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Copernicus Space Component

Technical Operating Arrangement

ESA – BioSense Institute, Republic of Serbia

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Copernicus Space Component Technical Operating Arrangement

between the European Space Agency on one side,

and

the BioSense Institute - Research and Development Institute for Information Technologies in Biosystems, Republic of Serbia, on the other side,

executing the Cooperation Arrangement concluded between the European Commission and the Ministry of Education, Science and Technological Development of the Republic of Serbia on their Cooperation in the area of data access and use of Sentinel data of the Copernicus Programme.



1 INTRODUCTION

1.1 Background

Copernicus is a European programme, providing Earth Observation information for environmental monitoring and civil security. The dedicated Sentinels missions are being developed to meet the operational needs of the programme.

According to Article 9 of the Regulation establishing the Copernicus Programme, the European Commission will manage, on behalf of the European Union (EU) and in its field of competence, relationships with third countries and international organisations.

In line with this Regulation, the European Commission has concluded Agreements with the European Space Agency (ESA) and the European Organization for the Exploitation of Meteorological Satellites (EUMETSAT) on the implementation of the space component of Copernicus.

These Agreements foresee that ESA and EUMETSAT will provide support to the EU for the matters concerning the international technical cooperation of the Copernicus Programme. In particular, ESA and EUMETSAT will assess the impact of international technical cooperation requests and will implement and be responsible for technical actions with international partners subject to the prior approval of the European Commission and prerequisite funding provided by the European Union.

On this basis, the European Commission requests ESA and EUMETSAT to establish relevant technical operating arrangements with international partners, primarily focusing on the Sentinels operated by ESA and EUMETSAT and addressing issues such as liability and technical data interface specifications.

ESA and EUMETSAT will be responsible for the implementation of the technical operating arrangements, in coordination and subject to prior consultation with the European Commission.

The implementation of the technical operating arrangements will be facilitated by a joint 'Copernicus Cooperation group', involving the European Commission (lead), ESA, EUMETSAT, the European Environment Agency (EEA) and the international partners, whose members meet whenever necessary, to oversee and stimulate cooperative activities as mentioned in the Cooperation Arrangement.

1.2 Purpose and objectives

The European Union, represented by the European Commission, and the Ministry of Education, Science and Technological Development of the Republic of Serbia (“the Ministry”) have signed on 07 June 2018 a Cooperation Arrangement (“the Arrangement”) that reflects both sides’ recognition of the current and potential value of Earth observation data.

The Arrangement identifies areas where the Ministry and the European Commission see potential for cooperation to help realise this value.

In the Arrangement both signatories recognize that the European Union and the Ministry are pursuing Earth Observation activities in a number of areas of common interest and that sharing each other’s data based on reciprocity should provide mutual benefits. Both sides acknowledge that access to in-situ data provided by the Ministry through the “BioSense Institute – Research and Development Institute for Information Technologies in Biosystems” of Serbia (“BioSense”) and its partners will bring benefit to the Copernicus Programme. The Ministry has entrusted its activities in the area of data access and use of Sentinel data to BioSense.

Both signatories of the Arrangement are committed to the principle for full, free and open access to European Sentinel and Earth Observation data and information, subject to applicable security restrictions.

The European Commission wishes to provide BioSense with access to Sentinel data using high bandwidth connections from data hub to data hub with a view to foster the exchange of Earth Observation data between Europe and the Republic of Serbia.

Furthermore, the European Commission would like to emphasise the importance of BioSense’s and its partners’ in-situ data for the Copernicus programme.

Acknowledging that the Copernicus programme emphasises the importance of in-situ observations and the complementarity with space-based observations, BioSense wishes to support this objective and intends to facilitate access to data from local monitoring stations under its responsibility, including geophysical and meteorological networks, to support the enhancement of the Copernicus data architecture and the development of global products. Both sides acknowledge that access to in-situ data provided by Biosense and its partners will bring added value to the Copernicus programme.

In order to give technical effect to relevant aspects of the Arrangement, ESA and BioSense (hereinafter jointly referred to as “Signatories” or individually as “Signatory”) will collaborate to undertake the necessary technical activities. These activities are described in the present Technical Operating Arrangement (TOA).



The purpose of this TOA is to define ESA's and BioSense's respective roles and responsibilities, as well as the terms and conditions under which they will cooperate to implement the exchange of satellite data foreseen in the Arrangement in the area of data access and use of Sentinel data of the Copernicus Programme.

The TOA will be implemented based on voluntary, non-legally-binding cooperation without exchange of funds. In the event that either ESA or BioSense is unable to continue one or several of the activities described in this TOA, each Signatory may discontinue participation in such activities. In such cases, the Signatories will endeavour to consult each other and provide each other with reasonable notice of their intentions.

The TOA will take effect on the date of the last signature by both Signatories to this TOA.

1.3 Scope

This non-binding ToA describes the technical operating arrangements (e.g. cooperative initiatives description, operational interfaces, required support) between BioSense and ESA, necessary to give effect to relevant aspects of the Arrangement.

Where other entities (e.g. Institutes, Ministries, commercial enterprises, etc.) are involved in the implementation of the ToA on BioSense's or ESA's side, BioSense and ESA will act as the sole interface and contact point with such entities.

For in-situ data of relevance for the Copernicus services, BioSense and the European Commission and/or the EEA (delegated entity for the crosscutting coordination of the Copernicus in-situ component) will act as the interface and contact points. The detailed arrangements covering this specific cooperation are outside the scope of this ToA.

It is understood that the in-situ data made available by BioSense and/or its involved entities in the course of the implementation of this ToA will be made available for distribution on the European "Copernicus Data Access and Information Systems" (DIAS). Consequently, the transmission of these in-situ data will allow for such a distribution, without restriction.

1.4 References

An overview of the overall Copernicus dedicated Sentinel missions is available in the Sentinel Online portal at sentinels.copernicus.eu. In particular, the portal contains up to date information on:

- Mission description, including space and ground segment aspects, and operational news
- Products definition, including contents and format specifications
- Detailed mission user handbook
- Link to data access hubs, including registration, user manuals, operational news

The following documents are referenced in this ToA and provide further detailed information:

- CSC Operations Concept document, GMES-GSEG-EOPG-PD-12-0056, Issue 1.1
- “Legal notice on the use of Copernicus Sentinel Data and Service Information”, https://sentinel.esa.int/documents/247904/690755/Sentinel_Data_Terms_and_Conditions

2 EUROPEAN ACCESS TO BIOSENSE CALIBRATION AND IN SITU DATA

BioSense and its collaborators operate networks of geophysical, meteorological and other in-situ and Earth observation data that can support the calibration and validation of satellite Earth observations and derived products, as well provide input to the Copernicus services. A number of these facilities have been specifically established to support satellite Earth observation calibration and validation.

Data from these networks, and other data and information of value to calibration/validation activities and the Copernicus services is made available to the Copernicus programme in accordance with national, state/territory and organisation-level policies.

Significant data is made available on a free and open basis, generally under ‘Creative Commons’ licenses. Data are available from a range of sites, including:

- www.agrosense.rs – data from national portal for Digital Agriculture of Serbia. BioSense has designed and maintains this portal where data from multiple sources related to agriculture and environment are gathered. Part of this data



which is not restricted due to privacy issues, will be made available to the Copernicus programme.

- dip.biosense.rs/geonetwork – geonetwork node ran by BioSense with vast amount of environmental data from whole of Europe and especially from several Serbian environmental sites.
- Ground-truth data related to crop structure on the territory of Serbia used for modelling of crop structure and yield estimation from remote sensing will be provided through a dedicated site.
- BioSense will launch a nation-wide network of around 500 meteo stations connected through IoT LoRa network, registering a number of weather parameters including soil moisture. Once these data become available, they will be made available to the Copernicus programme.

Other means of access, including near-real time protocol access and file transfer services, may also be available to the Copernicus programme and BioSense will facilitate discussions on these matters where requested by ESA, the European Commission and/or EEA.

A report describing these facilities in more detail will be available from <http://biosense.rs/ESA> and will be updated by BioSense from time to time.

Where ESA identifies a desire to access data to support calibration and validation, or wishes to discuss complementary calibration/validation activities, BioSense will act as a coordinating point to facilitate such discussions.

Where the European Commission and/or the EEA identify a desire to access BioSense's in situ data to support the Copernicus services, BioSense will act as a coordinating point to facilitate such discussions.

3 ARRANGEMENT OF TECHNICAL INTERFACES

In the frame of Copernicus, the present TOA aims, among others, at providing:

- supplementary access to Sentinel Mission data, i.e. through specific data acquisition services (data hub to data hub), specific data (higher-level) products, mirror sites, etc., thus further valorising the Sentinel missions exploitation.
- access to relevant Partner data, i.e. through specific data acquisition services (data hub to data hub), specific data (higher-level) products, mirror sites, etc.,

thus further valorising the relevant networks of geophysical, meteorological, in-situ and other Earth observation data.

ESA will serve as facilitator for data transmission to the DIAS.

3.1 Technical Arrangements Types

The TOA provides a frame for specialized solutions in five main areas:

1. Data acquisition and Quasi Real Time production (International Local Stations – currently not foreseen)
2. Complementary collaborative data products and algorithms definition
3. Core data product dissemination and access (e.g. international mirror sites)
4. Development of innovative tools and applications
5. Complementary external validation support activities

The above technical arrangement types address on one side the Sentinel missions, and on the other side relevant data from BioSense.

In the case where the Copernicus Programme requests access to BioSense's in-situ data, technical arrangements will be discussed and agreed between BioSense and the European Commission and/or the EEA.

In the context of the present TOA:

- additional areas of technical cooperation may be included in the future if relevant and prior endorsed by the European Commission
- occasional technical meetings are intended to be held between BioSense and ESA, e.g. within the Copernicus Cooperation Group, this latter led by the European Commission. The European Commission will be invited to all meetings and all meeting documentation will be forwarded to the European Commission for information.

The following Sections define the technical arrangements for the specific area of cooperation.



4 INTERNATIONAL ARCHIVING AND DISSEMINATION CENTRES, MIRROR SITE

4.1 Involved Entities

BioSense will directly connect to the ESA interface (i.e. the International Data Hub). Other partners may be engaged as required, following prior consultation with ESA and the European Commission.

4.2 BioSense's Activity

BioSense intends to establish a Regional Copernicus Data Access/Analysis Mirror Site ('BioSense Data Mirror Site') to improve access to, and exploitation of, Sentinel data in the Republic of Serbia and wider Balkan area.

In the context of the present TOA, BioSense Data Mirror Site is intended to retrieve data from ESA-operated Sentinel missions from ESA-operated data systems, and then to store and make available such data to government, industry, research and general public users for download and online analysis. BioSense Data Mirror Site is intended to access all data products produced by all ESA-operated Sentinel missions for a geographical area of interest that includes the land and marine territories of countries in the identified region (Map at Annex A).

The specific data products to be retrieved, and the scope of the geographic region for which data will be retrieved/stored/re-distributed, may change from time to time. BioSense will discuss such changes with ESA prior to implementing them in BioSense Data Mirror Site. For purposes of technical efficiency, simpler geographical boundaries may be employed that encompass an area larger than the specific area of interest.

BioSense Data Mirror Site is intended to be a distributed system:

- The primary entry point of data into BioSense Data Mirror Site, the primary online archive of products, and the primary point facilitating access for re-distribution/analysis, being established at BioSense Institute premises,
- A backup entry point of data (to assure continued download of data in case of an outage of BioSense) being established at facilities operated by BioSense's partner, University of Novi Sad. The backup entry point will only retrieve data from ESA systems in case of an outage of the BioSense data hub, and will re-synchronise with the primary archive following resolution of the outage.

- Long-term archives, not intended for day-to-day use for re-distribution or analysis, being hosted by BioSense.

BioSense intends to utilise Academic Research Networks on the Serbian side peering to GEANT, as the backhaul connection from ESA-operated systems to BioSense’s Data Mirror Site. Such networks are scaled for data of the scale of Copernicus, and are a cost-effective way of moving large amounts of scientific data. BioSense understands that ESA intends to directly connect ESA-operated data systems with the European GEANT network using high-bandwidth connections.

The types and levels of service provided by BioSense Data Mirror Site (such as web service access, direct file download, etc.) will be determined from time to time by BioSense in consultation with its partners and ESA.

Access will always be in a manner consistent with the overarching terms documented in the Arrangement.

4.3 ESA Support

4.3.1 Access to the Sentinel International Data Hub

ESA grants BioSense access to the International Data Hub (IntDH), a rolling archive providing bulk dissemination capabilities for Sentinel data products.

The IntDH will continuously store Sentinel data acquired during the previous month(s) at the processing levels agreed as part of the Sentinel core data product list and the associated timeliness as defined in the CSC Operations Concept Document, it enables searching, browsing, previewing and downloading the Sentinel data. The time interval covered by the IntDH rolling archive will be scalable and include at least the previous 30 days of data.

Access to the Sentinel archived data is provided via a separated data access infrastructure not subject of this TOA. If required in the future, ESA and BioSense may discuss specific campaigns, to be coordinated with other international partners, to transfer missing data. Such campaigns, including selected archived data publishing in the IntDH, may also apply in the future to make re-processed Sentinel data available

Access to the IntDH is allowed via a web authentication module. ESA will provide BioSense with a username and password to access the IntDH. This username and password may be used only by BioSense (including its representatives, employees and contractors involved in the present initiative) for the purpose of the initiative and will not be shared with other natural or legal persons.



BioSense will use the IntDH access only for the purpose of its activity in the initiative described above. Through registration at the IntDH, accessing and/or downloading available content, BioSense will not misuse or interfere with the service of the IntDH portal. In particular, BioSense aims at building a mirror archive of Sentinel data and hence will not repeat the download of identical datasets from the IntDH, but store downloaded Sentinel data for re-use and re-dissemination.

All functionalities and contents offered by the IntDH are provided by ESA on a best efforts-basis. The transmission of content from the IntDH may be interrupted or delayed by ESA in the event of technical constraints, such as the internet bandwidth. In such case, the download requested by BioSense will be enabled later taking into account other users' requests.

4.3.2 Data Transfer

ESA will provide appropriate interfaces, to transfer Sentinel data to BioSense and partners via internet. If required, ESA supports network performance analysis to help fully utilize available bandwidth.

4.4 Time Schedule

The IntDH will be available from the sentinels.copernicus.eu portal. ESA will provide Sentinel data sets as they become available in accordance with the ESA data provision plan (e.g. after launch, commensurate with the commissioning and ramp-up plan for data provision).

BioSense will be ready to accept data transfers indicatively from 01 April 2019.

4.5 Reporting

BioSense will keep the European Commission and ESA informed about the course and success of the activity.

The regular reports regarding the Sentinel data mirror site will have at least annual frequency, and will as a minimum contain information regarding:

- Sentinel data use and applications;
- Onward-dissemination of Sentinel data, including user statistics of the mirrored Sentinel data;
- Any changes to the pre-agreed set up of activities that may have an impact on ESA's support to the partner's activities.
- BioSense will provide feedback to ESA on the Copernicus data access mechanism.

BioSense intends the Data Mirror Site to collect statistical information on Sentinel data re-distribution and analysis, and intends to cooperate with ESA on technical means for ensuring such data is formatted/structured to ensure it is of maximum value.

BioSense intends to collect BioSense Data Mirror Site user and use information, and report this information to ESA and the European Commission, consistent with the terms documented in the Arrangement.

In order to support the distribution of Sentinel data in the Republic of Serbia and wider Balkan area, and to share aggregated information with ESA and the European Commission, a simple and un-bureaucratic user registration process will be implemented.

As concerns Sentinel data Mirror Site usage statistics, the following minimum categories of information will be provided:

User statistics, including:

- Utilisation domain (i.e. research, commercial, education, other)
- Usage field (i.e. atmosphere, emergency, marine, land, security, climate, other)
- Country of the user

Note: the above fields should be requested as part of the user account registration.

Data dissemination statistics, including:

- Data delivered per utilisation domain and usage field
- Data volume per utilisation domain and usage field
- Total number of distinct users
- Total number of data distributed
- Total volume of data distributed by product
- Statistics on the core product delivered
- Proportions of data delivered per utilisation domain and usage field.

The statistics should be provided for reporting period and cumulatively.

4.6 Sentinel Data Governance

Sentinel data made available via the IntDH are governed by the “Legal notice on the use of Copernicus Sentinel Data and Service Information”.



In the event that specific Sentinel data are assessed as “sensitive”¹, the access to such Sentinel data through the IntDH and its use and distribution may be subject to different licensing conditions.

This also applies for Sentinel data that may have already been received by BioSense, or a partner, and re-distributed.

Where Sentinel data are identified as “sensitive”, BioSense will endeavour to remove such data from BioSense Data Mirror Site, noting that it will be unable to retract data already re-distributed.

5 INTERNATIONAL COMPLEMENTARY EXTERNAL VALIDATION SUPPORT

5.1 BioSense activity

BioSense intends to conduct complementary Sentinel data Calibration and/ or Validation activities in collaboration with ESA with the aim of improving the quality of both core Sentinel core products and of derived higher-level products.

Sentinel data required for those projects may be supplied directly from the Copernicus Open Access Hub (<http://scihub.copernicus.eu>) to the project, or from BioSense Data Mirror Site, described in Section 4.2 above. In the latter case, reporting and data governance are handled as per Section 4.5 above.

BioSense may conduct these Calibration/Validation projects together with partner entities. In such case, BioSense acts as an interface and contact point between ESA and the other entity.

Details of on-going and planned Calibration/Validation projects are described in separate documents, describing the involved entities, the scope of the Calibration/Validation project, applied methodology, expected results and related use/licence conditions, geographic area of interest, mechanism for supply of Sentinel data, time schedule and reporting.

Annex B contains a list of the currently on-going and planned projects. Annex B will be updated as and when necessary.

¹ As defined in Art. 13 of the COMMISSION DELEGATED REGULATION (EU) No 1159/2013 of 12 July 2013 supplementing Regulation (EU) No 911/2010 of the European Parliament and of the Council on the European Earth monitoring programme (GMES) by establishing registration and licensing conditions for GMES users and defining criteria for restricting access to GMES dedicated data and GMES service information.

5.2 ESA support

5.2.1 ESA technical support to complementary validation activity

ESA will provide relevant data sets from the Sentinel- 1, - 2, -3 and -5P core products (i.e. L1 and L2. In special cases also LO) as they become available to support joint validation and calibration activities.

5.3 Reporting

Reporting regarding the complementary external validation activities will be defined in the related separate technical documentation.

6 Disclaimer

6.1 Access to data from the Sentinel missions is on an “as is” basis. ESA disclaims all conditions, representations and warranties of any kind of any kind, whether express, implied statutory or otherwise including, but not limited to what concerns the functionalities of the Data Hub and the data transferred. This disclaimer includes the warranties regarding availability, continuity, accuracy, integrity, reliability, fitness for or compatibility with a particular purpose or meeting the users' requirements, satisfactory results or non-infringement of third party rights.

6.2 ESA will not be held liable for any damage that may result from the support activities provided under this TOA, including in particular the functionalities of the Data Hub, the data transfer, and advice and communication by ESA personnel.

6.3 ESA may at any time review, modify, suspend or terminate the support activities under this TOA, including but not limited to on the occurrence of the following events:

- (i) lack of sufficient funding for sustaining Sentinel missions, and associated facilities and activities,
- (ii) satellite or ground system failure,
- (iii) suspension or cancellation of planned activities of related Sentinel systems and facilities, in order for ESA or the EU to carry out activities considered of a higher priority.



6.4 ESA may modify the Sentinels' operations plans at any time, if it considers such corrective action necessary for ensuring the safety and success of the missions.

Annex A. Map of region of interest

The following represents the map of region of interest at the time of entering in force of the TOA.



Annex B. Complementary External Validation Support Projects

The following contains a list of the currently on-going and planned projects aimed at complementary Sentinel data Calibration and/ or Validation activities in collaboration between BioSense and ESA with the aim of improving the quality of both core Sentinel core products and of derived higher-level products.

- None at the moment of signing this TOA.



