

WGDisasters – Meeting 15 (online)  
March 2021



Committee on Earth Observation Satellites

## RO Demonstrator Activities/ Deliverables/ Updates

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11 March 2021 @ 13:55 UTC



# When and how satellite and remote sensing may be used in Recovery



**Disaster Event**



**Post Disaster Needs Assessment**



**Disaster Recovery Framework**



Emergency & Humanitarian Response: satellite imagery of affected area, infrastructure and population

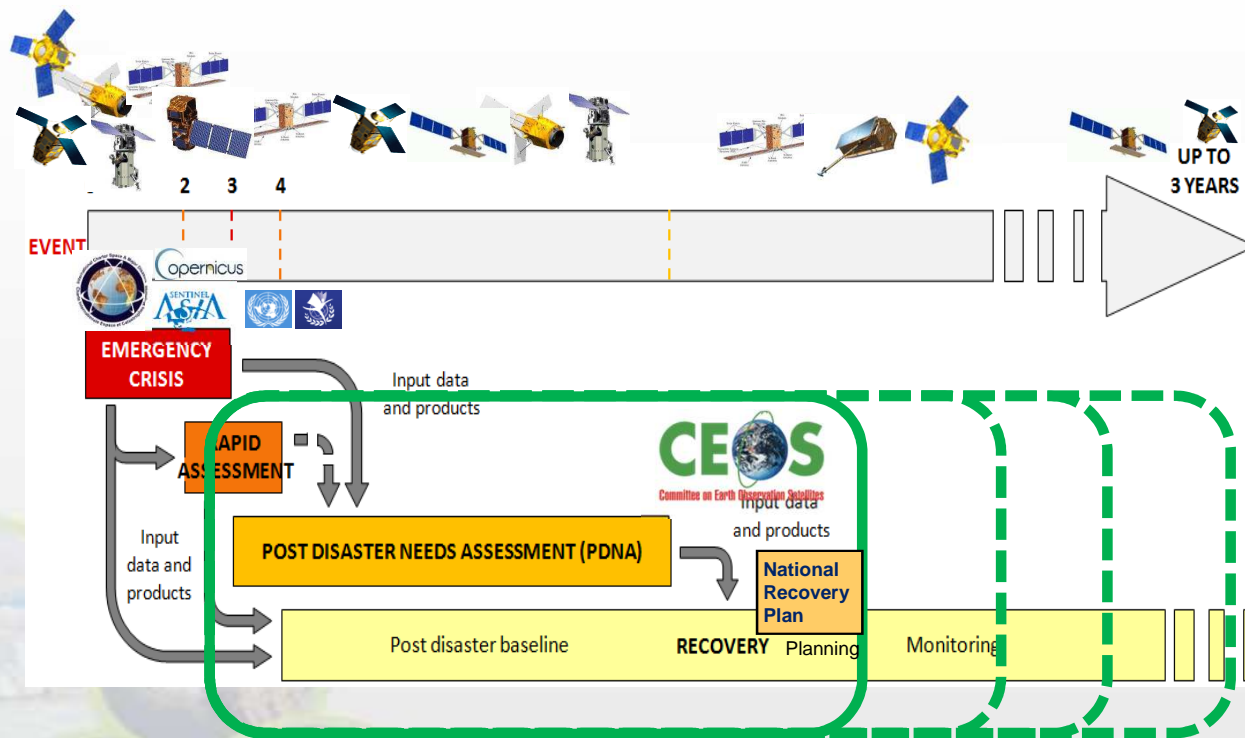
Assessment process supported by more focused, sector specific images of pre and post disaster situation: agriculture, environment, infrastructure, housing, connectivity networks

Continued use of selected imagery to monitor and document recovery processes 6 Months +

## RO Pilot (post Matthew Haiti)



# Objective in medium term : RO integrated in Recovery process



**“Recovery Observatory”** : Process allowing operational use of EO for Rapid Assessments, PDNA, Recovery planning & Recovery M&E

# When and how satellite and remote sensing may be used in Recovery



**Disaster Event**



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**Disaster Recovery Framework**



Emergency & Humanitarian Response: satellite imagery of

Assessment process supported by more focused, sector specific images of pre and post disaster situation:

Continued use of selected imagery to monitor and document recovery processes 6 Months +

## RO Demonstrator

and population

connectivity networks

**RNA/GRADE**

**PDNA**

**DRF  
REC PLANNING**

**RECOVERY  
M&E**



## Based on lessons from RO Pilot (2017 – 2020) completed, RO Demonstrator will:

- **Deliver a use and utility report** reviewing and evaluating the timely contribution of EO data/products at several scales
  - **Characterizing impacts on livelihoods and environment**
  - **Assessing general and sectoral needs**
    - Post-Disaster Needs Assessments (PDNAs) with UNDP, EU, World Bank and others for reconstruction and rehabilitation
    - Global Rapid-post-disaster Damage Estimation (GRADE) approaches with governments and other stakeholders for reconstruction
  - **Determining extent and scale of damage and losses**
    - Complement Charter observations to complete damage assessment and support recovery planning (3-6 months)
- **Complete 1 RO test then 3 to 5 ROs over 3yrs**
  - **Activation by PDNA Tripartite Agreement partners (UNDP, GFDRR/WB, EU)**
  - **Communicate results to CEOS agencies and stakeholders**



### Maps and analysis at various scales

- **Mid-scale** (10m) overviews of changes in land use and cover updated every 10 days for 6 months
- **High-resolution** hot-zones and lifelines, infrastructure, transport, residences, camps ...updated every 1 to 2 months
- **Integrate essential ancillary data:** terrain validation data, aerial and drone data, statistics, cartography, ....

- **CEOS WGD RO Demo** lead: H el ene de Boissezon (CNES), Andrew Eddy (RO Sec, Consultant to CNES)
- **WB:** Rashmin Gunasekera, Claudia Soto + ESA liaison (TBD)
- **GFDRR:** Mare Lo, Elad Shenfeld
- **EU/EC:** Claes Andersson, Dominique Blariaux, Thomas Hockley - Attilio Gambardella, Peter Spruyt
- **UNDP:** Rita Missal
- **UNOSAT:** Samir Belabbes, Einar Bjorgo
- **NASA:** Jean-Paul Vernier
- **ESA :** Philippe Bally, Christoph Aubrecht
  
- **CEOS WGD Leader:** David Green / Dave Borges (NASA)
- **CEOS WGD DCT:** Pierric Ferrier (CNES) (awaiting new DCT lead)
  
- **GEO Sec:** Steven Ramage (interim GEO Sec Disasters focal point)

# RO Demonstrator Triggering and Set Up

- **RO Demonstrators** based on **extension of Charter activations** for major events retained by Recovery stakeholders and RO Demo team.
- **RO Demo leadership** will liaise with Tripartite Agreement partners (World Bank/GFDRR, UNDP, EU) and monitor possible activations.
- All activations are at **request of a Tripartite partner**.
- Request to activate an RO is made by the partner to CEOS through **RO Demonstrator lead**, who **consults with CEOS RO Demo partners** and confirms best effort contribution as planned in Implementation Plan. This takes place **in the 2 to 3 weeks following the event**. Only activations requested by Tripartite partners and deemed feasible by CEOS RO Demo partners will be approved.
- **Activation Plan for each RO** is drafted and **submitted to RO Demonstrator Team**, covering scope and length of activation, key milestones and reporting process on use of satellite data in RO.
- For each RO, a **RO liaison** is designated (volunteer agency) who **works directly with PDNA (or other) user team** to establish requirements, organise access to satellite-derived data products, coordinate with value-adding partners and report to RO Demonstrator Team. The RO liaison is designated from one of the RO Demonstrator partners. He/She will also update the Activation Plan if required during the 2 to 6 month activation period.

## 4 sections :

- **“Use of satellites for recovery assessments”** : case study of recent assessments and survey of past rapid assessment leaders
- 1<sup>st</sup> draft of **Concept Paper** circulated to RO Demonstrator Team (Feb 2021)
- **RO test** : Beirut blazes
- **1<sup>st</sup> RO activation** : triggered on March 5<sup>th</sup> for Iota



## Purpose of report

- In support of the development of the RO Demonstrator, it was felt that a ***thorough review of several past recovery assessments*** would be of significant benefit
- An ***initial review of the written reports*** was conducted, and this review produced preliminary conclusions; these conclusions were then presented through an ***interview process*** to people involved in the recovery assessments; a ***final PPT report*** was drafted integrating the results of the interview process and ***making recommendations*** for RO Demonstrator implementation
- The analysis is an ***internal process*** to improve the RO Demonstrator. There is no plan to publish the results of the review or to further promote its conclusions.

## Choice of Recovery Assessments

Analysis sought to review a range of different assessments representing different geographic regions, different types of disasters, different scales, different methodologies, and, if possible, some assessments using EO and some not using EO

The final selection was:

- Mozambique (Cyclone Idai 2019) – GRADE and PDNA
- Bahamas (Hurricane Dorian 2019) – GRADE
- Vietnam (Typhoon Damrey 2017) – Rapid assessment
- Somalia (Drought 2018) – DINA
- Albania (Earthquake 2019) – PDNA
- CAR and Nigeria (Civil Unrest 2017) – RPBA

## Interviews Conducted fall 2020

- WB: Alexander AGOSTI (Somalia, Dorian)
- WB: Rashmin GUNASEKERA (Dorian, ++)
- EU/Particip: Thomas HOCKLEY (CAR, Nigeria)
- WB: Michel MATERA (Idaï)
- WB: NGUYEN Huy Dzung (Dampfrey)
- WB: Ayaz PARVEZ (Somalia, ++ dozens of assessments)
- WB: Anthony POMONIS (Dorian, ++)
- UNDP consultant: Ricardo ZÁPATA-MARTÍ (Idaï, Albania)

# Use of satellites for recovery assessments

## High-level Conclusions (1 of 2)

The **potential of EO-based information** to provide high-level impact assessments is well recognized, especially for rapid assessment (first two weeks after an event), but not always well understood;

Satellite EO-based information is sometimes used by recovery assessment managers, however, there is **no systematic use of satellite EO**, nor is that use systematically considered;

Satellite EO-based information usually comes from **either well-known open sources** such as USGS' Landsat or openly available NASA data, **or as a bundled package with other data and information** such as opinion surveys and social media statistics (e.g. Ipsos);

There is **little understanding** within the DRM community of the myriad of options available from a satellite perspective:

- Radar vs optical;
- High resolution vs very high resolution;
- Revisit time;
- Data vs products and commercial vs free and open.
- Recent advances in data analytics (EO and AI).

# Use of satellites for recovery assessments

## High-level Conclusions (2 of 2)

- Satellite data use is **opportunistic**, relying on **individual connections, knowledge** and contacts;
- The main purpose of recovery assessments is to prepare for **donor conferences**, typically about two months after event. The most critical input from EO must arrive before this. A second phase could provide useful support to national monitoring, beyond assessment phase;
- EO has the **potential to contribute significantly** to certain **sectoral analyses**  
(Productive Sectors – Agriculture, Industry/Tourism; Social – Housing; Infrastructure – Electricity, Transport; Cross-cutting – Civil Protection, Environment);
- EO is **irrelevant for many other sector analyses**, so the value of EO is in part tied to the scale/scope of the assessments (cf. Albania vs Mozambique);
- EO can be a useful tool to illustrate overall impact in the case of floods, droughts, and generally for events that impact a **large area**;
- **In some cases EO** was integral to analysis (e.g. Somalia), but this required support from value adders;
- While there is awareness of the potential, the **actual contribution is not well defined**.

- **Fully automated EO applications (machine learning, AI, ...)** are only **emerging** – possible demonstration in RO Demo
- Effective use of EO in recovery assessments **still requires value-adding**
- As a **bundled product**, value adding has been used (cost cited ranged from \$50k to \$100k per event, when used)
- **Use of value adding** in PDNAs and RPBAAs has been **very limited** (Ipsos example) and was provided by a polling organization rather than an EO expert (through contacts with Planet under subcontract)
- **Better understanding of what value adders provide**, who they are, how they work and what they cost would be valuable

## Recommendations for RO Demonstrator implementation

- **Increase awareness** of EO within the international recovery community
  - Provide **short summary** of EO technologies and products useful for recovery (Q1 2021)
  - Organize **webinar event** (and eventually face-to-face presentations) showcasing possible value-added providers and possible EO recovery applications (late 2021 with first RO Demo activation results?)
- **Update PDNA Guidelines** to include explanations on accessing EO data and information products (Q1 2021)
- Baseline **cost-benefit analysis** of EO use in each RO activation for final report on RO Demonstrator
- Provide **feedback to survey participants** from our group



## 1st draft of Concept Paper circulated to RO Demonstrator Team (Feb 2021)

Currently under review and will be augmented with activation experience

### *Outline:*

- *Introduction*
- *The Challenges of Recovery*
- *Using Satellites to Gather Recovery Information (current use)*
- *The Recovery Observatory (RO) Concept*
- *RO Pilot feedback and RO Demonstrator (3 year project)*
- *Cost-Benefit of Satellite Services for Recovery*
- *Sustainable Use of Satellites for Recovery (sustainable vision)*





## RO “test case” : Beirut blazes - activated by European Union FPI (+ UNDP, WB/GFDRR) in January 2021

- Copernicus EMS R&R activation (from fall 2020) to be updated every three months for one year
- Copernicus SEA activation being considered (SatCen)

Service Request Form (SRF) - FLEX

European Commission Copernicus EMS Risk and Recovery Mapping

To be sent to the ERCC (Mon-Fri 9-17h) Email: echo-ercc@ec.europa.eu Tel: +32-2-29-21112

Please provide the information requested in the areas marked in blue. For more information on the service and a printable/editable version of this form, please refer to <http://emergency.copernicus.eu>.

Activation details

Activating institution

National Focal Point  EC Services  EEAS

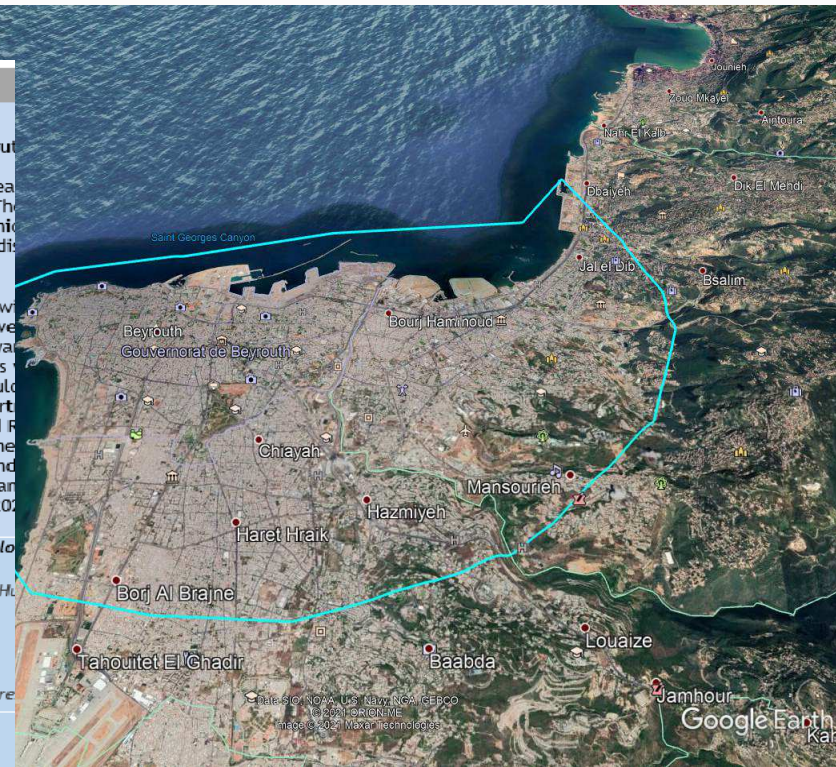
Organisation Name: European FPI  
Contact Person: Claes Anderson

Country: Beirut, Lebanon

Reason for activation: Monitoring recovery and reconstruction following the Beirut Explosion in the port of Beirut; Initial explosion in port was 4 August 2020, causing 204 deaths and destroying buildings and infrastructure in a 7 km radius. The estimated damages are in excess of \$US 15 billion. Copernicus EMS R&R and RRM were activated and has provided pre- and -post disaster maps, but there is a need for on-going monitoring of the reconstruction process.

Maps to be provided: The EC is committed to working on Beirut reconstruction with World Bank and UNDP in the context of the Reform, Recover and Rebuild (3RF). Monitoring progress towards reconstruction is a critical element of the 3RF. Copernicus EMS offer a holistic view of progress on the ground, which would be combined with in situ information available from local partners. The 3RF process will run to the end of 2021. This Risk and Recovery Mapping (RRM) activation aims to establish the January 2020 baseline reconstruction start (beginning of official 3RF process), and concrete progress in terms of reconstruction of buildings and infrastructure at three month intervals (April 2021, July 2021, October 2021 and finally January 2022).

<p><b>Hydrological</b></p> <p><input type="checkbox"/> Floods</p> <p><input type="checkbox"/> Landslides</p> <p><input type="checkbox"/> Coastal flooding, storm surges</p> <p><input type="checkbox"/> Coastal erosion</p> <p><input type="checkbox"/> Soil erosion</p> <p><b>Human-related</b></p> <p><input type="checkbox"/> Humanitarian crisis</p> <p><input type="checkbox"/> Crowd disasters</p>	<p><b>Geophysical</b></p> <p><input type="checkbox"/> Earthquakes</p> <p><input type="checkbox"/> Volcanic activity</p> <p><input type="checkbox"/> Tsunamis</p> <p><input type="checkbox"/> Ground deformation</p> <p><b>Technological</b></p> <p><input checked="" type="checkbox"/> Post-disaster situation map</p> <p><input checked="" type="checkbox"/> Reference map</p> <p><input checked="" type="checkbox"/> Pre-disaster situation map</p>	<p><b>Meteorological, climatological, biological</b></p> <p><input type="checkbox"/> Tropical cyclones / Hurricanes</p> <p><input type="checkbox"/> Wildfires</p> <p><input type="checkbox"/> Droughts</p> <p><input type="checkbox"/> Extreme temperature events</p> <p><input type="checkbox"/> Epidemics</p> <p><input type="checkbox"/> Windstorm</p> <p><input type="checkbox"/> Air pollution</p> <p><b>Other, please specify</b></p>
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**1st RO activation : triggered on March 5th for Iota – Honduras and Guatemala (Nicaragua : TBC).**

**Damage and loss assessment:**

- Honduras (ECLAC, IADB, WB): \$US1,900 million
- Nicaragua (national assessment): \$US 750 million
- COVID restrictions meant most assessment was desk-based. Full extent of damages still uncertain

Four main activities being considered:

- **Repository and continuation of Copernicus EMS** Grading maps in **Honduras**, Guatemala and Nicaragua, useful for the Recovery phase; covering a **greater area** than ‘small pockets’ of damage assessment conducted by Copernicus EMS;
- **Sectoral impact analysis** – use of EO in flood damage assessment and agriculture sector impacts in Honduras; could be extended to infrastructure sector as well.
- Develop a **framework and decision tree on post disaster activation**, choice and use of EO in post disaster analysis for Central America.
- **Capacity building** of interpretation and processing/integration of EO data at **CA regional entities** such as CEPREDENAC and coordination with **CEOS WGCapD** (this could be linked to development of a land use map for CA at a higher resolution).

**Month 1 - Week 1**

WB, in association with UNDP and EU, requests activation

RO Demo secretariat prepares an activation plan in consultation with the Bank and affected countries and stakeholders

**Month 1 - Week 2 or 3**

RO Demonstrator team reviews activation plan – contributing CEOS agencies would confirm their willingness to contribute

RO Demo team takes a decision to activate and designates a **RO liaison officer** (link between requestor and EO actors);

**Month 1 - Week 3**

Satellite data acquisition requests; valued-added planning; liaison with beneficiaries; identification of possible local nodes of expertise (for capacity building assessment, with WG CapD)

**Month 2**

Approved **RO plan** (3 to six months depending on needs / evolution of the situation)

First products; review and feedback from beneficiaries

**Month 3-5**

Regular products

Capacity Assessment and Capacity Development Plan

**Month 6 (at latest)**

**Wrap up** of RO Demo – hand off for **longer term capacity development** (CEOS WG Cap D, GEO-DARMA, UN-SPIDER? other possible partners?)

- Capacity Building is **systematically** part of international stakeholders activities in a country.
- **Existing capacity** would be an asset for triggering RO but variety of scenarios and **ad hoc approach** should be set up.
- Linkages with **WG CapD** capacities : to be analysed
- **Proposed strategy**: identify local node of expertise; evaluate capacity; make linkages to existing data streams and value-adding sources; develop targeted CB plan; hand-off.
- Capacity Building is critical but requires **long-term commitment**. RO activity can initialize CB plan and set wheels in motion.
- **Capacity Building** will focus on **Recovery monitoring as well as Early Recovery products**, and will continue long after RO activation.
- Need to **coordinate with WGCapD**



**Disaster Event**



**Post Disaster Needs Assessment**



**Disaster Recovery Framework**



Emergency & Humanitarian Response: satellite imagery of

Assessment process supported by more focused, sector specific images of pre and post disaster situation:

Continued use of selected imagery to monitor and document recovery processes 6 Months +

## Sustainable RO, integrated into Recovery process

and population connectivity networks

**Emergency Response**

**RNA/GRADE**

**PDNA**

**DRF REC PLANNING**

**RECOVERY M&E**



**Thanks for your attention!**



## PDNA Sectors (adapted from Albania assessment)

- ***Social Sectors:*** Housing, Health, Education
- ***Productive Sectors:*** Tourism, Business (Manufacturing and Trade) and Employment, Cultural Heritage, Agriculture
- ***Infrastructure Sectors:*** Electricity, Communication, Community Infrastructure, Transport, and Water, Sanitation & Hygiene
- ***Cross-cutting Sectors:*** Civil Protection and Disaster Risk Reduction, Social Protection (+macroeconomic analysis and gender impact analysis)
- ***Other sectors not from Albania assessment:***  
***Environment***

Identify the disaster (name, type, country, date):

Your name and title/organization:

Your role in the recovery analysis (GRADE/PDNA/RPBA/etc) process:

How long did the assessment process last from mission inception to reporting?

**Was satellite data used by you or your team in assessing the damages? If yes, how?**

If satellite data was used, did it arrive on time? \_\_\_\_\_ Did it require interpretation or was it already an information product?

**If satellite data was not used, were there questions that could have been better informed using satellite data?**

**If satellite data was used, what was the main benefit derived? If it was not used, did you consider it and what factors kept you from using it?**

Did the final report include any satellite imagery or derived products?

Which statement below best describes your knowledge of satellite data for recovery:

I consider myself to be well-informed about satellite data options to support recovery;

I have some knowledge of satellite data sources to support recovery;

I would not know where or how to obtain satellite data to support recovery.

Which statement below best describes your assessment of the usefulness of satellite imagery as a means to inform PDNA analysis?

Satellite data are a critical component providing unique information for recovery-focussed assessments;

Satellite data would be a useful complement to field data and other sources, when they are available;

Satellite data are difficult to integrate into the recovery assessment process and do not add significant value to the end result.

In your opinion, what are the major hurdles to increased use of satellite data for recovery-focussed assessments?



# RO Demo Implementation Plan – Partner Contributions (1/2)

## 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)

**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.

**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 EC/Copernicus:** Support through CEMS 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).

Still to be discussed: **CONAE, CSA/CCMEO, others...** consultations continuing through the fall.

# RO Demo Implementation Plan – Partner Contributions (2/2)

## 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.

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