CEOS WGD Recovery Observatory (RO) Demonstrator
Implementation Plan
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1. Overview and Objectives

The CEOS RO Demonstrator's primary goals are to:

- Demonstrate the usefulness of satellites for *early recovery* (impact assessment, recovery planning and early recovery monitoring), in continuity and full complementarity with the International Charter and other services (Copernicus EMS, Sentinel-Asia, etc) dedicated to *emergency response*.
- Further to the RO Pilot, build on partnership with *recovery stakeholders* for regular use of satellite imagery and derived products for standard recovery practices;
- Develop a plan for *sustainable use* of satellite imagery in the recovery community.

The RO Demonstrator's main tasks are to:

- Document past use of satellites during a few representative recent PDNA[1]s / GRADE[2] / RPBA[3] and identify opportunities for improved use of satellites;
- Develop guidelines for satellite use during the PDNA/RPBA process;
- Showcase satellite tailored prototype products during 3 to 5 PDNAs or similar requests such as WB GRADE process, proposed by User Implementation Leads, in the 2021-2023 period;
- Provide timely support in best effort mode to PDNA teams on the ground for the 3 to 5 PDNAs (or similar requests) through the provision of satellite-derived products that aim to meet operational constraints.

In this context, the RO Demonstrator will work through the RO Demonstrator Team to provide direct support in the form of satellite data and derived information products to 3 to 5 post event situations over a three-year period. More activations may be considered if resources allow. A Charter[4] activation for the given disaster would be a pre-condition for each RO activation.

The international RO Demonstrator Team will monitor the overall process, but for each "activation" of a RO, a RO liaison officer will be designated from within the RO Demonstrator Team. The role of this liaison is to work directly with the Assessment Team (PNDA, GRADE or RPBA[5]) to identify information needs and related satellite solutions, and

[1] Post disaster needs assessment
[2] Global rapid post disaster damage estimation approach
[3] Recovery and peacebuilding assessment
[4] International Charter Space and Major Disasters
[5] Within EU, UN and WB there are different institutional arrangements and interlocutors for PDNA and RPBA

to pass on requirements for satellite data acquisitions and product generation. The RO will facilitate access to the Copernicus EMS[6] Risk and Recovery Standard Products for each of the 3 to 5 events and offer further complementary satellite products on an as needed basis, tailored to the specific needs of each event (e.g. RRM flex).
A final report after the three-year demonstration period will document the successes, challenges and lessons learned during the process.

The RO demonstrator is a project that is implemented by volunteer contributions and is without a dedicated budget. Work is performed on a 'best-effort' basis, supported by in-kind contribution of partners. This best effort contribution may include budgetary contributions from partners to secure contractor support or purchase resources required.

International co-leads:

- Hélène de Boissezon, CNES
- Mare Lo and Rashmin Gunesekara, GFDRR/World Bank

This RO Demonstrator Implementation Plan will reviewed by the CEOS plenary for approval in October 2020.

2. Demonstrator Description

High-profile initiatives such as the International Charter Space and Major Disasters - co-founded by CNES, ESA and CSA two decades ago - provide ready access to free satellite data during *emergency response* to major disasters, and indeed have been augmented by partner initiatives such as Sentinel-Asia and the Copernicus Emergency Management Service.

The *recovery phase* of disasters has not had the same attention or benefitted from the same resources. And yet, the world has known significant disasters in the last decade which have left lasting damage to buildings, infrastructure, and ecosystems. Examples of disasters on this scale come quickly to mind: Sichuan Earthquake in 2008, Cyclone Nargis in 2008, the Haiti Earthquake in 2010, the East Japan Tsunami of 2011, Typhoon Haiyan in 2013, Hurricane Matthew in 2016, Mangkhut Super Typhoon in the Philippines and the Indonesia earthquake and tsunami in 2018, Intense Tropical Cyclone Idaï on Mozambique and Hurricane Dorian in Bahamas in 2019... These large-scale disasters require a holistic approach to recovery that is best offered through systematic use of EO data over the affected area.

Improving our recovery efforts, to bring about *more resilient recovery*, is a critical step towards *risk reduction*. Building back better will improve the lives of those living with risk, and also reduce the impact of disasters in the future.

The RO Demonstrator, building on past Pilot experience within the recovery community, aims to increase the systematic use of satellite EO for recovery by establishing a response that can be activated on request by international organizations supporting the recovery from major disasters. Born of the common desire across all contributing organizations to see a more systematic use of satellites during the recovery process, especially early assessment and recovery planning, its principal aim is to increase awareness of what is being done today, and

[6] Emergency management service

also to raise the profile of opportunities for increased benefit. In some cases, with regard to recovery from conflict for example where key affected areas are simply not accessible, satellite data represent the primary source of information about damage and impact.

The use of satellites alone cannot improve recovery. The satellite data collected must be converted to exploitable information, analyzed, and then integrated into existing decision processes. These unique data offer strong, complementarity information to data currently used, but this benefit can only be achieved if satellite data are collected in a timely fashion and used to generate information products useful and easy to use. Overcoming the hurdles and challenges of data access is necessary for data integration during the recovery planning and monitoring process.

Satellite data and derived information products are a useful complement to existing practices regarding recovery and cannot replace in-country teams and information collected in the field. However, used in conjunction with these, the overall recovery process should be facilitated and the task of monitoring recovery efforts should be improved.

The RO Demonstrator Team will establish a monitoring process that will follow all International Charter activations. ROs will only be established following a Charter activation and should be viewed as a continuation and development of the Charter process. It is highly likely that Copernicus EMS Rapid Mapping will be activated for the same major disaster event, as will Sentinel Asia if the disaster occurs in Asia.

Our vision for the development of the Demonstrator project over the next three years is:

Year 1 (September 2020 – September 2021): Analysis of past work, consolidation of resources, organisation and planning for activations; first test activation.

- **Report on past PDNAs (Q3 2020)**
- **Finalize RO Implementation Plan and consolidate resources for value-adding (Q3 2020)**
- **First demonstration through EO Clinic with World Bank (Q4 2020 to Q3 2021)**

Year 2 (October 2021 – September 2022): RO activations

- **RO Demonstrations and reporting**

Year 3 (October 2022 – September 2023): RO activations and compilation of lessons learned from 3-5 activations:

- **RO Demonstrations and reporting**
- **Lessons-learned and sustainable RO proposal (Q3 2023)**

3. Demonstrator Outcomes and Outputs

Key outcomes:

- Demonstration of EO capabilities for recovery support through 3 to 5 ‘real life’ RO demonstrations, building on existing PDNA/GRADE teams’ practice.

- Recommendation for synergistic use of optical and SAR imagery and EO derived products for improved recovery practices.
- Lessons learned for use of EO satellites for recovery through report on past experiences and up to five new demonstrations.

High level outcomes:

- Increased uptake of satellite imagery for recovery in the target regions.

Key Demonstrator outputs/deliverables:

- Report on past use of satellites in representative PDNAs or equivalent (GRADE) (Q4 2020)
- Guidelines for use of satellites during PDNAs (Q1 2021)
- RO Concept note (Q1 2021)
- Report on recovery activations in support of PDNAs or equivalent (1-5; 2020 – 2023)
- Lessons-learned and sustainable RO proposal (Q3 2023)

4. Key User Communities and Benefit

The anticipated **users** of the RO Demonstrator are managers involved in assessment reports after major disasters. These typically take the form of Post Disaster Needs Assessment Reports (PDNA managers, PDNA Team members), but may also be GRADE assessments or other assessments used by the international community to support national government needs in response to a disaster. Other users include national representatives of departments and ministries responsible for recovery activities.

The **beneficiaries** of the RO Demonstrator will encompass a broad group of people, including decision makers with responsibilities for recovery in Latin America, Africa and SE Asia. In the RO Demonstrator, we will have the policy of supporting the in-country organisations with responsibility for recovery from disasters. We aim to build, rather than undermine, local capacity.

While the short time frame for ROs does not allow for robust capacity building component to be developed, the RO will produce a **Capacity Development report** for each activation including specific recommendations on how the country can increase its use of satellite data, with linkages to local centres of expertise.

- Direct Users and Beneficiaries: national, regional and local governments, disaster risk reduction specialists with NGOs and international organizations, land use planning decision makers, environment ministries and environmental stakeholders, industry.

- Practitioners: recovery specialists in the international community, local centres of earth observation and GIS expertise.

- Scientists: the CEOS WGD scientific community, including DRM / DRR scientific teams, are intermediary users that will be fed with RO Demonstrator issues and datasets

- General public: journalists and other media involved in communicating recovery information after major events.

As much as possible, the short-term focus of the RO Demonstrator on ***early recovery*** will be balanced by a conscious effort to anchor on-going activities born of the RO to ***longer-term projects and initiatives***.

The Demonstrator recognizes that users of the outputs and products & services may be different according to global / regional / local interests and will endeavor to build stronger relationships with all categories of users through dedicated outreach activities.

5. EO data requirements

Satellite EO data:

The CEOS RO team will develop detailed EO data requirements for each activation, which will vary according to the type of disaster and the scale of the disaster. These areas of interest are similar to those used for response by the International Charter and Copernicus EMS Rapid Mapping, though in some cases the areas may be larger as the entire area affected is of interest, rather than only the most affected areas or most populated areas.

The EO data provided must be "analysis ready": ortho-rectified and geo-located by the imagery providers for easy integration into user systems and derived products. These products in turn are designed with open standards to encourage transmission and sharing across organizations and regions.

The EO data requirements include both archived and new image data from the satellite missions of CEOS member agencies (e.g., Radarsat-2 and RCM (when available), COSMO-SkyMed, TerraSAR-X, Landsat-8, Pleiades, SPOT-6/7, Sentinel-1 and 2, and others).

Value added products:

If relevant for early recovery needs, the RO will build on available value added products provided by the Charter and CEMS Rapid Mapping.

The RO will facilitate a request to Copernicus EMS Risk and Recovery mapping (RRM) for access to Standard (STD) products[7] to be provided after the response period is over. This will include baseline data before and after the event to establish the pre-event recovery baseline and the new post event baseline against which to monitor recovery. According to the disaster type, additional relevant STD products will be ordered.

Beyond Copernicus RRM baseline products, efforts will be made during the RO Demonstrator to link to other baseline data sets (such as those being developed by the World Bank on a global basis), and to encourage the further development and use of such data sets.

In addition to standard baseline and grading products to be produced and updated through Copernicus EMS RRM STD, the RO Demonstrator Team will identify specific tailored

[7] https://emergency.copernicus.eu/mapping/ems/risk-and-recovery-mapping-portfolio

products that will provide useful information to support early assessment and recovery planning for a period of approximately two to three months.

6. Partner Contributions

CEOS, through RO Demonstrator co-lead CNES, will act as the coordinating body to ensure the support and participation of member agencies in executing this project.

The main contributions of CEOS agencies are:

(a) data from satellites (archive and new acquisitions), including higher spatial resolution satellite observations after the event and, if needed, reference data from before and during the event;
(b) coordination of access to value-added products & services with partners (RO liaison officer);
(c) ad hoc support to capacity building in the beneficiary country; (d) support to legacy planning by developing relationships for long-term sustainability of demonstrator successes;
(e) project management support to oversee implementation and reporting for the demonstrator.

In addition, the following organizations envisage a contribution to the RO Demonstrator:

CEOS Agencies

ASI: contribution of Cosmo-SKYMED imagery during the RO activations. Possibility of value-added contributions in support of one activation on a best effort basis through ASI partner eGEOS (to be explored Q3 2020).

CONAE: TBD

CNES: contribution of Pleiades and SPOT imagery. Contribution of value-added products through CNES contract to supporting partner in support of one activation on a best-effort basis.

CSA/CCMEO: TBD

DLR: TerraSAR-X data in extension of Charter activation for 3 to 5 ROs over three years. Possibility of value-added contributions for one activation on a best-effort basis through DLR-ZKI (to be explored Q3 2020).

ESA: access to ESA EO Clinic at request of World Bank or UNDP – three months support to provide value-adding in conjunction with one or two activations of the RO – approximate cost of each activation provided 45k.

European Union and European Commission/Copernicus: Support through Copernicus EMS Risk and Recovery STD service at request of EU Delegation in affected country or other Copernicus Authorised User, to generate standard recovery products. Membership in RO Demonstrator Team. Possible role as RO liaison through Particip, for selected activations on a best effort basis, especially if EU is lead for PDNA/RPBA process for selected activation.

NASA: Membership in the RO Demonstrator Team – possible support through NASA centres on a best effort basis based on selected activations, as well as possible commercial data contributions or liaison with providers (Planet, Maxar, etc).

Non-CEOS agencies and organizations

World Bank/GFDRR: activation of ESA's EO Clinic (approx. 45k for value added support). Possible liaison support especially during assessments conducted by World Bank or GFDRR.

UNDP: support for the publication of the final report of the RO Demonstrator. Small dedicated budget of 10k to be used for selected value-adding activity on a best effort basis. Possible use of Standard Operating Procedures established with UNOSAT to organise UNOSAT support to RO. Possible activation of ESA's EO Clinic to be explored (see ESA above).

UNOSAT: possible use of Standard Operating Procedures to provide value-adding information products to RO.

7. Suggested Evaluation Criteria

THE CEOS RO Demonstrator fits into a broader strategy of CEOS and international Recovery Stakeholders to increase the effectiveness of recovery efforts from major disasters through improved and increased use of satellite observations. To that end, CEOS is also working on updating the use of satellite data in the Post Disaster Needs Assessment Guidelines and promoting the RO Concept more generally.

The RO Demonstrator will be evaluated after its three-year project period and this evaluation will seek to determine:

- The increased use of satellite-based recovery products as compared to before the RO Demonstrator;
- Increased benefits to the recovery process, either through improved planning, more efficient allocation of resources or improved recovery decision-making;
- Willingness of recovery partners to explore sustainable approaches to increased satellite use.

The evaluation process will look to the initial objectives of the Demonstrator and conduct interviews with recovery stakeholders especially people involved in the recovery in the areas where the 3 to 5 demonstrations took place.

The objectives at the outset are to:

- Demonstrate the usefulness of satellites for early recovery (impact assessment, recovery planning and early recovery monitoring.
- Document past use of satellites during a few representative recent PDNAs;
- Develop guidelines for satellite use during the PDNA process;

- Showcase standard satellite products during 3 to 5 PDNAs (or similar requests such as WB GRADE process) proposed by User Implementation Leads, in the 2021-2023 period.
- Provide timely support to PDNA teams on the ground for the 3 to 5 PDNAs (or similar requests) in order to assess operational imperatives and constraints.

Specific elements to be considered in the evaluation will be:

1. Feedback from PDNA managers.
2. Feedback from national recovery teams.
3. Number and quality of products delivered by the demonstrator.
4. Adherence to timelines.

8. Governance and Risk Management

The RO Demonstrator will be managed on a best effort basis by the project partners. CNES will provide overall management of the Demonstrator from a programme perspective.

The RO Demonstrator Team maintains an active monitoring of the International Charter activations and of CEMS Rapid Mapping activations. For each major activation, the RO Demonstrator Team will consider whether a RO activation would be appropriate and feasible in the weeks following an event. RO activations can only be considered at the request of the Team conducting the Recovery assessment, from amongst the PDNA Tripartite Agreement partners (World Bank/GFDRR, UNDP, EU). Each RO Demonstrator Team member is responsible for ensuring the liaison with their own internal team(s) conducting assessments.

If a RO is requested, the CEOS RO team members will conduct a rapid review of the feasibility of an activation (in around 5 working days). This report is coordinated by RO Demonstrator co-lead CNES and presented to an ad hoc meeting of the RO Demonstrator Team which decides whether or not to create a RO for the specific event. A summary Activation Plan is drafted by the RO Demonstration Team lead and presented to the Team.

The decision to activate is based on the willingness and ability of partners to provide data and value-adding resources for this specific event (given the best effort nature of the project), as well as the potential benefit of using satellite data (is the event one where satellite data would add value to the Recovery planning process?).

To summarize :

- The Tripartite member making the Recovery assessment makes the request for the RO activation.
- The RO co-leads consult with RO Demonstrator Team member agencies and determine whether the activation is feasible with contributions committed on a best effort basis, and coordinates with the RO Demonstrator Team members the nomination of a RO Liaison.
- The whole process takes places in the 2 to 3 weeks after the event.

For each “activation”, a designated RO liaison officer will be appointed between the RO Demonstrator Team and the assessment team conducting the Recovery assessment. The RO liaison will work directly with the team conducting the assessment to identify satellite requirements and opportunities to provide specific data and information for a period of two to

six months, depending on the length of the RO. RO activities may extend beyond this early recovery period if there is a willingness to continue by the country concerned and resources are identified. The RO liaison will update the Activation Plan if required and be responsible for the drafting of the Capacity Development Report for each activation.

The RO Demonstrator plans 3 to 5 ROs over a three-year period, but more ROs are possible if resources permit.

9. Outreach and Dissemination

The RO Demonstrator Team will identify specific events (e.g. Understanding Risk 2020 and 2022, ISPRS, World Reconstruction Conference 5, etc) at which presentations or side session discussion may promote the work of the RO Demonstrator and increase the ability to identify partners for sustainability.

The RO Demonstrator Team members will seek to attend these events and promote the RO therein.