LIST OF PARTICIPATING ENTITIES
(The following entities confirmed interest in sending participants)

BAPPENAS (*Badan Perencanaan Pembangunan Nasional* – Ministry of National Development Planning) – Water Resources and Irrigation
Ministry of Public Works and Housing
Ministry of Agrarian Affairs and Spatial Planning / National Land Agency
LAPAN (*Lembaga Penerbangan Dan Antariksa Nasional* - National Institute of Aeronautics and Space)
BIG (*Badan Informasi Geospasial* - Geospatial Information Agency)
Center for Volcanology and Geological Disaster Mitigation, Geological Agency, Ministry of Energy and Mineral Resources/ESDM
HATTI (*Himpunan Ahli Teknik Tanah Indonesia* - Indonesian Society for Geotechnical Engineering)
BPPT (*Badan Pengkajian Dan Penerapan Teknologi* - Agency for the Assessment and Application of Technology)

DRAFT TRAINING PROGRAM

DAY 1. ESA and project partners introductions; Copernicus programme and context of EO4SD (Earth Observation for Sustainable Development); Project introduction; Products and Services scope and means of data and information provision.

Copernicus

- European Commission and European Space Agency programme of global monitoring
- Copernicus space segment (operational and planned satellites of Sentinel constellation
- Elements of ground segment (examples of Collaborative Ground Segments and cloud infrastructures of Data and Information Access Services – DIAS)
- Copernicus geoinformational services (with special focus on Land and Emergency services)

EO4SD Earth Observation for Sustainable Development

- Long term ESA support for international development aid organizations,
- Introduction of selected activities

Geo4IRBM - Geoinformational support for Integrated River Basins Management

Land cover and land cover changes mapping

- Products and services
- Means of data and information provision
- Application fields

Crops mapping

- Products and services
- Means of data and information provision
- Application fields

Surface water monitoring

- Products and services
- Means of data and information provision
- Application fields

Surface deformations monitoring

- Products and services
- Means of data and information provision
- Application fields

Environmental analysis

- Products and services
- Means of data and information provision
- Application fields

DAY 2.Products and services - applied methods of EO data processing and analysis, achieved results, products and services application fields.

Land cover and land cover changes mapping

- Main and auxiliary input data sources, selection of valuable satellite scenes, advantages of continuous satellite monitoring, seasonal variations, historical data accessibility
- Methods of image classification, preprocessing, application of methods of machine learning and multitemporal classification, methods of data integration, selection valuable auxiliary datasets and objects types
- Limitations of the data sources, limitations of methods applied connected with nigh cloud coverage, topography and land use and land cover types patchwork
- Final products specification and introduction of results
- Potential fields of products and services applications including generation of other products in the project, analysis in the context of water resources, settlement distribution, crisis management, land cover changes, environment impact analysis, costal dynamics, urban sprawling, floods modelling
- Collection of feedback of participant - suggestions of further development and alternative application scenarios

Crops mapping

- Assumptions of products scope and accuracies
- Reference data needs, potential data sources, applicability of land cover data
- Selection of multitemporal SAR scenes, analysis of yields cycles, multitemporal SAR imageries classification methods
- Final products specification and introduction of results
- Potential fields of products and services applications
- Collection of feedback of participant - suggestions of further development alternative application scenarios

Surface water monitoring

- Introduction of assumptions of the service and general overview of the surface water monitoring system, applications in water management and flood protection
- Selection of satellite SAR data sources, advantages of long term, continuous monitoring
- Analysis of historical data sources archives, historical surface water monitoring
- Application of cloud computing environment
- Issues of integration of multitemporal information
- Limitations of data sources and the techniques applied, influence of land cover, topography, intervals of observations
- Final products specification and introduction of results, including web environment allowing for accessing and viewing continuously provided services

- Potential fields of products and services applications including water management, water resources mapping, agriculture monitoring, floods and inundation monitoring, crisis management, costal monitoring
- Collection of feedback of participant - suggestions of further development alternative application scenarios

Surface deformations monitoring

- Theoretical background of interferometric data analysis
- Characteristic of the input data sets and characteristic of the study area in the context of applicability of interferometric techniques
- Main steps of interferometric data analysis, basic problems during the data processing in the context of particular study area
- Analysis of first preliminary deformation maps; velocities, spatial extent possible origins of deformation
- Possibility of monitoring of various types of deformation (landslides, soil erosion, subsidence, tectonic faults, earthquakes etc.) in the context of spatial distribution and quality of measurements points for various land cover types within the study area
- Possibility of continuous service provision over the large areas in the context of the first results of data analysis

DAY 3. Terrain deformation monitoring (Vincenzo Massimi)

EO4SD in support to Disaster Risk Reduction (Intro by P. Manunta and A. Lorenzo)

- Manunta: ESA and ADB partnership. EO4SD program

EO4SD DRR in support to risk and recovery in Central Sulawesi (P. Manunta and A. Lorenzo)

- General presentation of EO4SD DRR. Support to Sulawesi recovery. The web tool
- General presentation of the EO4SD DRR project. How the project was "activated" for supporting Central Sulawesi Recovery. Identification of needs and translation into technical requirements. Summary of the products produced and showcasing in the web mapping application.

Brief theoretic introduction to multi-temporal interpherometry (InSAR)

- Introduction to SAR: Synthetic Aperture systems and SAR interferometry (InSAR)
- Working principles, applicability requirements, and main error sources of InSAR techniques covering all relevant theoretical concepts.
- Theory of Multi-Temporal Interferometry SAR (MT-InSAR) technique (Persistent Scatterers and Distributed Scatterers) to carry out the displacement time series measurements

Engineering applications of Multi-Temporal InSaR (MTI). Examples with Use-Cases

- Example of engineering applications based on Multi-Temporal interferometry SAR (MT-InSAR)

- Use cases related to the monitoring of natural phenomena like landslides and subsidence and infrastructures stability like buildings, roads, railways, dams, mining area etc.

Analysis of the MTI results on Central Sulawesi (ex-ante & ex-post)

- Rheticus® Displacement service presentation.
- Presentation and discussion of the results of the MT-InSAR data processing (PS/DS map), ex-ante and ex-post Palu earthquake, based on the Sentinel-1 data and performed using the Rheticus® Displacement processing chain

Added value to the PSI result. Buildings motion measurements layer

- Presentation and discussion on examples of vertical monitoring applications of PS/DS map for infrastructures and built-up areas, with focus on the buildings motion measurements layer produced over Palu area (ex-ante & ex-post)

DAY 4. EO Cloud Processing for Geohazards – ESA Geohazard Exploitation Platform

The Copernicus Sentinel & ESA Earth Observation programmes

- Sentinel missions' overview and status
- Sentinel operational products and data access
- ESA heritage SAR missions and new mission concepts
- Scientific exploitation and achievements
- SentiNel Application Platform (SNAP)

ESA Geohazard Exploitation Platform (GEP)

- Background
- Thematic Apps and Services
- Community platform and e-collaboration
- The Early Adopters programme

Theoretical Background on SAR, InSAR and Optical Remote sensing

- Basic principles of SAR and Optical remote sensing for geohazards applications
- SAR interferometry - From processing to interpretation
- Monitoring geohazards with multiple resources

Building Experience with GEP services

- Familiarizing with GEP environment & Satellite Image Screening
- SAR Interferometry chains for earthquake and volcano deformation
- Optical Image Correlation chains for mapping ground displacements
- Change Detection for geohazards mapping

DAY 5.Flood hazard. Exposure mapping. Risk assessments. EO Products in a user context (Alberto)

Presentation of the flood susceptibility: automatic extraction of flood events using satellite imagery. Geomorphic approach for flood hazard modelling. Semi-automatic approaches.

- Presentation of different approaches to measure flood hazard. Hydrological models, models of flood susceptibility using DEMs and time series analysis of flood events. Pros and cons
- Use of DEMs to extract flood-prone areas. Sources, techniques, results and limitations
- Time series analysis: methods to extract water information from optical and SAR satellite images. Sources of information, processing issues and limitations. The specific case of urban areas
- The need of semiautomatic approaches in a context of dynamic river morphology

Exposure mapping: presentation of the Land Use Land Cover product. Different scales for different purposes.

- Exposure mapping, types. Asset mapping, elements of interest for different hazards types: land cover (including built up area), population and value of assets
- The Land Use land cover product: automatic vs manual approach, pros and cons
- Examples of different scales for representing different elements: 1:50000, 1:10000, 1:5000

Products in a user context. End to end services. Risk mapping.

- Extracting valuable information form hazard and exposure mapping
- Risk Mapping as the final result of the disaster risk assessment process
- Putting the products in the user context

Next steps for cooperation