

# Geo-Spatial Data Availability and Accessibility to Map Users

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## ABSTRACT

Geospatial data form an important input in many developmental activities. Availability of accurate and recent maps of appropriate scale, and precise co-ordinates and heights of survey control points is vital for planning of any developmental and engineering project. In India, a huge amount of geodetic data, and accurate maps on different scales exist; however, users are either not aware of these, or they do not have an easy access to this national treasure. With the dynamic scenario in the developmental and engineering fields, the needs of the map users are also undergoing significant changes, resulting in ever-increasing demands of such data in various formats. The aim of this paper is to introduce the map users to the availability and sources of such valuable data, and to discuss some important issues related to the accessibility of this data.

For any developmental activity, availability of accurate, reliable and updated topographical maps and geodetic survey data is of vital importance. Such data are also valuable aids for administrative and strategic planning, disaster mitigation, engineering construction projects, and numerous related activities. For military purpose also, maps and geodetic data are essential tools, hence such data are often security classified, making them unavailable to the common user. The Indian geodetic control network is one of the best in the world. The geodetic data, collected through centuries of dedicated efforts, consists of the Great Trigonometrical (G.T.) Triangulation Network of India, the Satellite Survey Control Network, the High Precision, Precision and Secondary Levelling Network, the Laplace Stations Network, the Gravity Stations Network, the Tidal Stations Network, and the Geomagnetic Stations Network. The topographical maps by Govt. of India are another such database. A wealth of information is contained in this databank. An overview of these networks is presented here.

Most of this data is still stored using age-old methods. This places severe restrictions on the availability of information related to the data, and also delays the process of supply of such data to the users. The computerisation of this databank is a national priority today. This aspect has been discussed, and some suggestions related to this mammoth task are presented. The availability of this data to the users is controlled by the restriction policy of Government of India, implemented by the Ministry of Defence. Even though the national security considerations must receive top priority, the restrictions need to be reviewed in light of the "open door policy" of the country, and the importance of such data for developmental activities. This aspect is discussed in detail, and suggestions and recommendations for formulating a comprehensive "National Geodetic & Map Data Policy" are presented.

## INTRODUCTION

For any developmental activity, availability of accurate, reliable and updated topographical maps and geodetic survey data is of vital importance. Such data are also valuable aids for administrative and strategic planning, disaster mitigation, engineering construction projects, and numerous related activities. For military purpose also, maps and geodetic data are essential tools, hence such data are often security classified, making them unavailable to the common user. The availability of such data globally and in the Indian context, their storage and dissemination mechanism, the restrictions imposed on their accessibility, and suggestions for making the optimum use of this valuable national resource, are discussed here.

## GEODETIC DATA COLLECTION TECHNIQUES

The different geodetic techniques in use for collecting data are:

### (a) Terrestrial Techniques:

- (i) Geodetic Triangulation
- (ii) Electronic Distance Measuring Instrument (EDM) Traverse
- (iii) Astro-Geodetic Methods
- (iv) Precision levelling

### (b) Space Techniques:

- (i) Global Positioning System (GPS)
- (ii) Very Long Baseline Interferometry (VLBI)

- (iii) Satellite Laser Ranging (SLR)
- (iv) Lunar Laser Ranging (LLR)
- (v) Other techniques like Doppler, LORAN, etc.

**(c) Geophysical Techniques in Geodesy:**

- (i) Gravimetry
- (ii) Geomagnetic

**(d) Tidal Surveys**

**GEODETTIC DATA CATEGORIES**

The huge amount of data collected using these techniques can be categorised in to following basic types of data:

- (i) Horizontal Survey Control Data: Latitude & Longitude
- (ii) Vertical Survey Control Data: Heights above Geoid / Mean Sea Level
- (iii) Other Auxiliary Survey Data: Azimuth, Deflection of Vertical, etc.
- (iv) Gravity Data: Gravity values at points, gravity anomalies, etc.
- (v) Geomagnetic Data: Magnetic values, magnetic anomalies, etc.
- (vi) Tidal Data: Tidal heights, predictions, etc.
- (vii) Derived Geodetic Data: Earth Rotation Parameters, Crustal Dynamic Parameters, Plate Motions, etc.

**GEODETTIC DATABANKS**

The geodetic survey data collected using the above-mentioned techniques is stored in different data banks all over the world, using various techniques, ranging from manual to completely automated.

**Global Scenario:**

Globally, several geodetic survey data centres exist for different types of geodetic data. These consist of the International GPS for Geodynamics Service (IGS) GPS Data Centres, the Crustal Dynamic Data Information System (CDDIS) of NASA, the National Geodetic Survey (NGS) Data Centres, the International Earth Rotation Service (IERS) Data Centres, VLBI Data Centres, SLR/LLR Data Centres, etc. All of these are computerised data banks on the internet, with free global accessibility to international users. A huge amount of geodetic data is stored on these data sites, and it is continuously being updated by the data managers. This data is accessed, down-loaded,

processed and used by several scientists from all parts of the globe regularly for their research. Thus, the enormous expenditure involved in acquiring this data is justified by its extensive use.

**Indian Scenario:**

In India, a huge amount of geodetic data has been collected through centuries of dedicated efforts by various Government agencies, with major contribution from the Geodetic and Research Branch of Survey of India. Extensive gravity data has also been collected by organisations like the National Geophysical Research Institute (NGRI), Wadia Institute of Himalayan Geology (WIHG), etc. Recently, many Govt. Institutes and agencies are also involved in GPS data collection.

The Geodetic Control Network of India comprises:

**(i) The Great Trigonometrical (G.T.) Triangulation Network:**

This consists of G.T. station chains spaced about 200 km apart in both N-S and E-W directions, with a total of about 3500 stations.

**(ii) The High Precision / Precision Levelling Network:**

The Level Network consists of level lines spaced about 200 km in N-S and E-W directions, with about 17000 precision Bench Marks (BMs), mostly along the roads.

**(iii) The Satellite Survey Control Network:**

This is a recent addition to the geodetic networks, with few stations added by the Doppler Satellite survey observations, and more being added by GPS. This is now being extended to cover the entire country, under the "National GPS Programme for Earthquake Studies" of Department of Science & Technology (DST) of Govt. of India. A National GPS Data Centre is also being established at Survey of India, Dehradun, under this programme.

**(iv) The Gravimetric Network:**

This consists of mesh of gravity stations, being established about 15 km apart, with over 35000 stations observed so far.

**(v) The Geomagnetic Network:**

This network has repeat and field magnetic stations spread over the country, observed regularly to detect changes in the Earth's magnetic field.

**(vi) The Tidal Station Network:**

This consists of a total of about 27 tidal stations, for round-the-clock tidal observations, to monitor and predict sea-level variations.

This enormous amount of valuable information, however, is mostly stored using manual and age-old methods, and very little computerisation has been done, except for the GPS data. This precious data is also not easily available to the common user, due to the security classification assigned to such data by the Government.

**DATA ACCESSIBILITY**

Much of the geodetic data is of strategic importance. The precise horizontal and vertical co-ordinates of important sites can be used for targeting them using missiles or conventional bombing. The gravity data is also very useful for precise navigation of missiles. Due to these reasons, this data is assigned different levels of security classifications, by the Ministry of Defence (MoD). While unrestricted data is available to any user on payment of fixed charges, restricted data is available to bonafide Govt. agencies only. Much of the data

and maps are also classified as secret, making them unavailable to users. The data dissemination policy is also very old and does not cover many aspects or new types of data, like the GPS data, gravity data, etc. This gives rise to anomalies and confusion, and often, personal biases determine the availability or denial of data to some users.

**SUGGESTIONS & RECOMMENDATIONS**

The importance of such security classification can not be questioned, as national security considerations over-ride all other activities. However, with the introduction of space geodetic techniques like GPS, remote sensing, etc., the validity of many of these security classifications need to be re-assessed. With the right to information assuming great importance, and the developmental activities being accelerated by entry of private sector, the easy availability of such data to these users must be given due importance. The National Geodetic & Map Data Policy needs to be subjected to a national debate, so that a more rational and clear-cut policy in the interest of the nation can be formulated. Such a policy will contribute significantly in speeding up the developmental and other important activities.