**Committee on Earth Observation Satellites (CEOS)**

**Land Surface Imaging Virtual Constellation (LSI-VC)**

**Terms of Reference (ToR)**

Satellites with instruments that image the land surface have been in operation since 1972. Numerous land remote sensing instruments are now in operation across many space agencies, many of which are represented in CEOS. Data volumes are large with an ever increasing depth of time series, but they are also cross-cutting amongst various societal benefit domains, providing valuable information across many of the Group on Earth Observations (GEO) societal benefit areas. Remotely sensed observations acquired from satellites are fundamental to understanding Earth system functioning and the effects of natural and human-induced changes on the global environment. They provide frequent and comprehensive observations across large terrestrial areas which contribute to notably improve observation capacity and thereby Earth science and monitoring programs. This presents great opportunities along with enormous challenges to use these assets to serve many different domains. These include:

* Optimizing the use of these assets to maximize global coverage and minimize important data gaps
* Making it easier for users to interact with such vast amounts and diversity of collected data, challenged by the ever increasing depth of satellite imagery collections over time
* Supporting downstream users to better enable them to seamlessly utilize the data generated from these various systems

**Purpose and Objective:**

The Land Surface Imaging Virtual Constellation (LSI-VC) exists to provide within CEOS an overarching coordination role for land imaging activities.

The LSI-VC aims to optimize the use of existing and future assets to better meet user needs in the following ways:

* Promotes sustained and systematic collection of satellite-derived land surface imaging observations
* Promotes program efficiency, increases resilience and redundancy in data provisioning, and avoids overlap and duplication
* Identifies current and potential data gaps (both in terms of geography and in land monitoring requirements)
* Coordinates production of fundamental, non-domain specific, measurements derived from those observations (e.g. surface reflectance, land surface temperature)
* Facilitates maximum utilization of land surface imaging observations and the fundamental measurements derived therefrom across domains, supporting all those who develop products and systems for specific domains

**Responsibility:**

The responsibility of the LSI-VC is to facilitate coordinated and optimized land surface imaging contributions from CEOS agencies to enable access to fundamental measurement products in support of confirmed/validated requirements linked to adopted CEOS priorities. These priorities are typically derived from key stakeholders, such as UN agencies/programs and GEO.

**Scope of Space Assets Concerned:**

All CEOS member instruments that generate data that can characterize the land surface and the organic and inorganic material on it are deemed to be in scope. This includes space-based remote sensing instruments operating in the visible, infrared, and microwave portions of the electromagnetic spectrum.

The LSI-VC will work with satellite operators with commercial or semi-commercial models, noting that it is better that an observational gap is filled by such data than not, since data policies can change.

**Scope of Activities:**

The scope of LSI-VC activity includes, but is not limited to:

* Assessing land surface imaging data requirements, identifying the fundamental measurements that are required from land surface imaging assets to meet them, and undertaking gap analyses
* Coordinating mission development to ensure the overall set of space assets is optimized, within the supplying organizations’ abilities and constraints, to support the overall package of validated data requirements
* Coordinating, based on inputs received from CEOS Working Groups and ad hoc teams, periodic acquisition planning to optimize asset use and help facilitate the resolution of conflicts between competing requirements, while promoting resiliency and redundancy
* Coordinating the retrieval and reprocessing of historical products to fill gaps in archives where required to support validated time series analysis
* Coordinating (along with the CEOS Working Group on Calibration and Validation (WGCV)) the implementation of consistent calibration and pre-processing approaches so that observation data are used to produce comparable fundamental measurement products for user benefit
* Coordinating the implementation of operational CEOS land surface imaging capabilities (such as those being developed by the CEOS Systems Engineering Office (SEO) and the Working Group on Information Systems and Services (WGISS)), which enable the broadest user access to fundamental measurement products for generating derived products

The scope of LSI-VC activity excludes:

* Generating domain-specific derived products
* Engaging with domain-specific user communities
* Coordinating ground stations or other ground infrastructure that is tightly coupled to a specific satellite system

**Membership and Representation:** LSI-VC participation is open to all CEOS Agencies, and organizations they sponsor, that are willing to support and contribute to activities that are in scope for LSI-VC The LSI-VC is a CEOS working body and representatives should possess relevant qualifications in satellite data acquisition planning, and/or requirements analysis, and/or data pre-processing and distribution for their agency missions.

 **Linkages:**

The following table outlines key linkages between the LSI-VC and CEOS Entities and CEOS Stakeholders.

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| **Linkage** | **Role of LSI-VC** | **Role of other entity** |
| CEOS Plenary |  | Identify CEOS priorities and identify valid sets of requirements towards which land surface imaging assets should be optimized. |
| WGClimate | Optimise the acquisition, production and distribution of fundamental measurement products to meet confirmed requirements. | Identify and confirm target derived products. |
| Domain-specific space data coordination groups |  |  |
| WGISS | Coordinating implementation and operation of ‘backbone’ data discovery and distribution systems. | Defining standards and developing technologies for adoption. |
| SEO | Identifying and hopefully auctioning the possible responses to identify gaps in historical data, current acquisition plans, and future mission scenarios. | Technical advice and systems to support gap analysis work. |
| WGCalVal | Coordinating implementation of pre-processing systems to promote alignment with techniques and standards defined by WGCalVal. | Developing the techniques and standards necessary to produce the required fundamental measurement products, to support quality assessment of data, and to enhance interoperability of data from different sensiors. |

**Schedule:** LSI-VC participants will assess and define the overall timetable for the work plan implementation, to include specific CEOS agency responsibilities.

**Reporting:** LSI-VC will report to the SIT Chair.

 **Meetings:** The LSI-VC will primarily utilize e-mail exchanges, telecons or video conferencing sessions, and workshops as needed to fulfill its objectives. A bi-annual meeting will be convened by one of the Co-Leads.