castro Gomez	ESA/ESRIN	Remote Sensing Project Scientist
Prakash Chauhan	Indian Institute of Remote Sensing	Director
Emil Cherrington	NASA	SERVIR West Africa RSCL
Lauren Childs-Gleason	NASA	Analysis & Coordination Lead
Amanda Clayton	NASA	NASA DEVELOP Projects Manager
Esther Conway	UKSA	Senior EO Data Scientist -UKSA WGISS lead
Albert DeGarmo	NOAA	International Relations Specialist
Jorge Del Rio Vera	United Nations Office for Outer Space Affairs	Scientific Affairs Officer, Space Applications Section
Robert Eckardt	Uni Jena	Project Coordination EO College
David Green	NASA	Disasters Program Manager
Brady Helms	NASA	Disasters Program Management Coordinator
Betzy Hernandez	NASA	Associate Program Manager AmeriGEO & Human Planet / SERVIR Capacity Building Lead
Kim Holloway	CEOS SEO (NASA)	Project Lead
Janin Huard	CSA	Strategic Planning Officer
Daniel Irwin	NASA	SERVIR Global Program Manager
Argie Kavvada	NASA	Lead for Sustainable Development Goals
Brian Killough	NASA	CEOS SEO
Tony Kim	NASA	SERVIR Project Manager
Astrid Christina Koch	European Commission	Senior Expert
Hugo Maree	ESA	Head of Education Office
Erin Martin	NASA	Consultant
Christine Mataya	NASA	Associate
Daniel Matsapola	SANSA	Science Engagement Manager

Amber Jean McCullum	NASA	Research Scientist
Franz Meyer	NASA	Professor for Remote Sensing
Nale Mudau	SANSA	Remote Sensing Scientist
Makoto Natsuisaka	JAXA	WGISS Vice Chair
Thi Mai Thy Pham	VNSC	Researcher
Fatima Pinto	ESA	Science Didactics Expert
Ana Prados	NASA	Research Associate Professor
Sabrina Ricci	Italian Space Agency	Academy and Education Unit
Alessandra Rodrigues Gomes	National Institute for Space Research - INPE	Head of Amazon Regional Center - CRA
Paul Rosen	NASA	Project Scientist
Kenton Ross	NASA	NASA DEVELOP Program Scientist
Francesco Sarti	ESA/ESRIN	Scientific Coordinator of Education and Training Activities
Kerry Ann Sawyer	NOAA	CEOS Executive Officer
Cindy Schmidt	NASA	Research Scientist
Nancy Searby	NASA	Capacity Building Program Manager
(David) Brent Smith	NOAA (retired)	Director, International and Interagency Affairs; member of the CEOS Secretariat
Monica Talevi	ESA	Head of Education & Outreach Unit
Linda Tomasini	CNES	Space Applications Development
Joost Vanreusel	ESA	Head of ESA Academy Unit
Luciane Veeck	VLab	Technical Support Officer
Tubolayefa Warekuromor	Office of the Surveyor General of the Federation (Nigeria)	Principal Surveyor
Xiang Zhou	Institute of Remote Sensing and Digital Earth, Chinese Academy of Sciences	Director of S & T Division Deputy Director of National Engineering Laboratory for Satellite Remote Sensing Applications

Annex 2: WGCapD-9 agenda

9th Working Group on Capacity Building and Data Democracy (WGCapD) Annual Meeting

Identifying Opportunities for Synergies and Innovation
10 to 12 March 2020

VIRTUAL MEETING: DIAL-IN INFORMATION ON LAST PAGE

TIMES EASTERN DAYLIGHT TIME (GMT-4) (AND UTC)

Agenda		
Day 1: Tuesday, March 10		**Information-sharing and highlights**
08:00-08:30 *(12:00-12:30 UTC)*	• Welcome and tour de table introductions • Meeting strategy and adoption of agenda	• Erin Martin, facilitator • Nancy Searby, NASA • All participants
Session 1 08:30-09:45 *(12:30-13:45 UTC)*	**Spotlight on innovation** *"Flash talks" highlighting new technical approaches, models, datasets and best practices.*	• Moderator: Erin Martin • Presentations (5 min each) • Discussion/Q+A (30 min)
	• <u>Luciane Veeck</u>, VLab: *Update on VLab innovation plans* • <u>Prakash Chauhan</u>, ISRO: *IIRS-ISRO E-learning and outreach program* • <u>Chris Barnes</u>, USGS: *Landsat Collection 2: science enhancements and improvements* • <u>Janin Huard</u>, CSA: *Canadian-European MOOC on radar remote sensing education* • <u>Michael Bock</u>, DLR: *HyperEDU and EnMAP Toolbox* • <u>Francesco Sarti,</u> ESA: *ESA innovative tools for EO education and training* • <u>Dan Irwin</u>, NASA: *SERVIR capacity building approach* • <u>Dan Matsapola</u>, SANSA: *Update on SANSA innovations and best practices* • <u>Robert Eckardt</u>, Univ. of Jena: *EO College - State of the art and future developments*	
09:45-10:00	LEG STRETCH	
Session 2 10:00-11:15 *(14:00-15:15 UTC)*	**Spotlight on partnerships** *"Flash talks" featuring insights and lessons learned on cooperation and collaboration at global, regional and national level with partner agencies, academic/research institutions, users, etc.*	• Moderator: Erin Martin • Presentations (5 min each) • Discussion/Q+A (30 min)
	• <u>Senthil Kumar</u>, UN CSSTEAP: *Gender diversity and competency analysis in learning geospatial technology and applications* • <u>Francesco Sarti,</u> ESA: *ESA partnerships for EO education, training and capacity building* • <u>Argie Kavvada</u>, NASA: *Tools to enable UN Member States at national and local level to use Earth observations to help deliver SDG 11 and the New Urban Agenda* • <u>Chris Barnes</u>, USGS: *USGS approach to Analysis Ready Data products* • <u>Nancy Searby</u>, NASA: *Progress on the Space Capacity Development Advisory Board* • <u>Paul Rosen</u>, NASA: *IEEE capacity building activities*	
SESSION BREAK – meeting reconvenes in the evening (Eastern Time)		

Session 3 23:00-24:00 (03:00-04:00 UTC)	**Regional highlight: ASIA-OCEANIA** *Structured, virtual conversation includes WGCapD presentation on activities in the region and opportunities for collaboration, followed by member "flash talks" and group discussion.*	• Moderator: Erin Martin
	- Pham Thi Mai Thy, VNSC, *Overview of WGCapD activities in Asia-Oceania* - Pham Thi Mai Thy, VNSC, *Insights on VNSC capacity building activities* - S.P. Aggarwal, ISRO: *ISRO capacity building activities in Asia* - Xiang ZHOU, AOGEO: *Update on AOGEO capacity building activities* - Dan Irwin, NASA: *NASA work in Asia* - Michael Bock, DLR: *DLR activities in Asia* - Amalia Castro Gomez, ESA: *ESA partnership with China for advanced scientific EO training-DRAGON Programme* - Linda Tomasini, CNES: *Overview of CNES activities in Viet Nam*	

Day 2: Wednesday, March 11   Expanding our reach

Session 4 08:00-09:30 (12:00-13:30 UTC)	**Expanding our work on data democracy** *Presentations and discussions on the current state of data democracy by theme and/or technical topic to identify opportunities for expanded WGCapD action.*	• Moderator: Erin Martin • Presentations (5 min each) • Discussion/Q+A (30 min)
	- Brian Killough, NASA: *SEO overview on data democracy initiatives* - Francesco Sarti, ESA: *ESA contribution to EO data democracy: data access and availability, future perspectives* - Michael Bock, DLR: *DLR EO Mission data and value-added data products* - Janin Huard, CSA and Cindy Schmidt, NASA: *SAR training for Indigenous communities and first nations* - Paul Rosen, NASA: *NISAR mission plans for early adopters and training associated with SAR* - S.P. Aggarwal, ISRO: *ISRO initiative in data democracy for capacity building* - Chris Barnes, USGS: *Landsat archive cloud access/data policy* - Kenton Ross, NASA: *NASA perspective on data access* - Daniel Matsapola, SANSA: *SANSA perspectives on data access* - Lauren Childs, NASA: *Making our work more discoverable and consistent*	
Session 5 09:30-10:15 (13:30-14:15 UTC)	**Coordinating and identifying synergies with others** Structured, virtual exchanges with the CEOS Working Group on Information Systems and Services	• Moderator: Erin Martin
10:15-10:30	**LEG STRETCH**	
Session 6 10:30-11:30 (14:30-15:30 UTC)	**Regional highlight: AFRICA** *Structured, virtual conversation includes WGCapD presentation on activities in the region and opportunities for collaboration, followed by member "flash talks" and group discussion.*	• Moderator: Erin Martin • Presentations (5 min each) • Discussion/Q+A (20 min)
	- Nancy Searby, NASA: *Overview of WGCapD activities in Africa* - Dan Matsapola, SANSA: *SANSA capacity building activities* - Nale Mudau: *AfriGEO engagement on capacity building* - Byron Anangwe, KSA: *KSA experience with capacity building* - Matthew Adepoju, NASRDA: *Agency update on capacity building* - Francesco Sarti, ESA: *ESA EO capacity building in Africa* - Michael Bock, DLR: *Snapshot of DLR and other German activities in Africa*	

	• Betzy Hernandez, NASA: *NASA activities in Africa*	
Session 7 11:30-12:30 *(15:30-16:30 UTC)*	**Regional highlight: AMERICAS** *Structured, virtual conversation includes WGCapD presentation on activities in the region and opportunities for collaboration, followed by member "flash talks" and group discussion.*	• Moderator: Erin Martin • Presentations (5 min each) • Discussion/Q+A (20 min)
	• Christine Mataya, NASA: *Overview of WGCapD activities in the Americas* • Sergio Camacho, CRECTEALC: *Current and future CRECTEALC work in Latin America and the Caribbean* • Alessandra Gomes, INPE: *Snapshot of INPE capacity building* • Albert DeGarmo, AmeriGEO: *Insights on AmeriGEO capacity building* • Francesco Sarti, ESA: *ESA experience for EO capacity building in Latin America* • Chris Barnes, USGS: *Update on capacity building activities* • Betzy Hernandez. NASA: *Update on NASA capacity building in the Americas*	
Day 3: Thursday, March 12		**Maximizing collaboration**
Session 8 08:00-9:30 *(12:00-13:15 UTC)*	**Applying learnings to future activities** *Quick check-in on existing deliverables and discussion on new deliverables in the context of ongoing discussions of innovation, partnerships, data democracy and collaboration with other working groups, ad hoc teams and virtual constellations.*	• Moderator: Erin Martin
Session 5a 09:30-10:45 *(13:30-14:45 UTC)*	**Coordinating and identifying synergies with others** *Structured, virtual exchange with CEOS Working Group on Disasters and the NASA Systems Engineering Office.*	• Moderator: Erin Marin
10:45-11:00	LEG STRETCH	
Session 9 11:00-12:00 *(15:00-16:00 UTC)*	**Regional highlight: EUROPE** *Structured, virtual conversation includes WGCapD presentation on activities in the region and opportunities for collaboration, followed by five member "flash talks" and group discussion.*	• Moderator: Erin Martin
	• Lauren Childs-Gleason, NASA: *Overview of WGCapD activities in Europe* • Francesco Sarti, ESA: *ESA EO capacity building and training in Europe* • Astrid-Christina Koch, EC: *Capacity development on behalf of Copernicus and the European Commission* • Michael Bock, DLR: *Framework Partner Agreement on Copernicus User Uptake* • Linda Tomasini, CNES: *Overview of capacity building activities* • Joost Vanreusel, for ESA: *Update on ESA Academy*	
12:00-12:05	LEG STRETCH	
Session 10b 12:00-13:00 *(16:00-17:00 UTC)*	**Coordinating and identifying synergies with others** *Structured, virtual exchange with Sustainable Development Goals Ad Hoc Team and Land Surface Imaging virtual constellation*	• Moderator: Erin Martin
Timing TBD	**WRAP-UP AND CLOSING**	• Nancy Searby, NASA