THE GEOSUR PROGRAM, A REGIONAL INITIATIVE TO INTEGRATE AND DISSEMINATE SPATIAL DATA IN SOUTH AMERICA.

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GeoSUR (http://geosur.caf.com) is a regional program to implement an effective and interoperable mechanism for generating, disseminating, and leveraging geospatial data useful for decision-making in South America. The Program was originally developed to meet the need of the Initiative for the Integration of Regional Infrastructure in South America (IIRSA, www.iirsa.org) to gain access to national and supra-national geospatial data needed to better plan and execute infrastructure projects in the region. The Program has subsequently grown to serve a wider public and other development objectives, both continental and national.

The main objectives of GeoSUR are the following:

- Facilitate access to geoinformation useful for decision-makers.
- Develop supra-national geoinformation as a regional public good.
- Establish a decentralized regional geoinformation network.
- Promote greater collaboration and exchange among geospatial specialists of South America.

GeoSUR has adopted a decentralized system architecture; one that keeps data close to its producers. This means that participating agencies implement and directly operate their map services, spatial data catalogs, and other geoservices. Neither data nor services are centralized. GeoSUR provides the means for users to access this regional and national network of geospatial data via a regional geoportal.

GeoSUR promotes the use of geospatial standards and protocols promoted by the Pan-American Institute of Geography and History (PAIGH) and by national geographic institutes of participating countries. Participating agencies are free to select any hardware platform and software toolset required for the development of their geoservices, as long as they use approved standards in order to integrate these services with the GeoSUR Network. GeoSUR coordinates with national Spatial Data Infrastructures operative in participating countries to make sure its approach is supportive of existing national policies on geospatial access and dissemination.

The Program has developed **three main components**: i) a geoportal, ii) a network of map services, and iii) regional elevation and derivative data sets. All geoservices directly developed by GeoSUR will be available in three languages: Spanish, English, and Portuguese.

The first component, the GeoSUR Geoportal was launched on June of 2009 and is available at http://www.geosur.info. The geoportal provides a point of entry to the map services and metadata catalogs operated by GeoSUR´s partner agencies. The portal was developed with support from the U.S. Geological Survey (USGS) Earth Resources Observation and Science (EROS) Center using GIS Portal Toolkit 9.3 and it is hosted on a server operated jointly by *Corporación Andina de Fomento* (CAF) and PAIGH. The portal periodically harvests metadata from more than 15 spatial catalogs operated by participating agencies and it is linked to more than 20 WMS-enabled services from South America.

Figure 1: Home Page of the GeoSUR Geoportal

The second component, a decentralized network of map services**,** is currently being developed. Each agency that participates in GeoSUR commits itself to the development of a WMS-enabled map service. Once developed, the map service administrator creates an ISO 19119 metadata record for the service and registers it in the GeoSUR geoportal for public viewing. Even though most geoservices in the network contain national geographic data, there are two regional services available: 1) Condor, an environmental regional map service developed by CAF (http://www.caf.com/condor) and 2) the GeoSUR Regional Map Service (www.geosur.info/iirsamapas).

The GeoSUR Regional Map Service was developed with support from the EROS Center using ArcGIS Server 9.3 and it is hosted on a server jointly operated by CAF and PAIGH. The service offers access to regional maps on diverse topics: roads, rivers, protected areas, land use, land cover, remotely sensed images and relief, among others. The service also offers access to a georeferenced database of IIRSA´s infrastructure projects and of other infrastructure projects funded by CAF. All data available in the map service can be downloaded at no cost.
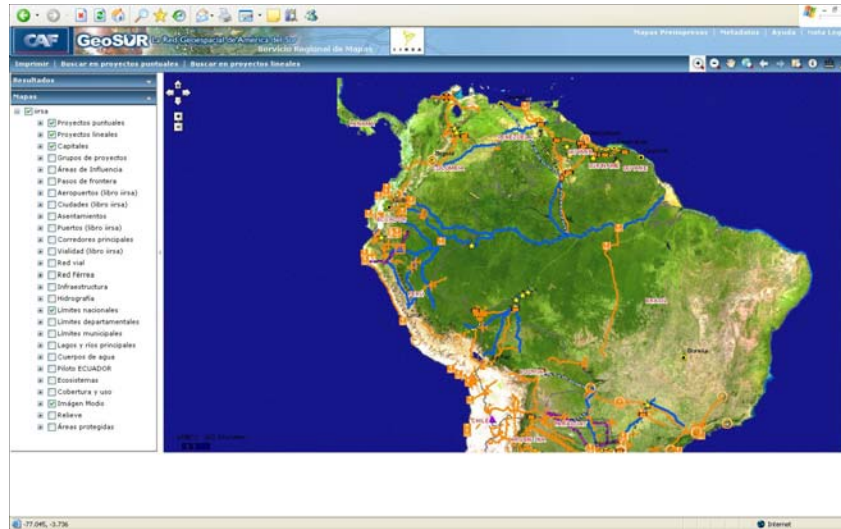

Figure 2: Regional Map Service showing IIRSA Projects.

The third component, the development of elevation derivatives, is due for completion by October 2009. GeoSUR will develop the following seamless datasets for South America (at 30-meter resolution):
- hill shade
- shaded relief
- slope
- aspect

The derivative data will be developed from the SRTM 30 meter dataset. GeoSUR, with assistance from EROS, will fill the SRTM data voids using the best available elevation data, and develop these derivatives using the void-filled SRTM dataset. All derived data will be available for download in 1 x 1 degree tiles.

In order to facilitate the generation and use of SRTM derivatives by the public, GeoSUR has developed an on-line geoprocessing service to allow users to produce these derivatives on-the-fly and to download them. The user can run the service models using an assorted set of Digital Elevation Models (DEM) at different resolutions: 1 Km., 500 m., 250 m., 90 m. and 30 m. Advanced users can download or access the models on-line and use them with their own DEMs for greater flexibility. The available models can produce some of the datasets that will be pre-processed for South America at 30-meter resolution, but can also produce other derivatives such as:

- Viewshed polygons.
- Elevation profile.
- Slope classification.
- Dynamic watershed delineation.
- Raindrop trace.

The Program hopes to develop a geoprocessing service that is collaborative in nature, meaning that South American specialists can load and test new models on it before making them available to the public. New models to evaluate the best route for building a road or a model that determines what areas are prone to landslides could be built under this scheme.
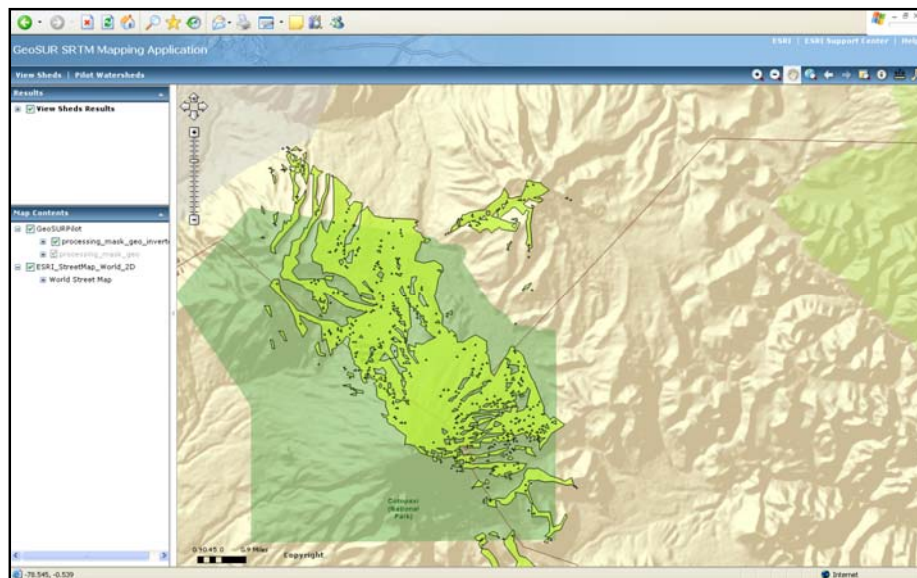

Figure 3: GeoSUR prototype showing a viewshed polygon.

Most of the geoservices to be developed by partner agencies as part of GeoSUR - or as part of their national spatial data infrastructures - use technologies developed over the last four or five years and require focused capacity-building. In tune with this reality GeoSUR has designed a **capacity-building program** which provides training and technical assistance to all partner agencies as they develop the map services and metadata catalogs to be linked to the GeoSUR Geoportal and the Regional Map Service. To date GeoSUR has organized and deployed the following workshops:

- A two-week workshop on the development of map services was held on August 2007 at the EROS Center in Sioux Falls, South Dakota. 24 specialists from South America participated in this workshop.

- A one-week workshop on metadata cataloguing was held on July 2008 at the Instituto Geografico Agustín Codazzi in Bogotá, Colombia. 18 specialists from South American countries participated in this workshop. GeoSUR sponsored a second workshop on the same topic with PREDECAN, a disaster prevention project for the Andean Community, earlier in the year.

- A one-week workshop on SRTM modeling and the development of DEM derivatives was held on June 2009 at the EROS Center in Sioux Falls, South Dakota. 20 specialists from South America participated.

This training program is supplemented by a **technical assistance program**. Participants learn in workshops the techniques needed to develop national geoservices to be linked to the GeoSUR Network. Once they return to their countries after each workshop and start developing these services, GeoSUR specialists remain on-call to offer any technical assistance they might need. The assistance is first provided remotely to keep down costs, and it is followed by on-site assistance when needed. The Program also organizes periodic on-line seminars on Program topics using on-line collaboration tools such as Webex or Elluminate.

We are aware that some of the spatial technologies associated with GeoSUR require intensive learning and continuous practice. In some cases the specialists who work for participating agencies in GeoSUR might be the only experts in a country dealing with a particular software or area of expertise. For reasons such as these outside assistance is needed to help keep these specialists productive and to avoid the frustration that can result from dealing with seemingly insurmountable technical issues that can appear from time to time. Networking of people is very important. GeoSUR has sponsored peer-to-peer communications among participating specialists by establishing a list server. More than 150 of them have become members during the last two years. The idea is to maintain this network of specialists active once the Program is over.

To date the Program has offered continuous technical assistance (both remote and on-site) to more than fourteen participating agencies for the development of national map services and for the establishment of geospatial catalogs. These geoservices are currently linked to the GeoSUR geoportal, providing a point of entry for users seeking geo-information for South America.

Having reviewed some of the technical aspects of the GeoSUR Program we now turn our attention to some of the **institutional aspects** that make it possible. Funding and oversight for this initiative are provided by CAF (www.caf.com), counterpart support and coordination are provided by PAIGH (www.ipgh.org) and the Interamerican Biodiversity Information Network (IABIN, www.iabin.net), and technical assistance are provided by the EROS Center (http://edc.usgs.gov/), the *Instituto Geográfico Agustín Codazzi* of Colombia (www.igac.gov.co), the *Instituto Geográfico Militar* of Chile (www.igm.cl), and the *Instituto Geográfico Militar* of Ecuador (www.igm.gov.ec). Participating agencies include, but are not limited to, national geographic institutes and national environmental agencies from the region. In total, more than 22 national agencies have agreed to participate in the GeoSUR Program thus far - and more are expected to join in the short and mid terms. Expansion to other geographical regions, such as Central America, the Caribbean, and Mexico will be evaluated.

When launching the Program we realized that having all participating institutions sign a legally binding MoU could be cumbersome and time consuming, due to the administrative complexity of this type of agreements compounded by the number of institutions involved. Instead, it was decided that an effective way of obtaining buy-in into the Program was to have these agencies sign a simple Implementation Plan, expressing their support for the development of key GeoSUR components such as national map services and metadata catalogs. To date more than fifteen agencies have signed these agreements and made a commitment to developing geoservices with commonly agreed standards and to make them interoperable with the GeoSUR platform.

MoUs were established with agencies that coordinate activities or provide technical assistance. To date four MoUs have been signed with the following entities:

- The Pan-american Institute of Geography and History (PAIGH).
- The U.S. Geological Survey (USGS).
- The Inter-american Biodiversity Information Network (IABIN).
- The Instituto Geografico Agustin Codazzi of Colombia.

Other national agencies, such as the National Geographic Institutes of Chile and Ecuador, have agreed to provide technical assistance without the need of a formal MoU.

We conclude the paper by stating the need in South America to take important development decisions, decisions that impact the lives of thousands – sometimes millions – of people using sound and accurate scientific information. Much of this information can be expressed geographically and can be put into formats and represented in ways that decision-makers understand and can readily use. We feel that important decisions are often taken without the proper use of geographic information that is readily available. We hope that GeoSUR, as a mechanism to facilitate free access to geo-information, will open the way for better decision making in the region. We need to promote the treatment of geographic data as a common resource of mutual benefit to us all.

References and linkages

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