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**Integrated Risk Management System Components
in the
GEO Architecture Implementation Pilot – Phase 2 (AIP-2)**

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Table Of Contents

1 Overview	3
2 Proposed Contributions	3
2.1 Societal Benefit Area Alignment and Support	4
2.2 Component and Service Contributions	4
2.3 Architecture and Interoperability Arrangement Development.....	5
3 Description of Responding Organization	5

ICT4EO & UKZN & 52°North Response to the GEOSS AIP-2 CFP

1 Overview

The consortium proposes to contribute to the Second AIP Call in several ways:

- Components and services

The consortium will provide multi-risk management related services and data sets and integrates existing GEOSS resources into a multi-risk management system for Southern Africa. By this, the consortium analyzes the usability of the existing initial operating capability. The activity will be conducted in close cooperation with NASA and other space agencies and related institutions.

- Facilitate the integration of CEOS-WGISS and DA-07-04 resources

ICT4EO is a contributing member of the CEOS-WGISS Sensor Web Interest Group and through their participation, can play a role in bridging the gap between this group and the AIP-2. The principal benefit provided is the additional resources that can be brought to bear by including WGISS and members of the DA-07-04 Task group. The consortium is active within the DA-07-04 Task group in supporting Sensor Web activities of the AIP-2. Members of these groups have many relevant skills and are also custodians of data sets that can be valuable for the AIP-2.

- Sensor Web consultative expertise

At the political interoperability level contribution will be mostly of a consultative nature. The group is also willing to contribute in a general sense to any areas where Sensor Web expertise is required.

- Testing and validation

In terms of standards the group would like to assist in testing out the Sensor Web related standards and would like to contribute by making recommendations back to the standards bodies in terms of areas where standards are lacking with respect to GEOSS and the AIP-2.

2 Proposed Contributions

“A disaster is an event which disrupts the daily life of the population of a community or country and can result in substantial loss of life and social upheaval, leading to many persons becoming homeless, helpless and hungry”
(National Disaster Management Centre).

The goal of the proposed contributions of this consortium is to demonstrate the capacity of standardized interoperable information and communication technology solutions to effectively mitigate disaster risks and to manage disaster scenarios. This contribution will be performed in partnership with NASA/GSFC Sensor Web. With the ultimate goal of developing a cross-national disaster management platform using GEOSS resources and

components, the consortium proposes to provide a number of service instances relevant to handle natural disasters caused by flood and fire. Though some countries in Sub-Saharan Africa run their own space programs, availability of remote sensing data sets primarily depends on external resources.

It is the goal of the consortium to analyze the initial operating capability of GEOSS towards usability in developing countries and by participating in the Disaster Response scenario. We will explore to which extent GEOSS resources can be identified and integrated with local resources and how the results can be fed back into the global system of systems as higher value information.

The consortium will deploy a number of Web services compliant to the standards of the Open Geospatial Consortium and registered in the GEOSS service registry. On the other hand, we will explore usability of the GEOSS clearinghouse in order to access required data sets not available on a local basis.

First coordination and integration activities have been performed upfront to team up with NASA. In a joint effort, we will explore the usability of NASA services and data sets provided to GEOSS as part of the Caribbean Flooding Project. Jointly, we aim for setting up a multi-risk management system in Africa. NASA data and processing services will be used to run flood and fire detection services. Additional services are planned to be developed and integrated in the future to provide a complete application solution, mainly used by disaster management, global climate change, and health related institutions. It is anticipated that additional partners, such as the International Red Cross and Red Crescent organization will support and join this activity in during the course of the AIP.

Besides the technical developments, coordination activities and the set up of relationships with other participants of GEOSS are important factors.

2.1 Societal Benefit Area Alignment and Support

The cross-national disaster management platform consists of a number of services and data sets that are useful to a variety of SBAs. Primarily, we address the SBAs Disasters, Health, and Agriculture. Nevertheless, all SBAs could benefit from the system components, as natural disasters often cause severe consequences in other SBAs.

2.2 Component and Service Contributions

The consortium will contribute services based on standards developed by the Sensor Web Enablement initiative of the Open Geospatial Consortium. Those services will be deployed in South Africa. Though connectivity is usually ensured, we cannot give guarantee on service or bandwidth availability due to infrastructural conditions we cannot influence.

The multi-risk management framework will use global background water levels, global TRMM precipitation anomalies, global MODIS real-time flood extent, global EO-1 imagery, and a high resolution model of the Mozambique region using Landsat base data, SRTM DEM, and Envisat radar data. Those services provided by NASA and the Ukraine Space Research Institute will be integrated with locally deployed services such as

weather forecast services using real time data provided by the South African Weather Service and potentially the Mozambique National Institute of Meteorology, fire and flood detection and dispersion model services, fire and potentially flood danger index services.

Additional data sets will be explored during the course of AIP-2. Optimally, high-resolution radar (C-Band) data will be available to improve flood models.

2.3 Architecture and Interoperability Arrangement Development

We plan to support the refinement of the architecture and interoperability arrangements based on our experiences made during the pilot.

3 Description of Responding Organization

ICT4EO @ Meraka Institute

The Meraka Institute facilitates national economic and social development through human capital development and needs-based research and innovation, leading to products and services based on Information and Communication Technology. The Institute supports regional initiatives under the New Partnership for Africa's Development (NEPAD), collaborating with ICT organisations through staff and student exchange, and the establishment of co-operative programmes. In addition, the Meraka Institute leverages international science and technology collaboration and establishes global links to international programmes to contribute to and take advantage of international efforts in redressing the Digital Divide.

The Meraka Institute addresses three critical areas: Human capital development in ICT (Information Communication Technologies) forms a critical thread throughout the Institute's activities and ensuring continued development, growth and sustainability. Second, the innovation in ICT leading to applications that address development challenges facing South Africa, the Continent and the developing world thereby directly contributing to addressing the challenges faced by the second economy. Third, advanced technical research enabling indigenous ICT leadership, through a critical mass of high quality research and development

The ICT for Earth Observation (ICT4EO) research group forms part of the Meraka Institute. The group is focused on sensor web enablement (SWE). Research is relevant in the context of Global Earth Observing Systems of Systems (GEOSS)/South African Earth Observation Strategy (SAEOS) architecture. The outcome of SWE will be a global network of interoperable sensors and sensor networks. We are working closely with the Open Geospatial Consortium (OGC) on SWE.

Our research is directed at developing intelligent middle ware to harvest meaningful information from the sensor web. We are currently investigating how semantic reasoning and knowledge representation can be used to configure the sensor web to observe particular phenomena. Further to investigating the sensor web it is at the core of the group the desire to bring sensor web to natural scientists as a mechanism of facilitating

research. Current activities in this regard explore scientific workflows as a means of bringing sensor web to the scientist.

Meraka represents GEO member South Africa.

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Computer Science @ UKZN

The University of KwaZulu-Natal aims to be a truly South African university that reflects the society in which it is situated – not only in terms of race, gender and class – but in terms of how it structures its values and priorities and how it responds to social needs. As an institution of higher learning, it is committed to academic excellence, innovation in research and critical engagement with society. With its vision to be the Premier University of African Scholarship, the University of KwaZulu-Natal draws inspiration from an African identity and takes seriously its responsibilities to the development of the African continent.

The School of Computer Science is housed within the Faculty of Science and Agriculture. The school offers a BSc and a BSc Honours degree in Computer Science, as well as research based MSc and PhD degrees.

Academic staff and students engage in a wide variety of research endeavours that cover both theoretical and applied areas of computer science. One of the key research areas is the development of middleware for the Semantic Sensor Web. The aim of this research is to investigate the use of ontologies to facilitate the discovery, analysis and integration of sensor resources on the Sensor Web. The current focus of the group is on information extraction from satellite imagery.

UKZN represents GEO member South Africa.

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52°North

52°North Initiative for Geospatial Open Source Software GmbH is an international research and development company whose mission is to promote the conception, development and application of free Open Source geo-software for research, education, training and practical use. 52°North backs a partner initiative, which is driven by leading research organizations and individuals in the international GIS field. Partners participate in the development of Open Source innovations and the transformation of these into practical technological solutions. The current focus is on Sensor Web Enablement (SWE), Web Security and Digital Rights Management (DRM), as well as Web Processing. Principal partners are con terra - Gesellschaft für Angewandte Informationstechnologie mbH, Münster (Germany), International Institute for Geo-Information Science and Earth Observation (ITC), Enschede (The Netherlands), University of Münster respectively the Institute for Geoinformatics (Germany) and ESRI Inc., Redlands (California, USA). The partners have a long and outstanding record in the domain of geoinformatics, spatio-temporal modeling, spatial data infrastructures, software architectures, and standardization processes. 52°North partners are actively involved in the OGC standardization process for Sensor Web Enablement and Digital Rights Management as well as in INSPIRE drafting teams.

52°North represents GEO member South Africa.

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