

Project Plan:  
GEO Societal Benefit Area Analysis  
(Critical Earth Observation Priorities)  
GEO Task US 09-01a

Air Quality Health SBA  
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===== *Report Outline For Context Only* =====  
(note to AG: this draft Outline for the final report, is based on guidance from the Task Leads. It is provided here as context for the review of the project plan, not for feedback. The final report will be a short, 30 to 40 pages long.)

## **Air Quality and Health Report Outline (Draft)**

1. Introduction (2-3 pages)
    - 1.1. GEO and Societal Benefit Areas
    - 1.2. Task US-09-01a
    - 1.3. Purpose of Report
  2. Methodology and Process (~5 pages)
    - 2.1. Task Process - Analyst and Advisory Group (How formed; AG members)
    - 2.2. Methodology
      - 2.2.1. Documents (general description on how Analyst/AG identified documents)
      - 2.2.2. Meta-Analysis Methods
      - 2.2.3. Prioritization Methods
  3. Air Quality and Health SBA (~5 pages)
    - 3.1. Description (General information, includes brief GEO definition)
    - 3.2. Sub-areas (statement and brief description/rationale)
    - 3.3. Documents (general; table of docs/region/, sub-area/org//author, GEO/Org)
  4. Earth Observations for Air Quality and Health SBA (3-4 pages/sub-area)
    - 4.1. Air Quality and Health - Observations/characteristics; rationale based on 2.3.2
  5. Priority Observations (4-5 pages)
    - 5.1. General; Table of priority obs.; characteristics reflecting 2.3.3
  6. Additional Findings (1-3 pages) anything not fitted in above sections
  7. Comments and Recommendations (2-3 pages) perspectives, process, suggestions
- Appendix

## **1 Introduction (Draft)**

*(note to AG: This draft Introduction to the final report (below) is based on guidance from the Task Leads. It is provided here as a context for the AG's review of the project plan)*

This report articulates Earth observation priorities for the Air Quality and Health SBA, based on an analysis of YY publicly-available documents ....

## **1.1 Group on Earth Observations**

The Group on Earth Observations (GEO, [www.earthobservations.org](http://www.earthobservations.org)) is an intergovernmental organization working to improve the availability, access, and use of Earth observations to benefit society. GEO is coordinating efforts to build a Global Earth Observation System of Systems (GEOSS)<sup>1</sup>. GEOSS builds on national, regional, and international observation systems to provide coordinated Earth observations from thousands of ground, airborne, and space-based instruments. GEO is focused on enhancing the development and use of Earth observations in nine Societal Benefit Areas (SBA): Agriculture, Biodiversity, Climate, Disasters, Ecosystems, Energy, Human Health, Water, Weather.

## **1.2 GEO Task US-09-01a**

The objective of GEO Task US-09-01a is to establish and conduct a process to identify critical Earth observation priorities within each Societal Benefit Area and those common to the nine SBAs. Many countries and organizations have written reports, held workshops, sponsored projects, conducted surveys, and produced documents that specify Earth observation needs. Task US-09-01a focuses on compiling information on observation parameters from a representative sampling of these *existing* materials and analyzing across the materials to determine the priority observations.

This task considers ground, in situ, airborne, and space-based observations. The task includes both observed and derived parameters, as well as model products. This task seeks to identify Earth observation needs across a full spectrum of user types and communities in each SBA, including observation needs from all geographic regions and significant representation from developing countries.

GEO will use the Earth observation priorities resulting from this task to determine, prioritize, and communicate gaps in current and future Earth observations. GEO Member Countries and Participating Organizations can use the results in determining priority investment opportunities for Earth observations.

## **1.3 Purpose of Report**

The primary purpose of this report is to articulate the critical Earth observation priorities for the Air Quality and Health SBA. The report describes the overall process and specific methodologies used to identify documents, analyze them, and determine a set of Earth observation parameters and characteristics. The report describes the prioritization methodologies used to articulate the priority Earth observations for this SBA. The report also provides information on key challenges faced, feedback on the process, and suggestions for process improvements.

The report does not address the source or sensor technology involved with producing the Earth observations. The report identifies the priority Earth observation parameters, independent of any specific collection method. Similarly, this report does not address visualization tools, decision support tools, or system processing characteristics (e.g., data format, data outlet) associated with the direct use of the observations.

The GEO User Interface Committee (UIC) will use the results of this report in combination with the reports from the other eight SBAs. The GEO UIC will perform a meta-analysis across all nine SBA reports to identify critical Earth observation priorities common to many of the SBAs.

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1. f Earth observations GEO 10-Year Implementation Plan:  
<http://www.earthobservations.org/documents.shtml>

Following a discussion of the methods used in this analysis (Section 2), the report describes the SBA and the specific sub-areas that were part of the analysis (Section Air Quality and Health 3). Section 4 articulates the specific Earth observations for each Air Quality and Health sub-area, and Section 5 presents the priority observations across the Air Quality and Health SBA. Sections 6 & 7 present additional findings from the analysis of the documents and any recommendations. The Appendices include further information describing aspects of the Air Quality and Health SBA.

===== *End of Report Outline For Context Only* =====

===== *Project Plan For AG Feedback* =====

## **Project Plan (July 1, 2009)**

*(note to AG: Feedback and guidance from the AG are expected for the sections below)*

This is the project plan for the Air Quality and Health SBA (AQ SBA) submitted to the AG on July 3, 2009. Feedback from the members of the AG and others are requested by July 17. Following the analyzed AG feedback and other developments, the project plan will be revised and re-posted on an open website ([http://wiki.esipfed.org/index.php/GEO\\_User\\_Requirements\\_for\\_Air\\_Quality\\_Report](http://wiki.esipfed.org/index.php/GEO_User_Requirements_for_Air_Quality_Report)) by the end of July.

## **Earth Observations: Types and Quality**

Earth observations have many facets and require a range of attributes for a full characterization and . Special effort will be devoted to the development of a suitable characterization of Earth observations for AQ SBA. The natural dimensions of EOs are the the measured parameters as well as the spatial and temporal extent. Each physical dimension is also characterized by the resolution of the observation, i.e. spatial and temporal resolution, and the possible grouping/lumping of the measured parameters.

Hardly any of the EOs can be used directly as raw data for decision making. Value adding processes (data filtering, aggregation and fusion) are needed to derive decision-ready products. The more difficult characterization of EOs is along the value chain from the raw observed data to the derived information and knowledge that is used for decision making. Typical derived parameters include the air pollution index (an aggregate of multiple air pollutant concentrations), that informs the public on the general level of air pollution and facilitates personal decision making. Similarly, compliance with an AQ standard (derived from multi-year data series) informs an air quality manager whether an AQ control action is required. Other facets of EOs include relevancy to the application, data quality, tracability, timeliness, etc. During the project, the suitability of such a multi-faceted characterization of EO priorities will be examined and, if possible simplified.

## **End-User-Driven Approach**

Identifying the key users is a necessity for proper evaluation of their Earth Observation (EO) needs. In the proposed approach, the user categories are represented in a two dimensional matrix. The first dimension is the *end-use category*. An end user uses the EO for making a personal or societal decision. We will consider three groups of end-users of air quality-relevant observations: **general public**, **air quality managers**, and **air quality policy makers**. Each end use group has different EO needs. The respective

information needs for each end user category will be determined.

The second dimension of EO user classification is along the value chain that transforms the raw observations into suitable information for the decision-makers (end users). **Data managers and data flow mediators** are a class of users who are responsible for the timely, robust and proper flow of EOs to the SBA application. These users, can be considered part of the GEO information infrastructure. Intermediate users include **researchers, analysts, and modelers** who digest and prepare the raw observations in a manner that is suitable for the end-user's decision making needs. The consumers of the processed EOs are the **end-users** listed above. Classifying users along the value adding chain would aid consistency with the GEOSS data sharing infrastructure, the the right information is delivered to the right user. It is here recognized that public documents that explicitly address the information requirements for each user class in the 2D user matrix will be sparse.

## **The [Nine-Step Process for GEO Task US-09-01a](#)**

This project will follow the nine-step process laid out in GEO Task US-09-01a. At this time, the project planning is confined to steps 1-4.

### **Step 1. The Advisory Group**

The first step in the nine-step GEO Task US -09-01a process is the formation of an expert Advisory Group (AG) that helps identify appropriate documents, provides feedback on the analysis approach and also reviews the preliminary and final reports. For the Air Quality and Health SBA, 17 potential AG members were identified. The sources of AG candidate names came from major Agency representatives, selections by the Analyst team, as well as additional AG candidates suggested by the AG members themselves. Ten of the invited candidates responded favorably and are listed in the Table below, two invitations were declined, three candidates did not respond and two candidates are still pending. Effort was made to include representatives from developing nations and to achieve a representation across geographic domains. Additional AG members would be desirable, particularly from the developing countries. The current AG is cordially invited to suggest additional candidates.

#### Advisory Group Members

<b>Name</b>	<b>Country</b>	<b>Organization</b>	<b>Specialty</b>
Jeff Brooks	Canada	Env. Canada	Air Quality
Jack Fishman	US	NASA Langley	Air Quality
Barry Jessiman	Canada	Health Canada	AQ and Health
Patrick Kinney	US	Columbia University	AQ and Health
Jim Meagher	US	NOAA	Air Quality
Rashmi S. Patil	India	IIT Bombay	AQ and Health
Leonora Rojas	Mexico	National Institute of Ecology	AQ and Health
Paulo Saldiva	Brazil	University of São Paulo	AQ and Health
Rich Scheffe	US	EPA OAR/OAQPS	Air Quality
Kjetil Tørseth	Norway	Norwegian Institute of Air Research	Air Quality

Michael Gatari	Kenya	University of Nairobi	Air Quality
*	China	Peking University	Air Quality

\* Pending

The group represents eight countries from five continents. Seven of the AG members have primary expertise in AQ observations and management, while five others have expertise in AQ and health. All AG members were sent a description of the tasks, their envisioned role in the US-09-01a process and also asked to supply document references that could be used in the analysis of priority observations.

## Step 2. Report Scope and Topics

A significant task of the AG is to assess, evaluate and comment on the proposed scope of the AQ SBA EO requirements. The initial scope proposed by the Analyst group is given below.

The composition of the atmosphere plays a significant role in at least three societal benefit areas defined by GEO: Climate, Disasters and Human Health. In Climate, atmospheric composition influences the energy budget of the Earth System, most notably through greenhouse gases and aerosols. The atmospheric observations, as they pertain to Climate, will be beyond the scope of this report. Among the Disasters, wild-land fires, dust storms, volcanic eruptions and severe pollution events have significant effect on atmospheric composition and through that on human health and well being. These causes will be considered within the scope of this EO needs assessment. The Human Health SBA will be the primary application of this EO needs assessment.

While the application is the protection of Human Health, the focus of this meta analysis will be on the Earth Observations that are relevant to human health. Morbidity, mortality, and other human health observations will not be assessed. The EOs of particular interest will include the concentration and exposure dosage of pollutants near the Earth surface, where people live. The spatial domain of primary interest will be the continents with emphasis on regions with highest population density. The vertical distribution will be considered as it relates to pollutant emission sources and transport. The temporal domain may extend over decades for the epidemiological studies, to short-term, hour-scale impacts of natural or anthropogenic pollution events. Geographic areas with high population densities will also be of high priority. Air pollutants over remote locations over land or ocean will be considered as they pertain to the identification of air pollutant sources and their transport.

The types of Earth observations will include ground-based in-situ monitoring of gases and aerosols, satellite passive remote sensing, active remote sensing lidar and conceivably some aircraft sampling. Air quality models on local, regional and global scales will be considered as they contribute to the understanding and forecasting of air pollution that impacts on human health. The focus on different air pollutants will differ regionally: ozone and industrial aerosols for the industrial countries and additional focus on biomass smoke and windblown dust in the developing countries. The above is not a prioritization per se, but guidance for the prioritization process.

*Note to AG: Feedback on this Scope from the AG will be particularly helpful, since it will guide both the selection of the relevant publicly available documents, as well as the subsequent prioritization of the required Earth observations. The suggestions regarding how to narrow the Scope will be particularly welcome.*

### **Step 3. Identification of Documents for EO Priorities**

The documents selected for this meta-analysis will include multiple sources, such as publically available consensus reports and open publications by authoritative contributors including academic and other publicly available research contributions. The document identification will be performed by the Analyst Group, the Advisory Group as well as other experts. The Analyst Group will focus on the identification of consensus documents prepared by major national and international organizations, including the World Health Organization (WHO), US Environmental Protection Agency (EPA), European Monitoring and Evaluation Programme (EMEP), and Air Pollution Information Network Africa (APINA). The selection of journal and other publications will be focused on multi-author review articles relevant to EO needs. An expanding list of publications under consideration is given in the [project website](#) and a subset in the [GEO Task Website](#).

*The AG is requested to point out documents referring to EO needs for Air Quality. Of particular interest would be documents that discuss the EO needs in developing countries where the health impact may be dominated by non-industrial sources and the relevant observations are particularly scarce.*

### **Step 4. Analytical Methods and Prioritization Criteria**

The identification of documents, the extraction of the relevant Earth observations and their prioritization is a highly subjective activity. Also, there are currently no generally accepted methods for conducting this process. For this reason, the leads for GEO Task US-09-01a have strongly encouraged the Analysts and the AGs to be inventive and resourceful in performing this delicate process. However, they also strongly suggest to the Analysts to formulate and to describe clearly the process that they have pursued. In this early phase of the project, we, the Analysts of this task have not developed a definite set of criteria for prioritization. The criteria below represents the initial ideas on the process that will evolve throughout the project.

Similar document analyzes and earth observation priority setting already conducted in other SBAs provide methods that will be considered in defining the method for AQ SBA, including:

1. Preliminary review and identification of suitable documents as defined in report scope (i.e., Step 2)
2. Comprehensive review of the selected documents for EO requirements and parameters characteristics (frequency, spatial resolution, timeliness, accuracy/precision, and adequacy)
3. Extraction of the characteristic information, e.g., by storing them in a database for subsequent analysis
4. Identify priority earth observation parameters based on algorithmic analysis
  1. Frequency analysis (e.g., number of documents mentioning a parameter keyword)
  2. Cross-cutting analyses, e.g. parameters identified across multiple documents, multipel sub-areas, multiple spatial scales
5. Advisory Group and Analysts provides expert recommendations for prioritization

An important aspect of the analysis is the archiving of the extracted information from the documents so that multiple prioritization analyzes can be conducted on a common set of information and to allow future refinement of the prioritization as experience is gained through the process. Ultimately, the prioritization is a combination of analytical algorithms and human expertise.

*Again, suggestions from the AG for the prioritization of the AQ relevant Earth observations will be welcomed.*

## **Step 5: Review and analyze documents for priority EO needs**

This step of identifying, reading and analyzing the reports, documents, recommendations is in progress. Records of the activities are kept on the open [project wiki website](http://wiki.esipfed.org/index.php/GEO_User_Requirements_for_Air_Quality).  
[http://wiki.esipfed.org/index.php/GEO\\_User\\_Requirements\\_for\\_Air\\_Quality](http://wiki.esipfed.org/index.php/GEO_User_Requirements_for_Air_Quality)

*Interested members of the AG and others may examine the current state of the project including the project plan, chronological list of project events, interactions with the Analyst of other SBAs in this GEO task etc*