

## **GEO Work Programme 2017-2019 Application**

### **GEO Initiative on Land Degradation Neutrality**

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## *Executive Summary*

In order to halt and reverse the current trends in land degradation, there is an immediate need to enhance national capacities to undertake quantitative assessments and corresponding mapping of their degraded lands, as required by the Sustainable Development Goals (SDGs), the SDG indicator 15.3.1 (“proportion of land that is degraded over total land area”) and by the adoption of Land Degradation Neutrality (LDN) targets under the auspices of the United Nations Convention to Combat Desertification (UNCCD).

A coordinated response from the geospatial community to this need would greatly assist countries in setting policy, planning and investment priorities among diverse land resource areas in order to make progress towards multiple SDGs. SDG indicator 15.3.1, for which the UNCCD is the custodian agency, is being estimated using three sub-indicators (i.e., land cover, land productivity and carbon stocks) that rely, to a large extent, on Earth Observations (EO) and geospatial information.

In September 2017, the UNCCD’s 13th Conference of the Parties (COP.13) adopted various decisions related to SDG indicator 15.3.1, most notably decision 9/COP.13 on “Promotion and strengthening of relationships with other relevant conventions and international organizations, institutions and agencies” which:

*Invites the Group on Earth Observations to support the efforts of Parties to the UNCCD in implementing the Convention by providing space-based information and in situ measurements to assist countries in fulfilling the reporting requirements for Sustainable Development Goal indicator 15.3.1 and fostering data access, national data capacity-building and the development of standards and protocols;*

The Group on Earth Observations (GEO), in collaboration with the Committee on Earth Observation Satellites (CEOS), is well positioned to assist the UNCCD and its contracting parties with the rapid provision and deployment of EO datasets, country support, capacity building and training, and EO tools and platforms so that countries can effectively monitor and report on SDG indicator 15.3.1 every four years starting in 2018 as well as to support longer term efforts to develop international standards and protocols on LDN and land degradation monitoring.

A GEO Initiative on LDN will assist countries and regions with monitoring and reporting necessary to implement and achieve SDG 15, “Life on Land”. The data and reporting protocols developed would be accessible in the Global Earth Observation System of Systems’ Common Infrastructure (GCI) and prove useful to other GEO Initiatives, including GEOBON, GEOGLAM and the Earth Observations for Ecosystem Accounting Initiative. The space-based information and *in situ* measurements provided to countries from this proposed Initiative are fundamentally linked to many other areas of the GEO work programme, its Strategic Plan 2016-2025 and global priorities on sustainable development, climate action and disaster risk reduction. While this proposed Initiative will be global in scope, participants and contributors may wish to leverage their regional strengths in alignment with regional GEO initiatives, and in terms of expertise and financing.

## 1. Synopsis of objectives and benefits

A GEO Initiative on LDN would be a major contributing factor in successfully assisting countries, at every level of development, to create the monitoring infrastructure necessary to support efforts and policies to combat land degradation, thereby contributing directly to GEO' s strategic objective 3.

The UNCCD as the custodian agency for SDG indicator 15.3.1 and its resource mobilization institution (the Global Mechanism) as the executing agency for the LDN target setting programme (LDN-TSP), are already actively involved with some GEO members and Participating Organizations (POs) in implementation at the national level. As a result, the overarching terms of reference and good practice guidance for and the expected benefits of this GEO Initiative on LDN have already been established. Given the level of ambition to monitor and report on land degradation at the national level in a manner that is timely and policy-relevant while at the same time ensuring national ownership, this proposed Initiative would serve to fill critical gaps.

The assets of the GEO community for this proposed Initiative would be utilized specifically to (1) leverage its convening power to turn information into knowledge and package it as user-centric tools, applications and services; (2) identify existing data and information gaps; (3) mobilize action to reduce these gaps by empowering countries and organizations to strengthen and develop their own capacities through the leveraging of technical assistance and increased access to EO datasets and products; and (4) link to relevant socio-economic data through partnerships in order to provide enhanced information for decision-making.

The **strategic objectives** of the GEO Initiative on LDN are to:

- 1) **Facilitate access to space-based information and *in-situ* measurements** for the three sub-indicators, namely changes in land cover, land productivity and carbon stocks. Effective reporting of SDG indicator 15.3.1 will require the use of multiple types and sources of data, such as those generated at national and sub-national levels as well as new sources of data outside of national statistical systems, such as global and regional geospatial data sets, including EO data sets. The complementarity, integration and harmonization of available geo-referenced data will help increase the accuracy of change detection in the sub-indicators and significantly reduce the costs of monitoring and reporting on the indicator, at the same time increasing policy relevance.
- 2) **Provide advice, tools and training to build national capacities:** This includes review and advice on selecting the appropriate data and information that is most applicable to national circumstances. It is vital that the training and technical solutions are practical and self-sustaining and that they address the size and complexity of the data selected for each country. Training on the use of available tools for accessing, processing, analyzing and interpreting data as well as validation techniques would ideally be done in collaboration with National Statistical Offices (NSOs), specialized agencies and the “main reporting entity” for the indicator.
- 3) **Assist with the further development of international standards and protocols for the indicator:** As SDG indicator 15.3.1 relies largely on geospatial information and digital data from various sources, it adheres to ISO 19115-1:2014 which defines the schema required for describing

geographic information and services by means of metadata. There is an existing international standard for the sub-indicator on land cover (ISO 19144-2:2012) which includes the Land Cover Meta Language (LCML): a common reference structure, used by the System of Environmental-Economic Accounting (SEEA), for the comparison and integration of data for any generic land cover classification system. The international standard for calculating NPP ( $\text{gC}/\text{m}^2/\text{day}$ ), the metric used for land productivity, from remotely-sensed, multi-temporal surface reflectance data, accounting for the global range of climate and vegetation types, was established in 1999 by the U.S. National Aeronautics and Space Administration (NASA) in anticipation of the launch of the Moderate Resolution Imaging Spectroradiometer (MODIS) sensor. For carbon stocks, IPCC (2006) contains the most relevant definitions and standards, especially with regard to reference values applicable for Tier 2 and 3 Greenhouse Gas (GHG) reporting. In this regard, the technical soil infrastructure, data transfer and provision of national reporting data is also standards-based.

The **strategic activities** of the GEO Initiative on LDN will focus on:

- 1) **Building capacity at the country level and ensuring national ownership of EO and *in-situ* measurements** will involve the preparation of curriculum and training sessions on the use of practical tools to support countries in accessing, interpreting and validating this data for UNCCD national reports, which in turn will inform reporting on SDG indicator 15.3.1 at the regional and global level (Strategic Objectives 1 and 2).
- 2) **Developing international standards and protocols** will be advanced by the establishment of federated collaborative platforms with high computing capacities and big data analytics tools (e.g., EO data cubes) that would allow countries to easily select, access, process, analyze, interpret and quality control large datasets associated with EO and geospatial information. (Strategic Objective 3).

The ultimate goal of this proposed Initiative is the delivery of information and services to users by specifically building national capacities for accessing, processing and utilizing data in multiple policy contexts. In this regard, halting and reversing land degradation trends will help deliver multiple SDGs, climate action in terms of enhanced carbon sequestration and reduced emissions, and increased resilience to slow onset disasters.

## 2. Relationship to previous developments and results

The GEO Land Cover (LC) and Land Cover Change (LCC) task works to improve the availability and quality of LC and LCC data by helping to convene and coordinate the various sectors of the LC community, including data providers and consumers. The GEOBON, GFOI and GEOGLAM initiatives are actively participating in global efforts to help classify land cover relevant to the communities served by these initiatives. This proposed Initiative, with a specific policy mandate provided by the UNCCD's governing body and the 2030 Agenda for Sustainable Development, would focus on a specific set of EO tools to facilitate long-term reporting on land degradation with the aim of improving ecological and human well-being, thereby also contributing to the "Earth Observations in Service of the 2030 Agenda for Sustainable Development" initiative.

The initiative and all data produced by its partners are not only for reporting (e.g. on indicator 15.3.1), but most importantly will serve countries as input for policies and sound decision making for sustainable land use management. Synergies with other global frameworks/reporting systems; Sendai, Aichi, Climate/AFOLU/REDD+ and other SDG indicators) are in the long run, the objective and must support countries towards integrated cross sectoral land monitoring systems. As an integral part of this activity, GEO will seek and take advantage of synergies across its work programme (GFOI, GEOGLAM, GEO-BON, etc.).

In 2014-2015, 14 countries participated in the UNCCD's LDN pilot project<sup>1</sup> to implement the target setting approach, including the use of the methodology and data options for reporting on the three sub-indicators. All of the countries established baselines based on these sub-indicators, either by using national data and/or global default data provided by the UNCCD and its partners. This pilot project demonstrated the importance of upfront technical assistance and country-tailored advisory services for overcoming data analysis challenges and barriers.

Launched in 2016, the LDN-TSP<sup>2</sup> is now supporting 114 participating countries and their national LDN working groups, which are comprised of representatives from key stakeholders across sectors (including ministries, civil society, research, private sector and development partners), in reviewing and validating LDN baselines and targets. While the members of these working groups are diverse in their areas of expertise, there is a need to increase representation from National Statistical Organizations (NSOs) and build more capacity for accessing, processing, interpreting and validating EO data and geospatial information as well as alternative data sources in order to establish baselines to monitor and report on the indicator. As of December 2017, over 60 of the 114 countries<sup>3</sup> participating in the LDN-TSP have established and validated a baseline for the indicator. A number of regional and national workshops and meetings have been conducted since 2016 and more are planned for 2018.

The UNCCD COP.13 also endorsed a LDN conceptual framework which underpins a universal methodology for estimating SDG 15.3.1 indicator.<sup>4</sup> At the global level, the UNCCD leads an inter-agency advisory group<sup>5</sup> that has produced Good Practice Guidance<sup>6</sup> for (1) measuring and evaluating changes in each of the three sub-indicators, and (2) estimating and reporting on SDG indicator 15.3.1. The SDG indicator 15.3.1 and its sub-indicators are included in the UNCCD's national reporting templates for 2018 and every four years thereafter.<sup>7</sup>

As noted above, at least four GEO initiatives will benefit from the strategic activities undertaken to support the monitoring of SDG indicator 15.3.1 and its sub-indicators. In addition, the SDGs have catalyzed numerous long-standing communities of experts and practitioners to reach agreement and

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<sup>1</sup> <http://knowledge.unccd.int/knowledge-products-and-pillars/ldn-target-setting-building-blocks/lessons-learned-14-pilot-4>

<sup>2</sup> <http://www2.unccd.int/actions/ldn-target-setting-programme>

<sup>3</sup> <http://www2.unccd.int/actions/ldn-target-setting-programme>

<sup>4</sup> [http://www2.unccd.int/sites/default/files/documents/2017-08/LDN\\_CF\\_report\\_web-english.pdf](http://www2.unccd.int/sites/default/files/documents/2017-08/LDN_CF_report_web-english.pdf)

<sup>5</sup> Including the Food and Agriculture Organization of the United Nations (FAO), United Nations Statistics Division (UNSD), United Nations Environment (UNEP), United Nations Framework Convention on Climate Change (UNFCCC) and Convention on Biological Diversity (CBD).

<sup>6</sup> <http://bit.ly/2zMAvK6>

<sup>7</sup> [http://www2.unccd.int/sites/default/files/sessions/documents/2017-09/ICCD\\_CRIC%2816%29\\_L.3-1715758E.pdf](http://www2.unccd.int/sites/default/files/sessions/documents/2017-09/ICCD_CRIC%2816%29_L.3-1715758E.pdf)

take specific action to address the national reporting requirements for universal reporting under the SDG indicator framework. This would include close collaboration with the work being done of Systems of Environmental-Economic Accounting (SEEA) and the OECD's Green Growth Headline and Core Set of Environmental Indicators. In terms of the Paris Agreement, improving the accuracy of carbon stock estimates would allow for better monitoring of Nationally Determined Contributions (NDCs). Leadership and engagement in this initiative will further reinforce GEO's role in global, regional, national and community scale monitoring and expert processes to set standards and specifications for EO land products and related natural resources observations.

### 3. Participants/contributors

The following have been identified as potential participants and contributors to the proposed GEO Initiative on LDN. This draft is being shared with the GEO principles representing the below to ascertain their overall willingness to participate in the proposed initiative and serve on the Implementation Committee and its subsidiary bodies, and specifically their commitments to:

- (1) In-kind contributions, such as those specified in the budget allocations of participants;
- (2) Initiative-specific funding, such as voluntary contributions or secondments to the GEO secretariat; or
- (3) The provision of technical expertise and resource persons for
  - Management and governance of the Initiative
  - Data access, processing, tools, training and products
  - Capacity building at the national level
  - Development of standards and protocols

**GEO members:** Australia, EC, Germany, Sweden, India, China, Bahrain, Brazil, Canada, Mexico, United States, South Africa, Senegal, Uganda, Ghana

**CEOS members:** ESA, NASA, JAXA, SANSa, ISRO, INPE, DLR

**GEO POs:** CEOS, CI, FAO, Future Earth, OSS, OECD, UNCCD, UNEP, UNOOSA, JRC, World Bank

**Others:** GIZ, DFID, JICA, USAID, ISRIC

#### **Here GEO members/POs are invited to describe the level and kind of participation and contribution**

The Center for Remote Sensing of Land Surfaces (ZFL) of the University of Bonn will contribute to the GEO LDN initiative as follows:

1. Provide scientific and methodological expertise and advice.
2. Align current and future ZFL research activities and projects with the implementation plan and goals of the initiative.
3. Contribute to working groups of the initiative and participate in meetings and events.

The German development agency (GIZ) can offer within the GEO-LDN initiative:

1. Contribution to the development of curricula with focus on the use of data for land use planning and spatial planning;
2. Integration of an introductory module on economics of land degradation (ELD).
3. In addition we can offer to advise 1-2 developing countries, which are showing particular commitment within the GEO-LDN initiative and which are seeking assistance for further innovative steps in the context of LDN.
4. University Bonn, ZFL (PoC: odubovyk@uni-bonn.de, cc Adrian.Strauch@uni-bonn.de) has relevant research and development projects on Land Degradation and Drought monitoring, that could be linked to the project (e.g. GlobeDrought and EVIDENZ).
5. The United Nations University EHS in Bonn (PoC: walz@ehs.unu.edu) has several research projects that are linked to land degradation from a perspective of disaster risk assessment and management. They are interested in research on land vulnerability and drivers of land degradation from a social-ecological systems. They are also involved in EVIDENZ and GlobeDrought, but also have other relevant projects, such as Telepath and Wascal.
6. The German Aerospace Center DLR (PoC: Uta.Heiden@dlr.de, Ursula.Gessner@dlr.de) works on innovative remote sensing methods for large scale landcover/landuse change, land productivity and land degradation.

Suggested Contributions provided by OECD

- Share expertise and provide feedback from the use of LC datasets, communicate emerging demands for data and information from global land monitoring to data providers, and articulate the “user needs” for development of new data products.
- We could also consider participating in the GEO-LDN Working Group on International Standards. Although the terms of reference of this WG remain to be fully defined, we would like to propose that they include guidance on the desired attributes and quality characteristics of LC datasets that would better meet the users’ varied needs (e.g. spatial, temporal and thematic resolution and consistency of LC measurement, associated uncertainty metrics, etc).
- Share with GEO members OECD’s policy advice to address land-related challenges (including LDN) drawing on the relevant items in OECD’s programme of work and promote them in OECD products and processes. The OECD could consider participating in relevant GEO workshops or meetings related to policy applications of land cover data, and could in turn help disseminate results of the GEO-LDN Initiative via its network.

## 4. Description of activities

### Capacity Building for National Reporting

Regional capacity building workshops to support UNCCD national reporting, which includes the SDG indicator and sub-indicators, will be organized in early 2018 under the auspices of the Global Support Programme (“Strengthening UNCCD reporting –enhancing implementation of the UNCCD”) which is funded by the Global Environment Facility (GEF) and executed by the Global Mechanism of the UNCCD. Synergies with other global frameworks/reporting systems; Sendai, Aichi, Climate/AFOLU/REDD+ and other SDG indicators) will be included as a part of the strategic context for the knowledge imparted in these workshops. The workshops will enable countries to prepare and submit UNCCD national reports by mid-2018, which in turn will inform SDG reporting<sup>8</sup> at the regional and global level in February 2019. Workshop participants will include UNCCD national focal points and designated representatives of national statistical offices. The geographical scope of these regional capacity building efforts will be global and include all UN Member States, with a focus on countries with developing and emerging economies.

While the proposed Initiative is being formally established according to GEO protocols and procedures, the UNCCD will continue to collaborate informally with GEO members and POs. Once the GEO Initiative on LDN has been formally adopted, there will likely be opportunities to follow up on these workshops and provide targeted assistance throughout 2018 as well as to advise the UNCCD secretariat in its regional and global aggregation of data for reporting to UN Secretary General in February 2019. The Implementation Committee (see below) will develop a capacity building work plan for 2019-2022 to increase the country coverage and the level of confidence in the indicators among national authorities.

### Integration with the GEO GCI

As a part of the on-going efforts to integrate SDG reporting into the GCI, Application Program Interfaces (API’s) will be established with the UNCCD secretariat to ensure that reporting data can be accessed through the GCI. The GEO and UNCCD secretariats will initiate the necessary consultations to implement this access capability.

### Development of International Standards

The pathway for developing an international standard for monitoring and reporting on land degradation (and the sub-indicators) will be developed by the Implementation Committee in consultation with external experts. This will be a long term strategic activity involving numerous global consultations. One possible approach would be to build upon the existing ISO standards for “Good practices framework for combatting land degradation”,<sup>9</sup> the Land Cover Meta Language (LCML)<sup>10</sup> and the international standard for calculating NPP established in 1999 by the U.S. NASA.<sup>11</sup> For carbon stocks, IPCC (2006) contains the

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<sup>8</sup> [http://www2.unccd.int/sites/default/files/sessions/documents/2017-09/ICCD\\_CRIC%2816%29\\_L3-1715758E.pdf](http://www2.unccd.int/sites/default/files/sessions/documents/2017-09/ICCD_CRIC%2816%29_L3-1715758E.pdf)

<sup>9</sup> <https://www.iso.org/obp/ui/#iso:std:iso:14055:-1:ed-1:v1:en>

<sup>10</sup> <https://www.iso.org/standard/44342.html>

<sup>11</sup> Running et al. 1999. MODIS Daily Photosynthesis (PSN) and Annual Net Primary Production (NPP) Product (MOD17): Algorithm Theoretical Basis Document [https://eosps0.gsfc.nasa.gov/sites/default/files/atbd/atbd\\_mod16.pdf](https://eosps0.gsfc.nasa.gov/sites/default/files/atbd/atbd_mod16.pdf)

most relevant definitions and standards, especially with regard to reference values applicable for Tier 2 and 3 GHG reporting.<sup>12</sup>

In UNCCD decision 22/COP.11, soil organic carbon (SOC) stock was adopted as the metric to be used with the understanding that this metric will be replaced by total terrestrial system carbon stocks, once operational. Information on the distribution of SOC was delivered to the UNCCD by ISRIC World Soil Information as a baseline for the SDG indicator 15.3.1. The SOC product is a remote sensing product, which is derived based on remote sensing data (MODIS) used in combination with machine learning algorithms and historic SOC field observations to derive the prediction of the SOC content and stocks. Future SOC assessments could follow a similar approach based on updated MODIS data and field measurements. The Implementation Committee could decide to take up the responsibility for facilitating delivering such a product in collaboration its members and participating organizations and ISRIC World Soil Information Centre.

#### Engagement with the Research & Development, Academic Community

The Initiative will include actions, including active recruitment of academic, R&D partners and institutions to provide expert input. The value of university general Earth science, data and data analytic techniques will be exploited in ways to both help national governments meet their conservation objectives and also as a demonstration instance translating R&D into policy and operations.

#### **5. Involvement of end-users**

The “community” in this proposed Initiative consists primarily of national governments and their National Statistical Offices (“main reporting entity” for the SDG indicators), and any sub-national entities or specialized agencies that are validating and reporting data for the UNCCD and SDG reporting processes. Advice and expert input from private sector, university R&D and civil society will also inform progress and priorities. The proposed Initiative will build upon the national working groups established in the framework of the LDN TSP in 114 countries and, from there, mobilize and strengthen the engagement of other countries.

Data, information, tools and trainings developed by the proposed Initiative will be tailored to meet the needs of decision makers for monitoring progress towards a number of global/regional targets and initiatives to halt and reverse land degradation and restore degraded land. Starting in 2010, these include the Aichi Biodiversity Targets, one of which aims to restore at least 15% of degraded ecosystems; the Bonn Challenge and its regional initiatives to restore more than 150 million hectares; and most recently the SDGs.

This initiative will assist with the rapid provision and deployment of EO datasets and promote in-country analysis and interpretation of those data sets, thereby ensuring national ownership.<sup>13</sup> The initiative will

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<sup>12</sup> IPCC. 2006. *ibid*

<sup>13</sup> United Nations General Assembly. 2015. Transforming our world: the 2030 Agenda for Sustainable Development. Resolution adopted by the General Assembly on 25 September 2015 (A/RES/70/1).

leverage the UNCCD reporting mechanism and tools,<sup>14</sup> which provide a practical and harmonized approach to monitoring and reporting beginning in 2018<sup>15</sup> and every four years thereafter.<sup>16</sup> The quantitative assessments and corresponding mapping at the national level, as required by this indicator, would help countries to set policy and planning priorities among diverse land resource areas, in particular:

- to identify hotspots and plan actions of redress, including through the conservation, rehabilitation, restoration and sustainable management of land resources; and
- to address emerging pressures to help avoid future land degradation.

## 6. Planning, including specific milestones and deliverables

### Nov 2017 – Jan 2018

- Drafting of Initiative Application and Implementation Plan
- Consultation with core group of existing partners
- Recruitment of GEO members and POs
- Submission of application to the GEO Programme Board

### Feb-Apr 2018

- Formalize governance structure and establish the Implementation Committee
- Participation in the UNCCD's regional workshops to build national capacities

### May 2018

- First meeting of the Implementation Committee (back to back with the GEO Work Programme Symposium in Geneva)
- Draft Work Programme for the GEO Initiative on LDN
- Establish subsidiary bodies as appropriate (e.g., Standards Working Group, Capacity Building Working Group)

### Jun-Dec 2018

- Follow up to the regional workshops with targeted assistance
- Development of progress report for GEO Plenary (November 2018 in Kyoto)
- Formulate work plans for subsidiary bodies
- Consultations with UNCCD secretariat on APIs as well as regional and global reporting
- Public presentation of results (e.g., World Data Forum, Global Landscape Forum)

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<sup>14</sup> [http://www2.unccd.int/sites/default/files/sessions/documents/2017-08/ICCD\\_CRIC%2816%29\\_INF.1%20-advance.pdf](http://www2.unccd.int/sites/default/files/sessions/documents/2017-08/ICCD_CRIC%2816%29_INF.1%20-advance.pdf)

<sup>15</sup> [http://www2.unccd.int/sites/default/files/sessions/documents/2017-09/ICCD\\_CRIC%2816%29\\_INF.1-1714762E.pdf](http://www2.unccd.int/sites/default/files/sessions/documents/2017-09/ICCD_CRIC%2816%29_INF.1-1714762E.pdf)

<sup>16</sup> [http://www2.unccd.int/sites/default/files/sessions/documents/2017-09/ICCD\\_CRIC%2816%29\\_L.3-1715758E.pdf](http://www2.unccd.int/sites/default/files/sessions/documents/2017-09/ICCD_CRIC%2816%29_L.3-1715758E.pdf)

Jan-Jun 2019

- Report to the UNSD database, ECOSOC and the UN Secretary General reports, including storylines
- Working group consultations and revised work plans
- Annual progress report on the implementation of the GEO Initiative on LDN

## 7. Data management & data policy

National data on the three sub-indicators is and can be collected through existing sources (e.g., databases, maps, reports), including participatory inventories on land management systems as well as remote sensing data collected at the national level. Datasets that complement and support existing national indicators, data and information are likely to come from multiple sources, including statistics and estimated data for administrative or national boundaries, ground measurements, Earth observation and geospatial information. A comprehensive inventory of all data sources available for each sub-indicator is contained in the Good Practice Guidance for SDG Indicator 15.3.1. The most accessible and widely used regional and global data sources for each of the sub-indicators are briefly described here.

**1) Land cover and land cover change data** are available in the:

**(1) ESA-CCI-LC,**<sup>17</sup> containing annual land cover area data for the period 1992-2015, produced by the Catholic University of Louvain Geomatics as part of the Climate Change Initiative of the European Space Agency (ESA); or

**(2) SEEA-MODIS,**<sup>18</sup> containing annual land cover area data for the period 2001-2012, derived from the International Geosphere-Biosphere Programme (IGBP) type of the MODIS land cover dataset (MCD12Q1).

**2) Land productivity data** represented as vegetation indices (i.e., direct observations), and their derived products are considered the most independent and robust option for the analyses of land productivity, offering the longest consolidated time series and a broad range of operational data sets at different spatial scales. The most accurate and reliable datasets are available in the:

**(1) MODIS data products,**<sup>19</sup> averaged at 1 km pixel resolution, integrated over each calendar year since 2000; and

**(2) Copernicus Global Land Service products,**<sup>20</sup> averaged at 1 km pixel resolution and integrated over each calendar year since 1998.

**3) Soil organic carbon stock data** are available in the:

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<sup>17</sup> <https://www.esa-landcover-cci.org/>

<sup>18</sup> <https://modis.gsfc.nasa.gov/data/dataproduct/mod12.php>

<sup>19</sup> <https://modis.gsfc.nasa.gov/data/dataproduct/mod13.php>

<sup>20</sup> <http://land.copernicus.eu/global/>

**(1) Harmonized World Soil Database (HWSD), Version 1.2,**<sup>21</sup> the latest update being the current de facto standard soil grid with a spatial resolution of about 1 km; and

**(2) SoilGrids250m,**<sup>22</sup> a global 3D soil information system at 250m resolution containing spatial predictions for a selection of soil properties (at six standard depths) including SOC stock (t ha<sup>-1</sup>).

**(3) GSOC Map,**<sup>23</sup> the Global Soil Organic Carbon Map of the Global Soil Partnership of FAO.

In the absence of, to enhance, or as a complement to national data sources, good practice suggests that the data and information derived from global and regional data sets should be interpreted and validated by national authorities. The most common validation approach involves the use of national, sub-national or site-based indicators, data and information to assess the accuracy of the sub-indicators derived from these regional and global data sources. This could include a mixed-methods approach which makes use of multiple sources of information or combines quantitative and qualitative data, including the ground-truthing of remotely sensed data using Google Earth images, field surveys or a combination of both. The regular collection of in situ data is crucial for the validation of the three sub-indicators. Validation is important to allow proper assessment of the accuracy and precision of all three sub-indicators.

This proposed Initiative will promote GEO principles and implementation guidelines on data sharing and data management. As a singular new example, this proposed Initiative would be directly engaged and responsive to various multilateral environmental agreements and global initiatives for reporting on land degradation (and restoration). Data accessibility will be governed by GEOSS data sharing principals, including the development of formats that can be accessed by the GCI and hence all GEOSS data users. Although an open distributed model is anticipated, the envisioned access will enhance the holdings of the GEOSS Data CORE. The proposed Initiative will work with the GEO Earth Observations for the SDGs (EO4SDG) Initiative and others to reference this data in data cubes at the national level as they are developed.

## 8. Risk assessment

There are no substantive technical risks to implementation of this proposed Initiative recognizing that building national capacities for reporting on the indicators remains a challenge. Thus, capacity development is the key strategic objective of this proposed Initiative along with the development of international standards necessary to ensure confidence in the use of EO datasets.

## 9. Management and governance

The GEO Initiative on LDN is expected to have the following organizational structure:

- Implementation Committee (i.e. 9 members)

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<sup>21</sup> <http://www.fao.org/soils-portal/soil-survey/soil-maps-and-databases/harmonized-world-soil-database-v12/en/>

<sup>22</sup> <https://www.soilgrids.org/>

<sup>23</sup> <http://www.fao.org/global-soil-partnership/pillars-action/4-information-and-data/global-soil-organic-carbon-gsoc-map/en/>

- Chair and vice-chair elected every 3 years
- Secondments to GEO (in Geneva) to act as the secretariat for the Initiative
- Technical Advisory Group (i.e. 15 members, some from outside the GEO community)
- Working Groups (2 to start): capacity building and international standards

The Implementation Committee members will be nominated by the GEO Member Countries and POs participating and contributing to the Initiative. Once established the Implementation Committee will elect a Chair and Vice-Chair to facilitate and establish consensus on the work to be undertaken by the Initiative. Members of all bodies will be selected with due consideration of gender and geographical balance. The formal governance structure and means of communication shall be established in 2018 upon approval of the Initiative, and then revised as appropriate during the consolidation phase in 2019.

## 10. Summary of committed resources and annual budget

The implementation of the GEO initiative on LDN relies significantly, though not exclusively, on in-kind contributions from existing observing capacities, networks, expertise, staff time, interoperability arrangements and standards, datasets, information systems, user services, projects and capacity building programmes. The Initiative will focus on leveraging existing capacities and streamlining existing programmes and funding schemes for EO land products, platforms and tools to take advantage of multiple, existing or upcoming capacities. These include but are not limited to:

- The Copernicus space segment including the Sentinel series of satellites which for example provide raw data to the European Space Agency's (ESA) Climate Change Initiative on Land Cover (CCI-LC), the various vegetation indices and relevant data layers used to estimate net primary production and land productivity dynamics by the Joint Research Centre of the European Commission
- Other space borne resources from national space agencies collaborating through the Committee on Earth Observation Satellites (CEOS) and other global initiatives;
- In-situ data and modelling resources
- Information products from the Copernicus core services for monitoring land, oceans, atmosphere, climate, for security services, emergency response and humanitarian aid;
- Additional processes and products from agencies and organizations such as the European Space Agency (ESA), Conservation International (CI), Organization for Economic Cooperation and Development (OECD), Food and Agriculture Organization of the United Nations (FAO), United Nations Statistics Division (UNSD), etc.
- Research & innovation resources and projects related to geo-spatial information and Earth sciences;
- Other resources, such as data processing capacities, specific data sources, and information technologies for validation and verification made available through the involvement of the commercial sector, such as the google.

The GEO initiative on LDN provides an opportunity to reinforce GEO engagement and commitment to supporting countries in monitoring and reporting on the multi-lateral environmental agreements and the land-based targets in the SDGs. The administration and management of the Initiative will rely on staff resourcing contributions (e.g., secondments based at the GEO offices) by the GEO member countries, the European Commission and GEO POs. In addition to these in-kind contributions, during the period 2018-2019, the UNCCD will spend approximately USD 2 million from GEF Global Support Programme, and approximately another 2 million from voluntary contributions on LDN implementation and reporting.