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ANNOUNCEMENT OF OPPORTUNITY

Network of Resources (NoR)

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Table of contents:

1 INTRODUCTION.....	3
1.1 Applicable Documents	3
1.2 Reference Documents	3
1.3 Glossary	3
2 DESCRIPTION OF THE CALL.....	4
2.1 Background	4
2.2 General Objectives of the NoR Call	4
2.3 Specific Objectives	5
2.3.1 Science Objectives	5
2.3.2 Application and Pre-operational Objectives.....	6
2.4 Procedures.....	7
2.5 Description of the offered service	7
2.6 Projects Sponsoring	7
3 PROPOSAL EVALUATION PROCEDURES.....	8
3.1 Review Panel and Procedures.....	8
3.2 Evaluation Criteria.....	8



1 INTRODUCTION

The increasing size of available satellite mission data sets, together with Information Computer Technology (ICT) advances has resulted in a paradigm shift. Data do not need any more to be downloaded by the user to their local machine for further processing, on the contrary it is the user who can find the data and process them in cloud environments hosted by ICT providers with expandable processing capabilities. The Network of Resources (NoR) is an ESA initiative in the context of the Earth Observation Envelope Program 5 (EOEP5) Block 4 and aims to facilitate the use of cloud environments by users.

The NoR call offers to users from ESA member States participating to EOEP5 (see note 1 below) the opportunity to exploit ICT resources and platform services in support to eligible research, development or pre commercial activities.

Note 1: The Member states currently participating to EOEP5 are: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Norway, Poland, Portugal, Romania, Slovenia, Spain, Sweden, Switzerland, United Kingdom and Canada.

1.1 Applicable Documents

[A1] Guidelines for NoR Call submissions https://earth.esa.int/files/nor_guidelines

1.2 Reference Documents

[R1] ESA (2015). ESA's Living Planet Programme: Scientific Achievements and Future Challenges – Scientific Context of the Earth Observation Science Strategy for ESA, ESA SP-1329/2 (2 volumes), European Space Agency, Noordwijk, the Netherlands
http://www.esa.int/Our_Activities/Observing_the_Earth/The_Living_Planet_Programme/New_Earth_Observation_Science_Strategy

1.3 Glossary

DIAS	Data and Information Access Services
EO	Earth Observation
EOEP	Earth Observation Envelope Program
ESA	European Space Agency
ICT	Information Computer Technology
ITT	Invitation To Tender
NoR	Network of Resources
OSEO	Open Science EO
PI	Principal Investigator

2 DESCRIPTION OF THE CALL

2.1 Background

Earth Observation Exploitation platforms are the central element of ESA's Earth Observation Envelope Program 5 (EOEP5) Block 4 concept which envisages an open network of EO Exploitation Platforms based on coordinating assets spread across Europe. The concept aims at the increased integration of EO data and information for a much broader use, for scientific, social and economic purposes, as well as for the generation of new commercial applications and services by helping the user to work with the data.

Fostering activities already pioneered within the context of the Open Science Earth Observation (OSEO) call, in early 2019 ESA launched an ITT for a Network of Resources. The goal is to coordinate and secure the platform services and ICT needed by users to explore new possibilities for EO data exploitation, aiming to scientific innovation, creation of value-adding products and processing chains, demonstration of new applications and demonstration of pre-operational services.

The Network of Resources is composed by:

- an 'EO Resource Tier Layer' which consists of processing platforms with collocated data and provides the 'back-end' functionality where users can host their tools, algorithms and services. The Data and Information Access Services (DIAS) platforms are an example of one of foundation blocks of the European EO Resource Tier.
- a front-end layer of the exploitation platforms is to be populated also from various EOEP-5 Block-4 activities (e.g. evolved Thematic Exploitation Platforms, Datacubes, tools) including scientific projects and applications for both public and commercial benefit.

Within September 2019 a portfolio of services compiled via a Best Practice Tender will be available via a portal to allow users to consult, select and subsequently procure or request sponsoring. Until the listings are available sponsoring for eligible projects by ESA or by external entities providing sponsorship can be made via this Network of Resource call by providing information on the requested services.

2.2 General Objectives of the NoR Call

The objectives of the call are aligned to those of EO Science for Society, one of ESA Block 4 core activities for 2017-2021, and aims to pioneer new EO services and scientific discoveries, stimulate downstream industry growth, and support international responses to global societal challenges. In particular this permanent call is supporting users with access to the EO Resource Tier Layer and the front-end layer of the exploitation platforms needed to boost their ideas. This will support exploitation of a huge volume of different EO data and grant the needed computing power, platform services and ICT infrastructure to:

- Foster new advances in science
- Develop precursor applications and value-adding processing chains
- Demonstrate pre-operational services

2.3 Specific Objectives

2.3.1 Science Objectives

The call concerns all traditional Earth Science domains, with a particular attention to the challenges identified by ESA's Living Planet Programme, i.e.:

Atmosphere

- A1: Water vapour, cloud, aerosol and radiation processes and the consequences of their effects on the radiation budget and the hydrological cycle.
- A2: Interactions between the atmosphere and Earth's surface involving natural and anthropogenic feedback processes for water, energy and atmospheric composition.
- A3: Changes in atmospheric composition and air quality, including interactions with climate.
- A4: Interactions between changes in large-scale atmospheric circulation and regional weather and climate.
- A5: Impact of transient solar events on Earth's atmosphere

Cryosphere

- C1: Regional and seasonal distribution of sea-ice mass and the coupling between sea ice, climate, marine ecosystems and biogeochemical cycling in the ocean.
- C2: Mass balance of grounded ice sheets, ice caps and glaciers, their relative contributions to global sea-level change, their current stability and their sensitivity to climate change.
- C3: Seasonal snow, lake/river ice and land ice, their effects on the climate system, water resources, energy and carbon cycles; the representation of the terrestrial cryosphere in land surface, atmosphere and climate models.
- C4: Effects of changes in the cryosphere on the global oceanic and atmospheric circulation.
- C5: Changes taking place in permafrost and frozen-ground regimes, their feedback to climate system and terrestrial ecosystems (e.g. carbon dioxide and methane fluxes)

Land Surface

- L1: Natural processes and human activities and their interactions on the land surface.
- L2: Interactions and feedbacks between global change drivers and biogeochemical cycles, water cycles, including rivers and lakes, biodiversity and productivity.
- L3: Structural and functional characteristics of land use systems to manage sustainably food, water and energy supplies
- L4: Land resource utilisation and resource conflicts between urbanisation, food and energy production and ecosystem services.
- L5: How limiting factors (e.g. freshwater availability) affect processes on the land surface and how this can adequately be represented in prediction models

Ocean



- O1: Evolution of coastal ocean systems including the interactions with land in response to natural and human-induced environmental perturbations.
- O2: Mesoscale and submesoscale circulation and the role of the vertical ocean pump and its impact on energy transport and biogeochemical cycles.
- O3: Response of the marine ecosystem and associated ecosystem services to natural and anthropogenic changes.
- O4: Physical and biogeochemical air–sea interaction processes on different spatiotemporal scales and their fundamental role in weather and climate.
- O5: Sea level changes from global to coastal scales and from days (e.g. storm surges) to centuries (e.g. climate change).

Solid Earth

- G1: Physical processes associated with volcanoes, earthquakes, tsunamis and landslides in order to better assess natural hazards.
- G2: Individual sources of mass transport in the Earth system at various spatiotemporal scales.
- G3: Physical properties of the Earth crust and its relation with natural resources.
- G4: Physical properties in the deep interior, and their relationship to deep and shallow geodynamic processes.
- G5: Different components of the Earth magnetic field and their relation to the dynamics of the charged particles in the outer atmosphere and ionosphere for space weather research

It is expected that scientific projects selected within the NoR call will publish results in peer-reviewed literature, acknowledging ESA and NoR.

2.3.2 Application and Pre-operational Objectives

This call aims at encouraging users to exploit the benefits that European technology and cloud storage may offer in terms of development of innovative exploitation ideas, refinement of processing-chains, demonstration of value-adding services and their pre operationalization.

The following primary technological objectives have been identified, among others:

- T1: Reinforcing collaborative research environments and Virtual Laboratories (eg “Earth labs” to explore, analyze and interpret big data, share knowledge, support crowd-sourcing platforms...)
- T2: Demonstration of new applications
- T3: Migration to a cloud environment in order to refine and upscale existing processing chains
- T4: Definition and testing of innovative pre-operational and pre-commercial services.

2.4 Procedures

The call is primarily open to users from ESA member states. Proposals compiled according to the guidelines provided in [A1] can be submitted at any time for evaluation via the dedicated Web site at:

<https://earth.esa.int/aos/NoR>

Following submission, each proposal will be reviewed according to the criteria described in chapter 3.2. Based on the review outcome, ESA may decide to select only a portion of the proposed project, in which case the investigator will be given the opportunity to accept or decline such partial acceptance. Also, ESA reserves the right to propose alternative planning for the approved activities to better match with the available resources. Typical project duration is expected to be six months (maximum one year).

All selected Principal Investigators will be required to submit:

- a first report one month after start, to confirm that access to the required resources has been granted,
- a progress report 3 months after start to inform about status of the activities and eventual issues,
- a final report at project closure, including a rating of the received service

Consumption of the provided ICT resources will be monitored and in case of misuse of the allocated resources, ESA reserves the right to close the project before its formal end.

Upon invitation, PIs may be requested to present their results or part of their results at symposia or specialised workshops to be organised by ESA (e.g. ESA EO Open Science annual conference).

2.5 Description of the offered service

A description of the available platforms, services, products and related ICT will be published within September 2019 on a dedicated page which will be developed by the NoR coordinator. Until that date, sponsoring to pay for eligible projects is already available by ESA and the following providers:

- CreoDIAS <https://creodias.eu/>
- Sobloo <https://sobloo.eu/>
- CloudSigma <https://www.cloudsigma.com/>

Proposal authors are advised to describe as accurately as possible in their proposal their platform, service, products or ICT requirements.

2.6 Projects Sponsoring

The cost of the requested NoR services for eligible projects will be supported by ESA and by sponsoring providers listed above, however no direct funding to projects can be made available through this call.

3 PROPOSAL EVALUATION PROCEDURES

3.1 Review Panel and Procedures

The proposals will be reviewed by a panel of reviewers who will assess the merits of the proposed investigations in relation to the call objectives.

The purpose of the review is:

- To assess whether the specific projects are in accordance with the specific objectives of the opportunity.
- To evaluate the scientific, application and technical merits of the proposed projects in relation to their technical feasibility.

The selection process will consider the relevance to the call objectives of proposed projects and their feasibility requirements within the available system resources and support framework. ESA reserves the right to propose alternative planning for the approved activities to better match with the available resources

The results of the evaluation (acceptance/rejection or request for modifications) are then transmitted to the PI, typically within 3/4 weeks from proposal submission.

3.2 Evaluation Criteria

The following criteria will be used to assess the proposals:

- The merit of the project from a scientific/application/pre-operational viewpoint
 - Expected scientific/application contribution, degree of innovation, impact on users, proposed schedule and success criteria
- The merit of the project from an engineering viewpoint:
 - Sizing of requested resources and support framework (algorithms or platform services architecture shall show efficient use of resources), technical feasibility and maturity of the project.