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Coordinating an Observation Network of Networks EnCompassing saTellite and IN-situ to fill the Gaps in European Observations

Deliverable D1.2

Cooperation with other relevant project and initiatives report

Version 1

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Table of Contents

1. Executive summary

This deliverable exposes the cooperation activities of ConnectinGEO with other relevant initiatives, such as European projects, GEO activities and other global approaches.

2. Cooperation with other European projects and initiatives

2.1. ENVRI PLUS

ENVRIPLUS (H2020-INFRADEV-1-2014-1, 654182) is a cluster of research infrastructures (RIs) for Environmental and Earth System sciences, built around ESFRI roadmap and associating leading e-infrastructures and Integrating Activities together with technical specialist partners.

ENVRIPLUS is driven by 3 overarching goals: 1/ favouring cross-fertilization between infrastructures, 2/ implementing innovative concepts and devices across RIs, and 3/ facilitating research and innovation in the field of environment to an increasing number of users outside the RIs.

It aims to improve Earth observation monitoring systems and strategies, including actions towards harmonization and innovation, to generate common solutions to many shared information technology and data related challenges, to harmonize policies for access and provide strategies for knowledge transfer amongst RIs.

ENVRIPLUS coordinates actions to improve communication and cooperation, addressing Environmental RIs at all levels, from management to end-users, implementing RI-staff exchange programs, generating material for RI personnel, and proposing common strategic developments and actions for enhancing services to users and evaluating the socio-economic impacts.

ENVRIPLUS is expected to facilitate structuration and improve quality of services offered both within single RIs and at pan-RI level. It promotes efficient and multi-disciplinary research offering new opportunities to users, new tools to RI managers and new communication strategies for environmental RI communities. The produced solutions, services and other project results are made available to all environmental RI initiatives, thus contributing to the development of a consistent European RI ecosystem.

The project started on 2015-05-01 and is still on going until 2019-04-30.

ConnectinGEO shares some commonalities with ENVRIPLUS, especially in terms of coordinating EO networks (RIs, in the ENVRIPLUS case) and somehow both projects are targeting similar users.

From the beginning of ConnectinGEO, an approach to ENVRIPLUS activities has been done in order to not to duplicate the work and to increase the goals of both projects.

In this sense, some cooperation activities have been done:

- ConnectinGEO attended the ENVRIPLUS KO (11--13 MAY 2015. Finnish Meteorological Institute. Dynamicum, Erik Palménin aukio, Helsinki, Finland),
- ENVRIPLUS participated with a presentation to the ENEON meeting (October 10-14, 2016, Laxenburg, Austria): Ari Asmi (U. Helsinki): Envriplus, research infrastructures and networks
- ConnectinGEO attended to the 3rd ENVRI week (Prague, Czech Republic, November 14-18, 2016) with a presentation about ENEON.
- Both projects collaborated in pushing the 2016 EGU session: The Networks of Earth Observation, its coordination and their infrastructures to enhance international geoscience information access, provision and use

2.2. GAIA-CLIM

GAIA-CLIM, Gap Analysis for Integrated Atmospheric ECV CLImate Monitoring, (H2020-EO-2014, 640276) aims to improve our ability to use ground-based and sub-orbital observations to characterise satellite observations for a number of atmospheric Essential Climate Variables (ECVs). The key outcomes will be a "Virtual Observatory" facility of co-locations and their uncertainties and a report on gaps in capabilities or understanding, which shall be used to inform subsequent Horizon 2020 activities.

The project started on 2015-03-01 and is still on going until 2018-02-28.

The work on ECV in GAIA-CLIM is in the scope of ConnectinGEO and so we signed a MoU with them.

GAIA-CLIM has strongly helped ConnectinGEO in the definition of the in-situ EO gaps through its Gaps Assessment and Impacts Document (GAID) to identify and assess yet unfulfilled user needs ('gaps') in the observation capability of ECVs.

ConnectinGEO has used the characterization and definition of gaps proposed by GAIA-CLIM incorporating new attributes.

Gap Identifier	Gap Type	ECV(s)	Gap Short Description	Trace
G1.01	Technical Governance	H_2O, O_3, T, CO_2, CH_4, aerosols	Missing agreement on levels of data and associated names across domains	D1.3 GCOS AOPC Seidel et al., 2013
G1.02	Technical	H_2O, O_3, T, CO_2, CH_4, aerosols	Unknown suitability of measurement maturity assessment	D1.3
G1.03	Coverage Governance	H_2O, O_3, T, CO_2, CH_4, aerosols	Missing evaluation criteria for assessing existing observing capabilities	D1.1
G1.04	Coverage Governance	H_2O, O_3, T, CO_2, CH_4, aerosols	Lack of a comprehensive review of current sub-orbital observing capabilities for all the study of ECVs in atmospheric, ocean and land domains	D1.4, D1.6, D1.8
G1.05	Technical	H_2O, O_3, T, CO_2, CH_4, aerosols	Lack of unified tools showing all the existing observing capabilities for measuring ECVs with respect to satellite spatial coverage	D1.4, D1.6, D1.8
G1.06	Technical	H_2O, O_3, T, CO_2, CH_4, aerosols	Lack of a common effort in metadata harmonization	D1.4, D1.6, D1.8

ConnectinGEO added to those the following attributes:

| Status | Theme | Other Themes | EV | Other EV | Thread | RS/In-Situ | Editor | Ambassador | Purpose | Date | Review | Remedy | Feasibility | Feasibility rational | Impact | Impact rational | Cost | Cost rational | Timeframe | Time rational | Priority | Priority rational | Recommendation |

GAIA-CLIM has also contributed to ConnectinGEO in providing gaps regarding ECV.

Collaboration has also been done in terms of meetings participation, such as:

- GAIA-CLIM attended and participated with several presentations to the Workshop on Gap Analysis and Prioritization (October 10-11, 2016, Laxenburg, Austria):
  - de Maziere, M., Thorne, P., van Weele, M. and the GAIA-CLIM project team: GAIA-CLIM Gap Analysis
  - van Weele, M., de Maziere, M., Thorne, P. and the GAIA-CLIM project team: The GAIA-CLIM online Catalogue of Gaps and Gaps Assessment and Impacts Document
  - Thorne, P., De Maziere, M., van Weele, M.: From a gaps analysis and impacts assessment to prioritization: the current GAIA-CLIM plans
- ConnectinGEO participated with a presentation at the 2nd GAIA-CLIM User Workshop (21-24 November 2016, Belspo, Brussels, Belgium): Invited talk: How does the GAIA-Clim GAID fit into the wider context of GEOSS? (J. Maso, coordinator of the ConnectinGEO project)

2.3. EU BON

EU BON (FP7-ENV-2012, 308454) presents an innovative approach towards integration of biodiversity information systems from on-ground to remote sensing data, for addressing policy and information needs in a timely and customized manner. EU BON will provide integration between social networks of science and policy and technological networks of interoperating IT infrastructures, resulting in a new open-

access platform for sharing biodiversity data and tools, and greatly advance biodiversity knowledge in Europe. EU BON's 30 partners from 18 countries are members of networks of biodiversity data-holders, monitoring organisations, and leading scientific institutions. EU BON will build on existing components, in particular GBIF, LifeWatch infrastructures, and national biodiversity data centres.

EU BON will 1) enable greater interoperability of data layers and systems through adoption of new standards; 2) advance data integration by new (modelling) technologies; 3) increase data mobilisation via scientific communities, citizen scientists, and potential data users; 4) develop strategies for future harmonizing and mainstreaming of biodiversity recording and monitoring; 5) improve analytical tools and services interpreting biodiversity data; 6) support the science-policy interface by timely information and scenario development; 7) link integrated, customized information to relevant stakeholders, and 8) strengthen overall European capacities and infrastructures for environmental information management.

The project started on 2012-12-01 and is still on going until 2017-05-31.

ConnectinGEO and EUBON signed a MoU to collaborate in GEOSS and GEO BON activities. EU BON project will build a substantial part of the Group on Earth Observations Biodiversity Observation Network (GEO BON), and in doing so EU BON will be based on the "GEO BON Detailed Implementation Plan". EUBON and GEO BON are networks considered in the ENEON graph.

ConnectinGEO participated in the GEPW10 in Berlin (31 May – 2 June 2016) organized by the EUBON coordinators:

- 31 May 2016, 14:05-14:20. A Goal-Based Approach to Link the Sustainable Development Goals to Essential Variables. Hans-Peter Plag, Tiwah U.G
- 1 June 2016, 9:00-9:10. ENEON; European Network Of Earth Observation Networks. European Leadership of GD-06 GEO Task. Joan Masó, CREAF
- 1 June 2016, 16:15-17:25. Table III: Strengthening the in-situ approach in GEO: the case of biodiversity and ecosystem information. Joan Masó –ConnectinGEO
- 1 June 2016, 14:30-14:50. Monitoring individual quality of ERA-PLANET projects while ensuring coordination among them in the ENEON. Joan Masó (CREAF) - WP4 Leader

2.4. ECOPOTENTIAL

ECOPOTENTIAL (H2020-SC5-2014, 641762) focuses on internationally recognized Protected Areas (PAs) in Europe and beyond in a wide range of biogeographic regions, and it includes UNESCO, Natura2000 and LTER sites and Large Marine Ecosystems. Best use of Earth Observation (EO) and monitoring data is enabled by new EO open-access ecosystem data services (ECOPERNICUS). Modelling approaches including information from EO data are devised, ecosystem services in current and future conditions are assessed and the requirements of future protected areas are defined. Conceptual approaches based on Essential Variables, Macrosystem Ecology and cross-scale interactions allow for a deeper understanding of the Earth's Critical Zone. Open and interoperable access to data and knowledge is assured by a GEO Ecosystem Virtual Laboratory Platform, fully integrated in GEOSS. Support to

transparent and knowledge-based conservation and management policies, able to include information from EO data, is developed. Knowledge gained in the PAs is upscaled to pan-European conditions and used for planning and management of future PAs. A permanent stakeholder consultancy group (GEO Ecosystem Community of Practice) will be created. Capacity building is pursued at all levels. SMEs are involved to create expertise leading to new job opportunities, ensuring long-term continuation of services. In summary, ECOPOTENTIAL uses the most advanced technologies to improve future ecosystem benefits for humankind.

The project started on 2015-06-01 and is still on going until 2019-05-31.

ECOPOTENTIAL's WP2 "Conceptual Scientific Framework" is dealing mainly with EVs: D2.1 Review of existing EVs, D2.2 EO-driven EVs, D2.3 EO-driven EVs and general implications.

Both projects have worked together in this issue and, moreover, ConnectinGEO has provided the results of the project in terms of EVs among SBAs to ECOPOTENTIAL, contributing so far to D2.1. The cooperation on these activities will follow beyond the end of ConnectinGEO.

2.5. ERA-PLANET

ERA-PLANET (H2020-SC5-2015, 689443) reinforce the interface with user communities, whose needs the Global Earth Observation System of Systems (GEOSS) intends to address. It will provide more accurate, comprehensive and authoritative information to policy and decision-makers in key societal benefit areas, such as Smart cities and Resilient societies; Resource efficiency and Environmental management; Global changes and Environmental treaties; Polar areas and Natural resources. ERA-PLANET will provide advanced decision support tools and technologies aimed to better monitor our global environment and share the information and knowledge in different domain of Earth Observation.

The project started on 2016-02-01 and is still on going until 2021-01-31.

Within ERA-PLANET, ConnectinGEO will try to continue the activities on ENEON trough Strand-2: Resource efficiency and environmental management of the Joint Transnational Call. ConnectinGEO has currently passed the first stage of the call with the GEO-ESSENTIAL (Essential Variables workflows for resource efficiency and environmental management) proposal.

GEO-ESSENTIAL will demonstrate the feasibility and generality of the concept of Essential Variables (EVs) across the nexus Societal Benefit Areas (SBAs) (i.e. food, water, energy, simultaneously minimizing the impact on biodiversity) to evaluate, predict and monitor resources via Earth observations ensuring human development according to the Sustainable Development Goals (SDGs) and contributing to a better cross---domain coordination.

Specific objectives:

1. Enhance the existing Knowledge base infrastructure on EVs at the National, European and International level;
2. Address identified gaps in the definition and acquisition of EVs linked to the above mentioned SBAs in collaboration with the respective Communities of Practice, Stakeholders and identified Users (both intermediate and final);
3. Address identified gaps in EO to monitor specific goals and targets in order to help setting priorities for new observations;
4. Develop specific workflows and best practices to improve the interoperability and applicability of EVs as a contribution to GEOSS (via GCI) and Copernicus;
5. Contribute to the in-situ data and infrastructure coordination in Europe;
6. Develop synergies with and leverage the (National and European) Copernicus ground segments as well as the ESA TEPs (Thematic Exploitation Platforms), for EVs achievement, sharing and use; and
7. Promote the use of EVs across the EO Communities of Practice and beyond, i.e. by the creation of a MOOC on EO activities.

2.6. GEO-CRADLE

GEO-CRADLE (H2020-SC5-2015, 690133) lays out an action plan that starts by inventorying the regional EO capacities and user needs, which in turn leads to a gap analysis, the definition of region specific (G)EO Maturity Indicators and common priority needs. Through showcasing pilots, it demonstrates how the priorities can be tackled by the GEO-CRADLE Network, and provides the roadmap for the future implementation of GEOSS and Copernicus in the region, building on the GEO-CRADLE Regional Data Hub, which abides by the GEOSS Data Sharing Principles.

The project started on 2016-02-01 and is still on going until 2018-07-31.

GEO-CRADLE shares with ConnectinGEO the aim of discovering gaps in European EO data, in this case, in terms of regional availability, so it is somehow a complementary work.

Because of the displacement of the time-life period of both projects, there has not been many possibilities of collaboration, but some of them have been done, such as:

- During the last GEO European Projects Workshop (Berlin, Germany, from 31 May to 2 June 2016), GEO-CRADLE organised the session “Regional dimension for GEO and capacity building priorities”. ConnectinGEO participated in the Part 2 : Capacity building: success stories and initiatives in regions – building regional cooperation.
- GEO-CRADLE participated with a presentation to the Workshop on Gap Analysis and Prioritization (October 10-11, 2016, Laxenburg, Austria): Haris Konteos: The GAP Analysis process in the GEO-CRADLE project

2.7. LTER-Europe

Long-Term Ecosystem Research (LTER) is an essential component of world-wide efforts to better understand ecosystems. Through research and monitoring, LTER

seeks to improve our knowledge of the structure and functions of ecosystems and their long-term response to environmental, societal and economic drivers.

LTER contributes to the knowledge base informing policy and to the development of management options in response to the Grand Challenges under Global Change.

LTER-Europe was launched in 2003 as the umbrella network for Long-Term Ecosystem Research (LTER) in Europe. Its members are national networks operating a wide range of research and monitoring sites as well as larger platforms for socio-ecological research.

LTER-Europe is cooperating with ConnectinGEO in defining one of the ENEON commons pilot case on providing Ecosystem in-situ data networks.

3. Cooperation with GEO activities

3.1. Participation in the Foundational Task GD-06 on "GEOSS non-space based Earth Observation Resources"

ConnectinGEO, and ENEON, are participating since the beginning to this Foundational Task and has been pushing for its existence.

General description

Analyse the current trends and develop new scenarios for non space-based measurements, coordination, and access to data, which would allow inclusion of new types of data (such as drones, citizens' observatories) and their provenance. The regional scale would be considered as the reference to start.

Promote and coordinate non space-based observing systems (including both in situ and remote sensing airborne, land and ocean-based systems) to provide long-term continuous observations of all components of the Earth System (atmosphere, ocean, terrestrial, ice, solid earth). Identify critical gaps in existing observational networks with a particular focus on: the needs of developing countries, the need for continuity of observations, and the potential benefits of enhanced observing systems. Individual Earth observing systems operated by national, regional and international entities are integral to GEOSS.

Identify data resources needed by GEO (including flagships, initiatives and community activities) to achieve the objectives of the GEO Strategic Plan. Coordinate increased interoperability of non space-based data including new data flows from the private sector and the public, and develop global and regional datasets supporting the GEO community.

Compile global perspectives on existing plans for new non space-based observing networks and develop common strategies and actions to ensure sustained observations. Advocate adequate resources to maintain systems that provide continuity of observations.

Promote coordination of non space-based and space-based observation networks to provide calibration and validation sources, to fill measurement gaps, and to promote

technology sharing and infusion between the two communities. Promote communication between the non space-based and space measurement communities by sponsoring workshops, side events, and educational material as needed.

Implementation approach

The task activities are implemented by a task Team, supported by the Secretariat

Contributors

1. Cooperate with non space-based operators to promote and coordinate development activities related to non space-based observation infrastructures and networks; build upon ongoing coordination efforts & activities
2. Explore and determine how non space-based coordination frameworks put in place for national, regional (e.g. Copernicus, ConnectinGEO, ENEON, AfriGEOSS) and global (e.g. Eye on Earth) levels benefit most effectively the GEOSS objectives
3. Improve coordination and facilitate access to non space-based data resources
4. Improve global coordination of non space-based atmospheric observations (e.g., instrumented aircrafts, drones, balloons)
5. Improve global coordination of non space-based ocean observations and promote the development of new and enhanced measurements (e.g., global high-frequency-radar network to measure coastal surface currents)
6. Improve global coordination of non space-based land surface observations and promote the development of new and enhanced measurements
7. Explore how citizen science observation initiatives can contribute to filling non space-based observational gaps
8. Develop a global database of non space-based activities (i.e., regional and global projects), organized by domain (land, ocean, atmosphere) that includes information on the activities, its measurements and data access. Such a database will be essential for non space-based gap assessments and coordination with the space-based observation community. Coordinate the database development with the development of the GEO Knowledge Base.
9. Coordinate increased interoperability among non space-based datasets, between space and non space-based datasets, and new non space-based data flows from private sector and the public, and develop global and regional datasets supporting the GEO community. Coordinate this activity with the global observing systems, including the Global Geodetic Observing System (GGOS).

GEO Secretariat

1. Overarching coordination with administrative support
2. Promote coordination between space and non space-based observation communities and conduct gap assessments, as needed.

Planned activities and outputs in 2016

1. Develop a plan of activities for the task with defined leadership roles
2. Publish a report on the status of global non space-based coordination and frameworks. Include content addressing sustainability of existing measurements, investigating new non space-based measurements, facilitating the transition from

research to sustained long-term operations, and coordinating the integration of space-based and non space-based observations.

Task team

Lead				
Contributor	IEEE	Hans-Peter Plag	hpplag@odu.edu	ENEON
Contributor	Spain / CREAF	Joan Masó	joan.maso@uab.es	ENEON
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ConnectinGEO participates in every telco and has organized as well some sessions related to the activities done in the framework of the project:

- GEO-XII Plenary & Mexico City Ministerial Summit (10 November 2015)

http://www.earthobservations.org/me_sevent.php?seid=436

Non space based observation coordination

Organizers: CEOS

Abstract: **Background:** Non space-based observing systems (including both non space-based and remote sensing airborne, land and ocean-based systems) are global and diverse and there is no global group responsible for their coordination. Up to now, non space-based coordination for GEOSS has been included in the GEO Infrastructure (IN-01) task, “Earth Observations”. This task includes both the space and non space-based communities and observation coordination. As we move to the future, this task will be reformulated to separate space and non space-based coordination in the new GEO Foundational Task plan. It is believed this approach will allow the non space-based community to become more organized, focused and achieve greater success while allowing the space community (CEOS) to focus its efforts on the expanding amount of space-based measurements.
Objectives: In order to enhance progress in the non space-based community, CEOS has agreed to work with GEO to develop a detailed task plan for the non space-based foundational task (GD6, GEOSS non Space-based Earth Observation Resources) and complete a report to define the state of global non space-based coordination and recommendations for the future. It is expected that one of the GEO Participating Organizations will agree to manage

this task in the future and will utilize the work of this small task team to define its path.

Documents/Links: Agenda
WP Task GD-06 Description
Presentations
Agenda and introduction (Killough)
GEO's Need for Non-space Based Observations and the GEO Vision for GD6 (Ochiai)
Cross-cutting Coordination of the Copernicus In Situ Component
ENEON: Addressing Challenges and Facilitating Collaboration for non-space based Earth Observations

- GEO Plenary in St. Petersburg (Monday 7 November 2016)

https://www.earthobservations.org/uploads/506_eneon_agenda_v2.pdf

The task GD-06 "GEOSS in situ Earth Observation Resources (includes inclusion of citizens' observatories) (includes advocacy for continuity)" established the need for coordination between in-situ domains to tackle multidisciplinary questions with implications in Global Change and beyond.

The new work plan proposes the Foundational Task "GEOSS in-situ Earth observation resources" that favors more domain specific activities. ENEON is the European Network of Earth Observation Networks, particularly in-situ funded by the European Union under the H2020 ConnectinGEO project.

ENEON is working in involving heterogeneous in-situ networks into GEOSS together with the GEO Sec and the GD-06 task. ENEON is mainly including non-space networks to better coordinate them, with the aim of providing better observations for resolving interdisciplinary problems, to improve the European in-situ participation in GEO and in support of the implementation and monitoring of the UN SDG.

This session will present the results of the GD-O6 task, will discuss what ENEON is bringing to GEOSS and will think about the new orientation of the GEOSS in-situ foundational task for 2017-2019.

Agenda:

09:00 09:10: Welcome and agenda (Joan Masó, CREAF)
09:10 09:25: GD-06 report and conclusions (Hans-Peter Plag, Tiwah)
09:25 09:40: In situ activities of IAG and GGOS (Günter Stangl, ÖAW)
09:40 09:50: ENEON and its contributions to GEO (Ian McCallum, IIASA)
09:50 09:55: Contribution example: Mapping the Network Landscape (Ivette Serral, CREAF)
09:55 10:05: Contribution example: Meta network in solar energy (Lionel Menard)
10:05 10:10: Contribution example: Industry involvement (Geoff Sawyer, EARSC)
10:10 10:15: Contribution example: ENEON Commons concept paper (Joan Masó, CREAF)

10:15-10:30: Open discussion: The Foundational Task "GEOSS in-situ Earth observation resources" structure in view of the ENEON continuity plans. (Moderated by Hans-Peter Plag, Tiwah and Joan Masó, CREAF)

3.2. Participation in the Foundational Task GD09 on the "GEO Knowledge Base development"

ConnectinGEO has been the core contribution to the 2016 Foundational Task GD09 on the "GEOSS Knowledge Base" and has provided most of the resources to this task. Both Tiwah and CNR are the partners providing this contribution, and this is also continuing in 2017.

General description

The key objective of this task is to “develop a comprehensive interdisciplinary knowledge base defining and documenting observations needed for all disciplines. This will allow sharing not just data but also how these data can be used to address key policy or scientific question, and link also to the community of users addressing similar problems.

The Knowledge base will document the relationships between the data and the processes (models, workflows, algorithms) needed to develop the selected information/indicators.

The functionality of the knowledge base will support the GEOSS infrastructure in facilitating availability and accessibility of the observations to user communities. The knowledge base will include the rules for defining the observational needs and how to link them to user requirements, addressing a wide range of environmental and socio-economic information needs. Of particular interest are those information needs that are linked to indicators supporting the advocacy and monitoring of the Sustainable Development Goals (SDGs). The knowledge base will include rules to define the observation needs for these indicators.

The GEO Knowledge Base will be developed by leveraging existing knowledge repositories and databases and documenting what is being developed in association with GEO activities.

It will include user feedback with respect to the fitness for purpose of both data and processes.

Implementation approach and respective responsibilities

The activities will be performed by a Task Team lead by Hans Peter Plag, IEEE hpplag@odu.edu and Stefano Nativi, CNR Italy stefano.nativi@cnr.it

The Secretariat, will ensure dialogue between the Community-developing Knowledge- and the GCI development Team, developing solutions to make it available through the Portal. Key inputs are expected to come from task GD-8.

Contributors (IEEE. CNR, others)

- Identify relevant existing and developing knowledge bodies in various domains.
- Develop the concept for a comprehensive interdisciplinary knowledge base defining and documenting observations needed for all disciplines, including the rules for deriving the observational needs from user's requirements.
- Design and develop the functionalities in order to support the GEOSS infrastructure, including the DAB, in facilitating discoverability and usability of observations to user communities;
- Implement a prototype of the knowledge base and import the contents of the GEOSS User Requirements Registry to the prototype –i.e. one of the knowledge bodies.

GEO Secretariat

- Support the task Team
- Support the development and population of the Knowledge Base and engage user communities, including S&T communities, in these activities.
- Document the relevant existing and developing knowledge bodies in various domains and establish organizational links where needed.
- Coordinate the utilization of the knowledge base (e.g. in the GCI) and contribution to the knowledge base from all GEO activities (community, initiatives, flagships) and ensure coordination with capacity building activities.

Planned activities and outputs for 2016

- Form and convene the Team
- Issue a report on GEOSS knowledge base concept and development approach
- Start the compilation of available knowledge resources
- Design and prototype a database to host GEO-developed knowledge

Key deliverables

- **Deliverable 1**: Two co-leads were identified. The Horizon 2020 Project "*ConnectinGEO*" contributed substantial human resources to the Task. The Task Team needs to be enlarged particularly with participants from outside Europe. The GEOSS Science and Technology Stakeholder Network is organizing the Fifth Workshop on December 9-10, 2016 in Berkeley, CA, USA with a strong focus on the Knowledge Base and the goal to bring new member to the Task team.

- **Deliverable 2**: The report is in a draft status mainly based on work carried out in the frame of the *ConnectinGEO* Project. Several deliverables of the *ConnectinGEO* project are relevant for the development of the GEOSS Knowledge Base both in terms of the concept, development, and methodologies used to generate new knowledge. The data model of the knowledge base has been fully defined. Two complementary approaches are used to link societal goals and activities to observational needs. Both approaches utilize the concept of Essential Variables widely used in GEO SBAs. The "expert-based approach" starts from the observation side and identifies the essential variables with a strong focus on feasibility and then links these variables to societal benefits. The "goal-based approach" starts at agreed-upon societal goals and targets and then identifies Essential Variables required for the monitoring of progress towards these goals and

in support of goal implementation. *ConnectinGEO* also developed an approach to gap analysis and an approach for prioritization of gaps is under development. These approaches are all included in the knowledge base concept.

- **Deliverable 3**: An initial list /and definition) of what are the "knowledge resources" to be made accessible has been drafted and the link with the GCI Team has been activated. This list includes the former GEOSS User Requirements Registry and several observational requirements registries. It also includes a comprehensive knowledge base on sustainable development programs and activities in the United Nations including the Sustainable Development Goals. The Midterm review of the *ConnectinGEO* project by the European Commission underlined the importance of integrating the project outcomes into the Knowledge Base.

- **Deliverable 4**: A prototype of the Knowledge Base is under development and very preliminary version is available at the URL http://www.seeinkb.net. It is expected that initial functionality will be available for community testing late in 2016. The prototype is developed as an open source utility with the aim to engage a broader community in the development. The rules implemented in the Knowledge base for the identification of Essential Variables, gap analysis, and prioritization will be reviewed during a *ConnectinGEO* workshop in October 2016. The functionality of the knowledge base as a platform to link the Sustainable Development Goals to data, models and capacity building will be further explored during the 5th GEOSS S&T Stakeholder Workshop in December 2016.

3.3. Participation in the GEO Initiative GI-18 "Earth Observations in Service of the 2030 Agenda for Sustainable Development"

ConnectinGEO has represented the European Commission in the 2016 in the GEO Initiative GI-18.

General objectives

The 2030 Agenda for Sustainable Development provides a universal development agenda for all countries and stakeholders to use as a blueprint of action for people, the planet and prosperity. The agenda is anchored by seventeen Sustainable Development Goals (SDGs), associated targets, and a global indicator framework. Collectively, these items assist countries and the global community to measure, manage, and monitor progress on economic, social and environmental sustainability.

The 2030 Agenda specifically demands new data acquisition and integration approaches to improve the quality, coverage and availability of data to support the implementation of the development agenda at all levels. The 2030 Agenda includes efforts to exploit the contribution to be made by a wide range of data, including Earth observation and geospatial information, while ensuring national ownership in supporting and tracking progress.

Earth observations and derived information have already played key roles in supporting sustainable development. Serving the 2030 Agenda, they can play insightful roles in monitoring targets, planning, tracking progress, and helping nations and other

stakeholders make informed decisions, plans, and on-going adjustments that will contribute toward achieving the SDGs. Combined with demographic and statistical data, these sources enable nations to analyze and model conditions, create maps and other visualizations, evaluate impacts across sectors and regions, monitor change over time in a consistent and standardized manner, and improve accountability.

The primary purpose of GEO Initiative 18 (GI-18) is to organize and realize the potential of Earth observations to advance the 2030 Agenda and enable societal benefits through achievement of the SDGs.

A primary objective is to integrate Earth observations and geospatial information into national development and monitoring frameworks for the SDGs. Activities within GI-18 underscore and support GEO's emphasis on sustained observations, open data, and capacity building. The initiative also serves to advance GEO's strategic engagement with entities at national to international levels, such as UN agencies, foundations, and development banks. Overall, GI-18 enables countries and organizations to leverage Earth observations to support the implementation, planning, monitoring, reporting, and evaluation of the SDGs and their normative societal benefits.

Areas of Action

The GI-18 initiative pursues actions in several coordinated areas, addressing technical, organizational and programmatic components. Collectively, these actions support methods, engagement, data advancement, communications, capacity building, and evaluation on how Earth observations can support the 2030 Agenda. The Areas of Action include:

a) Methods I: Development of a general approach on the contributions of Earth observations data and derived information in achieving the SDGs and in monitoring the relevant indicators. Using specific examples in selected countries, this action will examine and document case studies of methods to integrate Earth observations in monitoring, planning, and reporting the SDGs.

b) Methods II: Development of tools and methodologies to measure relevant SDG indicators. This action includes suitability assessment, sensitivity analysis, frequency testing, and other factors to characterize uses of Earth observations and their appropriateness across users and regions. This action includes analyses and practices on innovative methods, visualizations, and graphic design approaches to communicate status and trends in SDG indicators.

c) Capacity Building and Engagement: Support to countries in the implementation of all appropriate measures to properly address the 2030 Agenda. Drawing on capacity building activities within GEO, this action coordinates and fosters capacity building efforts at appropriate levels on effective ways to convey methods, enable data access, and sustain use of Earth observations in context of SDGs. Activities here will draw on and support GEO efforts to characterize user needs. Given the basis of the SDGs in statistical data, this action includes engagement with the SDG statistical community about Earth observations as well as capacity building within GEO and the Earth observations community about SDG statistical principles and practices.

d) Data Advancement: Advances in the provision, access, discoverability, and applicability of Earth observations data and derived information for use with the SDG indicators.
This action supports the development and progressive implementation of provisions that allow the connection with the providers of basic data, information and knowledge and the access to users. This activity includes the collection of feedback from SDG user organizations about data characteristics, usability, preferred formats, etc. to help GEO refine approaches to enable greater use of Earth observations.

e) Communications: Development of activities for GEO community engagement of national and international entities about uses of Earth observations with the SDGs. This action develops of portfolio of materials, organizes events, publishes articles, and supports trainings and other activities to promote awareness about Earth observations and the SDGs. Some activities within these Areas of Action are and will be overlapping. In addition, other Work Programme elements refer to and encompass the SDGs. This GI-18 initiative is the primary element dedicated specifically to address GEO's broad engagement on the SDGs. Coordination with all elements related to the SDGs is appropriate and expected.

Implementation approach

Under a GI-18 Implementation Plan, GEO Members and Participating Organizations use several physical and virtual tools to address the areas of action. GEO conducts them in partnership with relevant UN agencies and other involved entities. Key implementation approaches in the GI-18 Initiative include:

Projects

A series of pilot projects apply and test uses of Earth observations to support the assessment and tracking of the SDGs, including integration with national statistical accounts for the indicators. Such projects will develop and test relevant methodologies and/or capacity building approaches, scaling up existing initiatives and bringing innovative applications from other examples. Projects encompass simple feasibility studies to in-depth endeavours. Some pilot project activities may focus on one country and address several SDG indicators; others may focus on a particular SDG indicator and apply it to several countries.

Building on these projects, the GI-18 initiative documents examples, case studies, lessons learned, and smart practices using Earth observations with the SDG indicators. The initiative identifies and conveys feedback from user organizations on their experiences with and recommendations for Earth observations data and derived information, such as formats and access. The projects include efforts to support qualitative and quantitative evaluation on the benefits of Earth observations to enable societal benefits.

Outreach

A program of activities related to outreach and engagement about Earth observations and SDGs. Implementation of this includes the creation and maintenance of a portfolio of materials, such as examples, stories, articles, and web features. For instance, a series of thematic examples can articulate how Earth observations relate to specific SDGs and can

be integrated with traditional statistical approaches; these examples support efforts by GEO members to engage with their national statistical offices.

Additional outreach activities envisioned include events, such as workshops and sessions at key conferences; trainings, including webinars and hands-on sessions; side events at key UN agency meetings; awards for innovative uses of Earth observations to advance the SDGs; and publications, such as a library of guidance handbooks on uses of Earth observations with SDG indicators.

Partnerships

GI-18 will work to expand GEO's current partnerships, enhance its strong relationship with the UN, and foster consolidated engagement of the individual Member countries and Participating Organizations. Associated with the SDGs, key UN entities includes the UN Statistics Division, the UN Initiative on Global Geospatial Information (UN GGIM), the UN Sustainable Development Solutions Network (SDSN). Additional potential partners including development banks, non-governmental organizations (NGO), and international entities (e.g., Skoll Global Threats Fund, Packard Foundation). Engagement and partnership with these entities help build processes, mechanisms and human capacity to include Earth observations into national development plans and integrate them with national statistical accounts to improve the measuring, monitoring and achievement of the SDGs.

2016 Activities and outputs

- Develop a multiyear implementation plan for the initiative.
- Scope a communications and outreach strategy, plan, and calendar.
- Produce multiple examples on uses of Earth observations in the indicator framework.
- Scope a framework of projects and initiate two or more projects.
- Hold a side event at the 47th Session of the UN Statistical Commission (UNSC), where the SDG indicator framework is to be approved.
- Prepare a report on the value that Earth observations adds in SDG monitoring and implementation in support of the UNSC meeting in 2017.
- Prepare a partnership plan.
- Continue the development and implementation of the GEMI initiative (with a particular focus on integrating Earth observations into existing, traditional water quality and water management measuring and monitoring mechanisms).
- Develop a concept on methods for access to SDG related data, information and knowledge.
- Scope an Earth observations SDG toolbox capable to process EO data and information.
- Develop a general outline for a handbook describing use of Earth observations for SDGs
- Conduct a side event at GEO-XIII

Future Plans (and resource requirements)

The Initiative team strives to complete the GI-18 Implementation Plan for presentation and release at the 2016 GEO Work Programme Symposium.

3.4. Participation in the GEO Vision for Energy (GEO VENER)

Reference to the activity GI-10 (page 11) (https://www.earthobservations.org/documents/geo_xiii/GEO-XIII-2-Inf-01(Rev1)_2016_Work_Programme_Progress-Report.pdf):

A Sensor observation service capacity for the Energy SBA has been set-up through the ConnectinGEO project for Enhancing GEOSS Webservice-Energy SD and is available at http://insitu.webservice-energy.org. It allows the visualization and processing of in-situ solar radiation measurements. It is also used for discussing the involvement of private solar companies within GEO as providers of in-situ solar irradiation and users of the GCI. A video showing the benefits of this new component of webservice-energy.org is available (in French subtitled in English) at https://youtu.be/p-NCtwkGlZg

3.5. Participation in the GEO Cold Regions Initiative (GEO CRI) implementation plan

ConnectinGEO took part in the discussions of the GEOCRI implementation plan introducing the need to fix a set of Cold Regions EV and the corresponding gap analysis. Minutes are not already available but a reference to the ConnectinGEO Gap Table will be introduced.

Contribution to “Task 2. Monitoring Network and Data” and “Task 3. Integrating in situ and Remote Sensing Observations” of the 2017-2019 Implementation Plan (draft available at http://www.wmo.int/pages/prog/sat/meetings/documents/PSTG-6_Doc_06-04_GEOCRI-implementation-plan-8.pdf)

3.6. Participation in the GEOSS Science and Technology Stakeholder Network

A strong engagement of science and technology (S&T) communities in both the development and use of GEOSS is necessary to address the complex issues associated with the on-going transition out of the Holocene. S&T support is needed to improve interoperability between global observing, modelling, and information systems; to enable data integration across disciplinary boundaries; to facilitate data sharing, archiving, dissemination, and reanalysis; to optimize the recording of observations, assimilation of data into models, and generation of data products; to enhance the value of observations from individual observing systems through their integration in the SBAs; and to harmonize well-calibrated, highly accurate, stable, sustained in-situ and satellite observations of the same variable recorded by different sensors and different agencies. Consequently, the GEO Work Plan includes several Tasks focusing on outreach to S&T communities, and most of the GEO Community of Practice have a strong S&T component. The GEOSS S&T Stakeholder Network facilitates input from S&T communities to GEO.

The 3rd GEOSS S&T Stakeholder Workshop was organized as a ConnectinGEO workshop in the US, and the 4th GEOSS S&T Workshop (in the US as well) had strong participation by ConnectinGEO partners.

3.6.1. 3rd GEOSS Science and Technology Stakeholder Workshop. March 23-25, 2015, Norfolk, VA, USA

The 3rd GEOSS S&T Stakeholder Workshop focussed on the knowledge needs of the global and national decision makers to enable progress towards global sustainability on a changing planet. The workshop used the priorities of the discussion on the SGDs, the preliminary indicators, the grand challenges, and the global boundaries of the SOSH as a starting point in the discussion of the science of sustainability indicators with the goal to derive a comprehensive sustainability metrics. The workshop addressed to what extent the current and planned Earth observation systems would allow a quantification of the indicators comprising this metrics. http://www.gstss.org/2015_Norfolk_3rd/

Monday, March 23, 2015

0800 - 0900:	*Registration*
0900 - 1030:	Plenary Session 1: Assessing and Managing the Changes: The Metrics Co-Chairs: *Hans-Peter Plag, Stefano Nativi*
0900 - 0910	*Douglas Cripe, Geo Secretariat*: Welcoming Address
0910 - 0920	*Hans-Peter Plag, Stefano Nativi*: Workshop Organization and Goals (presentation: keynote, powerpoint)
0920 - 0950	*Douglas Cripe*: The GEO Strategic Plan for 2015-2025 (draft plan, presentation)
0950 - 1020	*Tim Lenton*: Keynote Presentation: Measuring Global Changes and Detecting Tipping Points (abstract)
1020 - 1030	*Workshop Chairs*: Mission for Breakout Sessions
1030 - 1100:	*Coffee Break*
1100 - 1230:	Breakout Sessions Block 1: Designing the Metrics See the breakout session questions for this block ...
	Breakout Session 1.1: Sustainable Development Goals, Global Boundaries, and Safe Operating Space for Humanity Chair: *Hans-Peter Plag*; Rapporteur: *Senay Habtezion*
1100 - 1120	*Hans-Peter Plag*: Introduction to the session (presentation: keynote, powerpoint)
1120 - 1220	*All*: Discussion
1220 - 1230	*Hans-Peter Plag, Senay Habtezion*: Session Summary
	Breakout Session 1.2: GEO Societal Benefit Areas Chair: *Antonio Bombelli*; Rapporteur: *Mark Bourassa*
1100 - 1115	*Antonio Bombelli*: Introduction to the session (presentation)
1115 - 1220	*All*: Discussion
1220 - 1230	*Antonio Bombelli, Mark Bourassa*: Session Summary (presentation)
1230 - 1400:	*Lunch*
1400 - 1530:	Plenary Session 2: Assessment of the Metrics Chair: *Jay Pearlman*
1400 - 1405	*Jay Pearlman*: Introduction to Session (presentation)
1405 - 1415	*Senay Habtezion*: Report of Breakout session 1.1 (presentation)
1415 - 1425	*Mark Bourassa*: Report of Breakout session 1.2 (presentation)
1425 - 1500	*Ben Hamlington*: Keynote: What we know and don't know about sea level (abstract, presentation)
1500 - 1530	*Toste Tanhua*: Keynote: Indicators and Essential Variables (abstract, presentation)
1530 - 1535	*Workshop Chairs*: Mission for breakout sessions

1600 - 1730:	Breakout Sessions Block 2: Quantifying the Metrics See the breakout session questions for this block ...
	Breakout Session 2.1: Essential Variables for Sustainable Development Goals, Global Boundaries and Safe Operating Space for Humanity Chair: *Hans-Peter Plag*; Rapporteur: *Senay Habtezion*
1600 - 1615	*Hans-Peter Plag*: Introduction to the session
1615 - 1720	*All*: Discussion
1615 - 1730	*Hans-Peter Plag*: Session Summary (Notes)
	Breakout Session 2.2: Essential Variables for GEO Societal Benefit Areas Chair: *Antonio Bombelli*; Rapporteur: *Kathy Fontaine*
1600 - 1615	*Antonio Bombelli*: Introduction to the session (presentation, description of EVs, Carbon EVs)
1615 - 1630	*Douglas Cripe*: Essential Variables in the Water SBA (presentation)
1630 - 1730	*All*: Discussion

Tuesday, March 24, 2015

0800 - 0900:	*Registration*
0900 - 1030:	Plenary Session 3: Monitoring and Foreseeing the Changes: The Role of Earth Observations Co-Chairs: *Paola Campus, Andiswa Mlisa*
0900 - 0910	*Senay Habtezion*: Report of breakout session 2.1 (presentation)
0910 - 0920	*Kathy Fontaine*: Report of breakout session 2.2 (presentation)
0920 - 0940	*Paola Campus*: Introduction to Monitoring of Changes (presentation)
0940 - 1010	*Roberto Azzolini*: Keynote: Monitoring the polar regions (presentation)
1010 - 1030	*All*: Discussion (Main Outcomes)
1030 - 1100:	*Coffee Break*
1100 - 1230:	Plenary Session 4: Setting Priorities Chair: *Wolfgang Grabs*
1100 - 1130	*David Arctur*: Keynote: GEOSS Water Services: Federating Regional and National Water Data (abstract, presentation)
1130 - 1200	*Mark Bourassa*: Keynote: Key essential variables: The example of the oceans (abstract, presentation)
1200 - 1230	*All*: Discussing the priorities
1230 - 1400:	*Lunch*
1400 - 1730:	Joint Plenary Session A: Changing Science for a Changing Planet Co-Chair: *Hans-Peter Plag, James Syvitski*
1400 - 1430	*Dork Sahagian*: Keynote: Science and Society: Symbiotic or Askew? (abstract)
1430 - 1500	*Dennis Ojima*: Keynote: Future Earth Research Challenges (abstract, presentation)
1500 - 1530	*Stefano Nativi*: Keynote: The Next Revolution for the GEOSS Common Infrastructure (abstract, presentation)
1530 - 1600:	*Coffee Break*
1600 - 1630	*Hans-Peter Plag*: Keynote: The Need For A New Science to Guide Humanity's Transition Into The Post-Holocene (abstract, presentation: keynote, powerpoint)
1630 - 1700	*James Syvitski*: Keynote: Use of Surface-Dynamic Models for Identifying Environmental Indicators and Processes (abstract)
1700 - 1725	*All*: Discussion
1725 - 1730	*Session Chairs*: Mission for the breakout sessions
1900 - 2100:	*Workshop Dinner (no host)*

3.6.2. 4th GEOSS Science and Technology Stakeholder Workshop. March 24-26, 2015, Norfolk, VA, USA

The 4th GEOSS S&T Stakeholder Workshop focused on the scope of the future GEOSS and the concepts and technologies that can support a future-oriented "system of systems" providing observations and practice-relevant knowledge to a wide range of users. Information and knowledge systems are challenged by rapidly developing knowledge needs on the one side and an equally rapid development in (big) data availability not only from traditional sensors but also from a variety of human sensors, the developing Internet of Things (IoT) and Internet of Everything (IoE) scenarios, and the output of increasingly more advanced models. Cloud computing provides any public and private organization with the ability to use data and applications over the Internet instead of hosting, storing, or processing them on locally managed hardware. http://www.gstss.org/2015_Norfolk_4th/

Tuesday, March 24, 2015

1400 - 1730:	Joint Plenary Session A: Changing Science for a Changing Planet Co-Chair: *Hans-Peter Plag, James Syvitski*
1400 - 1430	*Dork Sahagian*: Keynote: Science and Society: Symbiotic or Askew? (abstract)
1430 - 1500	*Dennis Oijma*: Keynote: Future Earth Research Challenges (abstract, presentation)
1500 - 1530	*Stefano Nativi*: Keynote: The Next Revolution for the GEOSS Common Infrastructure (abstract, presentation)
1530 - 1600:	*Coffee Break*
1600 - 1630	*Hans-Peter Plag*: Keynote: The Need For A New Science to Guide Humanity's Transition Into The Post-Holocene (abstract, presentation: keynote, powerpoint)
1630 - 1700	*James Syvitski*: Keynote: Use of Surface-Dynamic Models for Identifying Environmental Indicators and Processes (abstract)
1700 - 1725	*All*: Discussion
1725 - 1730	*Session Chairs*: Mission for the breakout sessions
1900 - 2100:	*Workshop Dinner (no host)*

Wednesday, March 25, 2015

0900 - 1030:	Joint Breakout Sessions: Creating the practice-relevant knowledge to cope with global change See the breakout session questions for this block ...
	Joint Breakout Session 1: Intelligent use of data quantity vs focusing on data quality Chair: *Stefano Nativi*; Rapporteur: *Bart de Lathouwer*
0900 - 0905	*Stefano Nativi*: Introduction to the breakout session
0905 - 0920	*Andreas Matheus*: The COB-WEB Project
0920 - 0935	*Bart De Lathouwer*: Use of WPS (and other web services) for Earth Observation (abstract, presentation)
0935 - 0950	*Jonas Eberle, Christian Hüttich, Christiane Schmullius*: Automatization of information extraction to build up a crowd-sourced reference database for vegetation changes (abstract, presentation)
0950 - 1005	*Palma Blonda, C. Marangi, A. Adamo, C. Tarantino, F. Lovergine*: Integration of EO and in-situ data through expert knowledge for habitats and ecosystems monitoring (abstract, presentation)
1005 - 1020	*Dave Jones*: The Challenge of accessing and Sharing "Big Data" in Real-Time — Connecting GEO Nations Now (abstrac)
1020 - 1030	*Stefano Nativi, Bart de Lathouwer*: Session Summary
	Joint Breakout Session 2: Shifting from disciplinary to problem and solution focused science Chair: *Kathy Fontaine*; Rapporteur: *Andiswa Mlisa*
0900 - 0915	*Kathy Fontaine*: Introductions to the breakout session (presentation)
0915 - 1020	*All*: Discussion
1015 - 1030	*Kathy Fontaine, Andiswa Mlisa*: Session Summary
1030 - 1100:	*Coffee Break*
1100 - 1230:	Joint Plenary Session B: Linking Societal Goals, Science, Metrics, and Observing System Co-Chairs: Stefano Nativi, Hans-Peter Plag
1100 - 1115	*Bart de Lathouwer*: Report from joint breakout session 1
1115 - 1130	*Andiswa Mlisa*: Report from joint breakout session 2 (presentation)
1130 - 1200	*Bruce Wielicki*: Keynote: Climate Change Accuracy: Observing Requirements and Economic Value (presentation)
1200 - 1230	*All*: Discussion

1400 - 1530:	Plenary Session 1: Leveraging a Never Ending Technological Revolution Chair: *Michel Schouppe*
1400 - 1410	*Stefano Nativi*: Welcome and Introduction
1410 - 1425	*Ben Burford*: Utilizing the emerging data super nova for Earth observations (video, Video Text)
1425 - 1450	*Lea Shanley*: Keynote: The Citizen Science Ecosystem (presentation)
1450 - 1515	*Muki Haklay*: Keynote: Citizen Scientists and Crowdsourcing (abstract, presentation)
1515 - 1530	*All*: Questions, Answers and Discussion
1530 - 1600:	*Coffee Break*
1600 - 1730:	Breakout Sessions Block 1: Emerging revolutions: challenges and opportunities See the breakout session questions for this block ...
	Breakout Session 1.1: Cloud and Big Data Revolutions Chair: *Lorenzo Bigagli*; Rapporteur: *Bob Chen*
1600 - 1610	*Lorenzo Bigagli*: Introduction to the session and the BYTE project (presentation, Byte Fact Sheet, Byte Info Sheet)
1610 - 1720	*All*: Discussion
1720 - 1730	*Lorenzo Bigagli, Bob Chen*: Session Summary
	Breakout Session 1.2: Secure Consumerization: the Genuine Trustworthiness Revolution Chair: *Craig Lee*; Rapporteur: *Paolo Mazzetti*
1600 - 1610	*Craig Lee*: Introduction to the session
1610 - 1630	*Robert Bohn*: NIST Cloud Federation and Cyberspace Identity Efforts (presentation)
1630 - 1650	*Daniel S. Katz*: Social Cloud: Facilitating "Trustworthy" Compute & Data Resource Sharing (presentation)
1650 - 1710	*Craig Lee*: Managing Disaster Response through On-Demand Resource Federation (presentation)
1710 - 1725	*All*: Discussion
1725 - 1730	*Craig Lee, Paolo Mazzetti*: Session Summary (Outcome Summary)
	Breakout Session 1.3: Social Revolution: Crowdsourcing movement, Citizen Observatories, and Earth Monitoring Chair: *Michel Schouppe*; Rapporteur: *Stefano Nativi*
1600 - 1620	*Michel Schouppe*: Introduction to the session (presentation)
1620 - 1640	*Brian Wee*: Citizen Observatories (presentation)
1640 - 1700	*Jonas Eberle, Christian Hüttich, Christiane Schmullius*: Crowd-sourced knowledge generation for the validation of global vegetation change analyses — A feedback tool to foster tests and evaluations of scientific algorithms (presentation)
1700 - 1725	*All*: Discussion
1725 - 1730	*Michel Schouppe, Stefano Nativi*: Session Summary (draft statement)

Thursday, March 26, 2015

0900 - 1030:	Plenary Session 2: From Data to Knowledge Sharing Chair: *Greg Yetman*
0900 - 0910	*Bob Chen*: Report from Breakout Session 1.1 (presentation)
0910 - 0920	*Paolo Mazzetti*: Report from Breakout Session 1.2 (presentation)
0920 - 0930	*Stefano Nativi*: Report from Breakout Session 1.3 (presentation)
0930 - 1000	*Andrew Turner*: Keynote: Information Generation from Data (presentation: external, local)
1000 - 1030	*Brian Wee*: Keynote: From OpenData to OpenKnowledge: Generating Open Knowledge from Information and Data (presentation)
1030 - 1100:	*Coffee Break*
1100 - 1230:	Plenary Session 3: Creating Knowledge by Applying a New Governance, Sustainability and Economic Paradigm Chair: *Douglas Cripe*
1100 - 1130	*Kathy Fontaine*: Keynote: New Governance: The example of the Research Data Alliance (presentation)
1130 - 1200	*Jay Pearlman*: Keynote: New Business Models (presentation)
1200 - 1230	*All*: Discussion
1230 - 1400:	*Lunch*
1400 - 1530:	Breakout Sessions Block 2: Sustaining GEOSS in a Changing World See the breakout session questions for this block ...
	Breakout Session 2.1: Global and Regional Observation Networks Sustainability and Capacity Building Co-Chairs: *Senay Habtezion, Bob Chen*; Rapporteur: *Wolfgang Grabs*
1400 - 1410	*Bob Chen*: Introduction to the session (presentation)
1410 - 1430	*Lucia Lovison-Golob*: Chilean Web Services and AIP- Capacity Building activity related to Societal Benefit Areas (abstract, presentation)
1430 - 1450	*Senay Habtezion*: Case Studies on the Role of EOs in Environmental Policy Support — A Synthesis (abstract, presentation)
1450 - 1510	*Andiswa Mlisa*: ID-02 – Developing Institutional and Individual Capacity (presentations)
1510 - 1525	*All*: Discussion
1525 - 1530	*Wolfgang Grabs*: Session Summary
	Breakout Session 2.2: A sustainable GEO Information System of Systems Chair: *Lorenzo Bigagli*; Rapporteur: *Greg Yetman*
1400 - 1415	*Lorenzo Bigagli*: Introduction to the session
1415 - 1445	*David Arctur (University of Texas at Austin), Robert Arko (Lamont-Doherty Earth Observatory), Stefano Nativi (CNR, ESSI Lab), Joan Starr (California Digital Library)*: Data Citation: DOI-Enabling GEOSS Discovery and Access (abstract, presentation)
1445 - 1520	*All*: Discussion
1520 - 1530	*Greg Yetman*: Session Summary
1530 - 1600:	*Coffee Break*
1600 - 1730:	Plenary Session 4: Final Discussion, and Conclusions: Setting Priorities Co-Chairs: *Hans Peter Plag, Stefano Nativi*
1600 - 1610	*Wolfgang Grabs*: Report from Breakout Session 2.1 (summary)
1610 - 1620	*Greg Yetman*: Report from Breakout Session 2.2 (presentation)
1620 - 1640	*Douglas Cripe*: Linking the Workshop outcomes to the GEO Strategic Plan (presentation)
1640 - 1715	*All*: General Discussion, Priorities, and Declaration
1715 - 1730	*Workshop Chairs*: Final General Discussion and Priorities setting

3.6.3. 5th GEOSS Science and Technology Stakeholder Workshop. December 9-10, 2016, Berkeley, California, USA

The workshop aimed to facilitate the development of a collaborative platform where providers, scientists, and policy makers can work together in support of the 2030 Agenda for Sustainable Development. The workshop focused on specific examples, in particular those SDGs scheduled for reviewing by the High-Level Political Forum 2017. The workshop provided a forum to review the knowledge needs associated with the monitoring and implementation of the SDGs. Science communities can help to generate the required knowledge and translate it into actionable forms. Decision and policy makers engaged in the monitoring and implementation of the SDGs benefit from having improved access to applicable knowledge and knowledge-creating tools. A platform incorporating this knowledge and tool set would support building new capacity in using this knowledge for policy making and the planning of action to implement the SDGs. http://www.gstss.org/2016_Berkeley/

The objectives of the workshop were to:

- Explore approaches to linking the Earth observation communities engaged in GEO to those communities monitoring the progress towards SDG targets;
- Better understand the needs to support through observations and models the policy development for SDG target implementation;
- Discuss gaps in observation and modeling support for SDG monitoring and implementation and means to address these gaps;
- Scope a collaborative platform, which supports the co-creation of and access to the knowledge required for the implementation and monitoring of SDGs, including initial considerations of the institutional framework the platform is meant to support.

The workshop specifically focused on one or more of the SDGs scheduled to be reviewed by the High-Level Political Forum 2017 (July-10-19, 2017, UNHQ, New York, see https://sustainabledevelopment.un.org/hlpf). These are:

- Goal 1. End poverty in all its forms everywhere
- Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
- Goal 3. Ensure healthy lives and promote well-being for all at all ages
- Goal 5. Achieve gender equality and empower all women and girls
- Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

Friday, December 9, 2016

0830 - 0900:	*Registration (Room 575)*
0915 - 1100:	Session 1: Linking Societal Knowledge Needs for Sustainable Development to Transformation Knowledge (Co-Chairs: Hans-Peter Plag and Norman Miller)
0915 - 0925	*Norman Miller, University of California, Berkeley* : Welcome and Opening Remarks
0925 - 0945	*Giovanni Rum, GEO Secretariat*: Expectations to the Workshop (presentation)
0945 - 1020	*Einar Bjorgo UNOSAT Manager, UNITAR*: UNOSAT's strategy to support Agenda 2030
1020 - 1110	*Steven Hagan, Oracle*: IT Innovations Powering Future GEOSS Systems: Big Data, GeoData, Graph, Sensors, Linked Data, Knowledgebase, Cloud (presentations)
1110 - 1140:	*Coffee Break*
1140 - 1310:	Session 2: Interconnection and Interaction of SDGs (Co-Chairs: Rick Lawford and Hans-Peter Plag, Room 575)
1140 - 1210	*Hans-Peter Plag, Old Dominion University*: Challenges and Workshop Goals (presentation) Challenges: Whole-Society Effort, Process Output, Collaborative Platform
1210 - 1240	*Rick Lawford*: Introduction to SDG 2 Discussions (presentations)
1240 - 1310	*Brian Walsh, IIASA (et al.)*: Food security and SDG Nexus (abstract, presentation)
1310 - 1400:	*Lunch*
1400 - 1530:	Session 3: Monitoring Progress Towards Goals: The Information Needs and Gaps (Co-Chairs: Giovanni Rum, Argyro Kavvada, Room: 575)
1400 - 1425	*Phil Dickerson, EPA*: Air Quality
1425 - 1450	*Rick Lawford, Morgan State University*: Possible directions for integration: The WEF Nexus and SDGs (presentations
1450 - 1510	*Giovanni Rum, GEO Secretariat*: GEO's contribution in support of SDG monitoring (presentation)
1510 - 1530	*Lee Hall*: Energy MonitoringAir Quality (presentation)
1530 - 1550	*Brice Mora, Wageningen University*: Monitoring progress towards Sustainable Development Goals: the role of land use & land cover (change) monitorings (abstract, presentation))
1550 - 1610	*Panel Discussion*: Facilitating Data Integration and Aggregation at multiple Scales. Panel: Jay Pearlman, Richard Bernknopf, Brice Mora, Chair: Douglas Cripe Challenges: Air Quality, Interoperability, Data Integration and Multiple Scales
1610 - 1630:	*Coffee Break*
1630 - 1800:	Session 4: Evidence-Based Policy Options for Implementing Goals: Knowledge Needs and Gaps (Co-Chair: Jay Pearlman, Room 575)
1630 - 1645	*Jay Pearlman*: Evidence-Based Policy Options for Implementing Goals: Knowledge Needs and Gaps (presentation)
1645 - 1800	*Panel Discussion*: What are pathways to the creation of transformation knowledge? Panel: Richard Bernknopf, Brain Walsh, Mary Hill, Norman Miller, Hans-Peter Plag; chair: Juli Trtani Challenges: Whole-Society Effort, GEOSS Solution Compendium, User Engagement
1830 - 2100:	*Social Dinner (no host)*

Saturday, December 10, 2016

0830 - 0900:	*Registration*
0900 - 1030:	Session 5: Adding Models to Earth Observations (Chair: James Syvitski, Room: 575)
0900 - 0915	*James Syvitski*: Session Goals (presentation)
0915 - 0935	*Stefano Nativi*: GEOSS Activities for SDGs: Model Webs to answer "what if" questions (abstract, presentation)
0935 - 0955	*Mary C Hill (KU), Ruth Douglas Miller (KSU), Danny Rogers (KSU), and Joshua Roundy (KU)*: A Food-Energy-Water Calculator, with initial application to Western Kansas (abstract, presentation)
0955 - 1015	*Robert Barron*: Integrated Assessment Based Analysis of Sustainable Development Goal Interactions and Implementation Policies (abstract, presentation)
1015 - 1030	*All*: Discussion: Coupled Agent-Based and Equation-Based Models: Can they Produce Transition Knowledge? Challenges: GEOSS Solutions Compendium
1030 - 1100:	*Coffee Break*
1100 - 1230:	Session 6: Building Capacity for Evidence-Based Policies for Sustainable Development (Co-Chairs: Douglas Cripe, Argyro Kavvada, Room: 575)
1100 - 1115	*Douglas Cripe*: Session Goals
1115 - 1135	*Werner Balogh (presented by Douglas Cripe)*: Development of a Space Capacity Index (SCI) and a Space Solutions Compendium (SSC)
1135 - 1155	*Argyro Kavvada*: SDG Initiative: EO in Service of the 2030 Agenda and Capacity Building (presentation)
1155 - 1205	*Hans-Peter Plag*: NASA DEVLEOP: Capacity Builidng for SDG-Related Monitoring
1205 - 1230	*Panel Discussion*: Options for GEO-Facilitated Capacity Building at National, Regional, and Global Levels Panel: Argyro Kavvada, Nancy Searby, Rick Lawford, Chair: Douglas Cripe Challenges: Capacity Building and Networking, Capacity Building
1230 - 1330:	*Lunch*
1330 - 1600:	Session 7: Ideation: Seeing the world through the eyes of the SDGs (Co-Chairs: Hans-Peter Plag, Stefano Nativi, Room 575)
1330 - 1340	*Hans-Peter Plag*: Ideation: Seeing the World Through the Eyes of a SDG (presentation)
1340 - 1545	*All*: Ideation for SDG2: No Hunger - Chairs: Shelley Jules-Plag and Hans-Peter Plag
1545 - 1600	*Hans-Peter Plag and Stefano Nativi*: Summary and Outlook: Progress towards a paradigm

4. Cooperation with other activities

4.1. Collaboration with the Belmont Forum

ConnectinGEO participated in the Belmont Forum activities and will continue participating after the end of the project through Joan Masó.

ConnectinGEO participated in the Belmont Forum e-IDM Workshop (November 28-29, 2016) at the Agence Nationale de la Recherche (ANR) in Paris: http://www.bfe-inf.org/sites/default/files/doc-repository/2-6B-Maso-ConnectinGEO.pdf

The workshop was a bottom up exercise to define the priorities that the Belmond forum should finance in the next years in terms of scientific infrastructures. The focus of this priorities needed to be based on international collaboration. This priorities are being balanced with the top down priorities of the funding agencies participating in the Belmond forum

This are some of priorities defined in November:

Technical challenges:
Challenges for federated data-analysis platform
Foster international collaboration and community building towards and know-how exchanges:

- Storage and computing architecture in support of massive and complex interdisciplinary data
- Streaming data analysis workflow orchestrating perfectly parallel data processing and complex data analysis stages with pervasive provenance systems
- Network-based and provenance –based data movement between different and distributed data and computing sources honoring data an AAI policies.
- Concurrent data access and data representation for data-intensive analysis
- Adding access, data analysis and visualization services on top of the data
- Energy and green technology challenges
- Collaboration with private providers: public cloud and others.

Bring the gap between multi-type and multi-disciplinary data

- Data stewardship, data and metadata formats data exchange protocols
- Credential and interoperability at the data level
- Implementing FAIR data principles
- Structured/Unstructured data
- Dealing with and assimilating different data spatial and temporal scales
- Strengthen the use of data by and from other communities, especially socio-economical communities.

Data model inter-comparison- validation – prediction

- Identify transnational expertise and beacons of good practices
- From model to coupled models framework
- Bridging scientific-driven and policy-driven concerns into a framework
- Extension to other socio-economic and health issues
- Foster standardization of protocols and methods across disciplinary

Interdisciplinary and trans-disciplinary projects where

- Big data and 4Vs issues with multi-type and multi-disciplinary data are present
- Findable , accessible, Interoperable Reusable Data concepts are present
- Data management and Data stewardship are present

4.2. Collaboration with OGC

4.2.1. ConnectinGEO contribution for the Energy Societal Benefit Area in the GEOSS Architecture Implementation Pilot – Phase 8 (AIP-8)

The AIP-8 contribution extended the existing GEOSS Webservice-Energy SDI (Spatial Data Infrastructure) to provide the GEO Energy community with access to in-situ measurements. The platform developed allows to:

- Visualize sensor locations on a map.
- Visualize measurements as time series plots and in tabular form.
- Display sensor metadata at different levels of detail.
- Download raw observation data for offline processing.

In order for data providers to leverage their efforts of releasing SSI in-situ measurements, the Sensor Web infrastructure enables a "search and discovery" mechanism of such measurements. This "search and discovery" mechanism provides by referencing all SSI in-situ measurement into an OGC compliant CSW (Catalog Service for the Web) catalog. This catalog allows both human user-friendly searches through a Web based graphical user interface (GUI) as well as machine to machine distributed operations for back-office processes. This catalog is weekly harvested by the DAB (Discovery and Access Broker) and consequently its content is accessible via the GWP (Geo Web Portal).

http://insitu.webservice-energy.org [/jsClient-0.2.0]

4.2.2. OGC-User Feedback Standard Working Group

The Open Geospatial Consortium (OGC®) announced the formation of a new OGC Technical Committee Standards Working Group (SWG). The purpose of this SWG is to explore and propose terms for a standard to enable interoperability between user feedback annotations and services. The charter is available here (https://portal.opengeospatial.org/files/57200).

The GeoViQua User Feedback Model offers a starting point for this discussion. There, the primary SWG focus is to develop a common conceptual model that will serve the purposes of creating encodings.

The GUF SWG consists of interested parties from across a broad range of the geosciences, academic institutions, and commercial and government organizations that are involved with or interested in improving metadata catalogues and discovery portals (generic or thematic) that are interested in providing better (and relevant) results and comparison capabilities based on user feedback. This is not meant as a limiting statement but instead is intended to provide guidance to interested potential participants as to whether they wish to participate in this SWG.

4.3. Collaboration with SoDa Service (solar radiation)

The SoDa Service is a broker to a list of services and webservices, i.e. it offers a one-stop access to a large set of information relating to solar radiation and its use. This is an Intelligent System (SoDa-IS) that builds links to other resources that are located in various countries. To answer a request, the SoDa service invokes several resources to elaborate the appropriate answer and ensures the flow and exchange of information between the services and itself, as well as with the customer.

ConnectinGEO participated in the FREE TRAINING IN SOLAR RADIATION - SESSION 2016 (27-28-29 Jan. 2016 - Sophia-Antipolis):

Friday 29th January 2016. 09:30 – 10:45. "Europe through the ConnectinGEO project funded under the Horizon 2020 program supports future developments for exchange and dissemination of in situ measurements - SOS, standards and interoperability - Discussion"

https://youtu.be/p-NCtwkGlZg

4.4. Cooperation with ECSA

ConnectinGEO collaborated with the First International ECSA Citizen Science Conference 2016 (19–21 May 2016, Berlin), aimed at policy makers, science funders, scientists, practitioners in the field of citizen science, Non-Governmental Organisations and interested citizens. This trans-disciplinary conference highlighted, demonstrated and debated the innovation potential of citizen science for science, society and policy, and its role within open science and innovation.

CREAF, ConnectinGEO's coordinator, is member of ECSA since 2015, so cooperation will be continued after the end of the project.