

Government of India
Ministry of Mines
Geological Survey of India



**The Proposal for Implementation of
National Geoscience Data Repository
(NGDR)**

Through NMET Funding

February 2021

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1. Preamble:

The National Geoscience Data Repository (NGDR) creation project was conceptualized by the Ministry of Mines (MoM) as part of the National Mineral Exploration Policy (NMEP), 2016 (Section 8 of the Policy Document deals with the concept of NGDR) and Geological Survey of India (GSI) has been declared as nodal agency to establish NGDR. The vision of the project is to conceptualize a comprehensive, multi-purpose program in order to make available all geological, geochemical, geophysical and mineral exploration data in public domain on a digital geospatial platform. This will include baseline geoscience data and collate all mineral exploration information generated by various central and state government agencies and mineral concession holders and maintain these on a single point of truth (SPOT) geospatial database made available to the interested stakeholders through a single window through an appropriate mechanism. Thus, the NGDR will function as a single window system for on-demand mineral exploration and baseline geoscience data Repository over an interoperable platform. The greater goal of this initiative is to increase the investment attractiveness of the mining sector in India.

2. Challenges in Mineral Sector:

The mineral and mining sector has grown in terms of mineral exploration and production in last three decades, but its contribution to the overall Gross Domestic Product (GDP) has remained stagnant. There remains significant scope of improvement in fostering private sector participation in mineral exploration and production activities to unravel the true potential of the mining sector in the economic development of the country. One of the major concerns in the mining industry from the perspective of investors is the lack of accessible information about the extensive data generated on mineral exploration by government agencies, public and private sector entities in the last hundred (100) years. This large volume of data, immensely valuable for both present and future investors, is lying with various exploration/mining organizations mostly in silos. Thus, the retrieval of this data in digital format and extraction of its meaningful insights becomes a major hurdle for the prospective investors.



The Geoscientific data producing agencies in India are diverse, spread across the country and belong to different administrative control units. Unlike other developed countries, in India, there are multiple regulatory authorities responsible for the operations, maintenance and formation of regulations for Mining industry. There are multiple Ministries and Departments including State DGMs and private sector, which are primary generators of baseline and exploration data in India and are also the primary custodians of the geoscientific data.

To address the aforementioned challenges, NGDR Project will aim to collate all baselines and mineral exploration information generated by various Central and State Government agencies and mineral concession holders and maintains these on a common geospatial platform. This database will be made available in public domain through an appropriate mechanism. The process will boost the mineral exploration activities and facilitate leveraging the technological prowess of the private players towards improving the efficiency and effectiveness of the mineral exploration and production activities as well as enhancing the overall GDP of the country.

3. Objective:

The primary goal of the NGDR project is to disseminate all geological, geophysical, geochemical and mineral exploration data in public domain at free of charge / or with a fee to be decided as per the data dissemination policy under finalisation and to provide access to pre-competitive baseline geoscience information for acquisition, processing and interpretation of such data towards exploration of mineral commodities across the obvious geological potential areas of the country. The major objectives of the NGDR project are:

- To expedite the exploration activity in the country by making the baseline geoscience data available to the potential investors
- To establish a centralized repository of baseline and mineral exploration information.
- To store, maintain and reproduce high quality and reliable geoscientific data.
- To facilitate efficient data reporting through a standard format as per the Mineral Exploration Reporting Template (MERT) and data exchange, among existing players including all geo-scientific agencies.



- To disseminate all geological, geophysical, geochemical & Mineral exploration data in public domain free of charge or with a fee as per the data dissemination policy.
- Align stakeholders to a common semantic, schematic and syntactic standard

The primary datasets that will be captured, maintained and disseminated are categorized into four broad groups viz. **Baseline Data** (Geological and Surface Geochemical data), **Exploration Data** (Detailed geology, geophysics, geochemistry and borehole data), **Geophysical Data** (Geophysical survey conducted from air, surface or along boreholes) and **Additional Exploration Data** (Any other mineral exploration related dataset, such as, large scale compiled map, alteration map, remote sensing derived products, mineral belt map, lineament map, land use/land cover map, geo-morphological map, etc). The key metrics for impact assessment of the project includes:

- % Increase in contribution of mining sector to overall GDP of the country
- The investment incurred by the Private Sector entities towards mineral exploration & subsequent mining.
- % Increase in number of successful e-auction of mineral blocks (on Y-o-Y basis)
- Volume of legacy exploration report and data incorporated into the NGDR database.

4. Details of NGDR project:

It is proposed to establish the state-of-the-art interoperable NGDR Geospatial platform for which the Data Centre (DC) and Disaster Recovery Centre (DRC) with the required hardware and software infrastructure will be hosted in the cloud. NGDR portal which is envisaged to be a GIS based portal and Mobile application would be developed on top of a combination of technology platforms such as Relational Database Management System (RDBMS)&Content Management System (CMS) for storage of the data, GIS and Geophysical application platforms for visualization, search and query of the exploration data and the portal will be a centralized gateway to access the National Repository to which the participating stakeholder agencies can



contribute by uploading their exploration data through the **Mineral Exploration Reporting Template (MERT)**.

For each of the above-mentioned data groups, the data could be in the form of Reports, Maps, Images, Tabular data or any other proprietary software files which will constitute a single project data. All the respective metadata for each of the file types will be captured (for GIS maps – the projection system, for borehole data – collar information, if present, etc.). MERT will store all important key data including administrative data like project information, area information, as well as technical details. It will be used for the following purpose in the NGDR portal:

- Standardization of Baseline data across multiple stakeholder agencies that will provide exploration data.
- Standardization of Metadata search and Result generation.
- Linking of Content with Spatial extension for GIS based search and query enablement.

4.1. Stakeholder Consultation:

GSI NGDR team and consultant identified stakeholders that were strategically most important and were co-located so that maximum number of stakeholder interactions could take place adhering to the stringent timeline. 30 such stakeholders (Central Organizations, State DGMs, Private Organizations, Research Organizations and Academia) were visited across India to gather the AS-IS information, Data holding information. Also, for stakeholder awareness and preparedness of stakeholder data and its modalities, a detailed questionnaire was mailed to all the stakeholders for reply.

- The primary stakeholders for the project are Ministry of Mines, Geological Survey of India (GSI), the appointed nodal agency for NGDR & National Mineral Exploration Trust (NMET). Estimated numbers of GSI Exploration Reports are approximately 7000+.
- Apart from GSI, there are other agencies, which are mandated and engaged in generating baseline and mineral exploration related Geoscientific data on a regular basis. These include the 29 State DGMs, Private exploration agencies



registered with IBM, PSUs involved in the mineral exploration agencies such as MECL, NMDC, and NALCO, etc.

- Private and public sector organizations that are dependent on the data providers for information on the rock types, available mineral types, and previous exploration history of an area, mineral grade and economic viability.
- Research and academic institutions that play a key role through their contribution towards research activities, academic training and processing of the raw mining and exploration data to generate valuable insights from them.
- Only a couple of stakeholders such as GSI, MECL & IBM possess digital baseline and exploration data/reports in digital and GIS compatible formats.
- Mining and exploration data for most of the stakeholders, especially the state DGMs are in hard copy (physical file formats). Estimated number of such Reports is approximately 13000.
- Some of the state DGMs such as in states of Maharashtra, Chhattisgarh, Madhya Pradesh, Assam, Odisha have already planned for or initiated the digitization process for their exploration reports and related maps/documents
- The IT / ICT system, required software, centralized repository and the skilled manpower is available with only a few stakeholders for the digital conversion of the legacy data, its maintenance and periodical update.
- In order to make NGDR a success and more inclusive, it is critical to bring in all the data available with the other stakeholders apart from the key ones such as GSI, MECL & IBM. To make this happen, a one-time data conversion & migration effort needs to be taken up centrally.

NGDR data will be both structured and non-structured. The data is proposed to be stored in two (2) different types of databases such as the GIS database for Structured data in Spatial RDBMS and Content Management System (CMS) - for unstructured data and Geophysical databases.

There is no existing software solution which can cater to all the envisaged data types and formats of the NGDR. It is proposed to build a customized software application which will interact with the underlying databases mentioned above and render the data visualization and search through the portal application. The proposed solution and architecture are technology agnostic.



Once NGDR gets functional, emerging technologies can be used to analyse, find patterns and prognosticate using the data accumulated in NGDR. For analysis of various data sets, building geo-processing tools and spatial data analytics based on AI /ML need to be developed, like:

- ML based classification, clustering, pattern recognition, etc. For example, a user may ask to show areas where the correlation co-efficient of Gold and Arsenic is more than 0.7 within a geochemical data set of stream sediment samples.
- NGDR will hold many unstructured / long tail data like reports (Text as Pdf) with metadata (MERT). The system is envisaged to be capable of prompting contextual information. For example, if a user searches for reports on gold prospects, the system should prompt him about other important precious metals like Silver, Platinum, etc.

4.2. Project Implementation Strategy:

- Project Initiation and Planning- including mobilization of material and human resources, interactions and communications; preparation of Integrated Project Management Plan (**IPMP**) and then the System Design phase comes followed by the System Development and Infrastructure Sizing.
- Legacy Data Digitization and Conversion- which consists of following three phases:
 - Gathering information for the geo-science data inventory and scanning
 - Conversion of the scanned documents to searchable texts, Geo-referenced images and maps, GIS vector data and digital tabular data. The digital data will be uploaded to the NGDR database along with the captured metadata in this phase.
 - The last stage is where the data will be analyzed and it will be attempted to bring uniformity in the nomenclature and structure of the data bases so that it can be migrated to a structured database and can be rendered using uniform symbology and data structure.
- Design and development of applications, portal, etc.



- UAT-Testing followed by organizing capacity building sessions.
- Based on the UAT the complete system should be integrated and operationalized for use. Then the **Stabilization Tests** will be conducted for the entire solution at the end of the stabilization period of three months after the go-live date. The test shall be conducted for ascertaining Response Time Performance and Availability Performance criteria.

Legacy Data Digitization and Conversion is contemplated to be done at a centralized facility. Proper Documentation will be done at every step. Post implementation, handholding support is to be provided to the stakeholders for a period of 1 year for operational & functional issues. In the end System Warranty Support will be taken care of. Last but not the least, the project closure phase will constitute updating and finalization of all the project documents; Preparation of a knowledge transfer Plan; Carrying out the Exit Management Process, etc.

5. BISAG-N Initiative:

In an apex level meeting in Ministry of Mines it was decided that a project of such national importance as NGDR will be implemented by Bhaskaracharya National Institute for Space Applications and Geo-Informatics (BISAG-N), a Centre of Excellence under MeitY. (Ministry of Electronics & Information Technology). Given that the engagement of BISAG-N by GSI will be on nomination basis, requisite approval will be sought from Ministry of Mines.

BISAG-N has been established under MeitY to provide services for Space, Defence, and other allied sectors in the domain of Geo-spatial technology, ERP's and other emerging technologies on indigenously developed platforms.

In order to prioritize and identify the scope of work, a committee was formed to interact with BISAG-N and the initial DPR prepared by GSI through engagement of a consultant for NGDR was shared with BISAG-N under the directive of Ministry of Mines. Thereafter, interactions between BISAG-N and GSI were made through VC and in person visit of GSI officers to BISAG-N office at Gandhinagar, Gujarat, where the broad components of NGDR and contours of implementation modalities was



discussed. During these discussions, three key decisions emerged which was earlier conceptualised differently, and are enumerated as under:

- The NGDR will be implemented in Cloud hosted platform as per the preferred procedure and guideline of MeitY.
- The NGDR will be developed through open source software, thus significantly reducing the overall cost.
- The NGDR will be implemented through LINUX operating system for better security.

Accordingly, BISAG-N submitted an "Execution Plan and Financial Proposal"**(Annexure-I)**for implementation of NGDR in active collaboration of GSI.

NGDR being conceptualised as a multi-dimensional, multi-layer, multiple decision making tool with respect to the stake-holders, BISAG-N has proposed to implement the following aspects to realise the concept of NGDR.

1) **System Design and Development:** Designing various modules of the NGDR portal and developing the same as per the requirements provided in the document. Adequate attention to proper design facilitates development of a convenient and user-friendly system. The NGDR portal will host the maps, data, reports, models, analytics and required tools for decision making purpose. Data will be collected from several stakeholders, will be managed centrally and provided to the users through various Integrated Modules.

2) **System Implementation:** Hosting the portal on the server and providing the access of the system to the user agencies for data uploading, validation and final implementation.

The NGDR project implementation will be completed in 18 months and operational support and maintenance will be provided by BISAG-N for further five years. The time schedule proposed by BISAG-N for NGDR project is given in Table-1.



Table-1

Time Schedule for NGDR project

Sr. No.	Activities	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16	Month 17	Month 18
1	Development of Digital Infrastructure *																		
2	Software Development (core engine and platform environment development)																		
3	GIS Based Decision Support																		
4	Database Standardization and Integration																		
5	User Interface design																		
6	Portal designing through UX																		
7	Metadata Search Engine																		
8	Application Development *																		
9	Integrated System Testing and Validation																		
10	Mobile Application Development																		
11	Mobile App testing and deployment																		
12	System Integration and Go live																		

* Some Activities may be extended in parallel.



6. Financial Overview:

The estimated total cost of the project stands at of **Rs: 33 Crore + Applicable Tax**.

The estimated budget includes the cost of IT H/W (CAPEX), Network cost (CAPEX), S/W (CAPEX), S/W (Year 0 to year 6.5), O &M, Bandwidth cost, Development cost, Digitization cost, Database creation and standardization. In executive summary the details of Project proposal and the details of modalities is described (**Annexure-II**).

The cost estimation does not include expenditure related to the establishment of NGDR Data Management and Analysis Centre (NDMAC) in GSI Central Headquarter.

The details of the financial proposal are given below in table format:

Item List	Cost in INR (Cr)
IT H/W (CAPEX) , Network Cost (CAPEX)	3.0
S/W (CAPEX)	10.0
S/W (Yr 0 to Yr 6.5)	1.5
O&M	0.5
Total Bandwidth Cost	5.0
Development Cost	1.0
Digitization Cost	5.0
Database creation and standardization	1.5
Sub-Total	27.5+ applicable tax
Contingent 20%	5.5 + applicable tax
Total Cost	33 +applicable tax
Amount in words : <i>Rupees Thirty-three Crore only+ applicable tax</i>	

1. NGDR implementation cost (based on proposal by BISAG-N): Rs. 27.5 Cr. + Applicable Tax
2. Contingency of 20%: (20% of Rs. 27.5 Cr) = Rs. 5.5 Cr. + Applicable Tax
3. Establishment of NDMAC (by GSI): Rs. 5 Cr. (GSI In-house expenditure)



The funding that is requested for NMET is **Rs. 33 Cr. + applicable taxes** (i.e, Rs. 27.5 Cr + 20% of Rs. 27.5 Cr). The cost estimation for utilising NMET fund prepared by GSI is attached herewith (**Annexure-III**).The payment is proposed to be made on milestone wise deliverable basis (**Annexure -I**).

7.0 Recommendation:

NGDR is the first step towards the establishment of the centralized exploration data repository as envisaged by NMEP 2016. All geological, geochemical, geophysical and mineral exploration data belonging to Central Government, State Government and Private Mineral Concession holders shall be collated in the proposed NGDR repository.

Given that currently NGDR does not have either the policy backing or the regulatory control to make the data sharing enforceable for the Central/State Govt. organizations and private exploration agencies, a data dissemination policy is under consideration along with implementation mandate for sharing of exploration data by all the stakeholders. This will make obligatory for the exploration agencies, either Government or otherwise, to share or submit the exploration data and report to NGDR.

Since this is a Ministry of Mines initiative, hence at present only the agencies and offices attached to Ministry of Mines are seen as the primary data contributors to the NGDR portal.

To make NGDR a true single source of truth for Mineral exploration data, it's imperative that necessary policy level changes, **which is, to make it mandatory to share the exploration data in totality with NGDR for all Government and private exploration Agencies, be affected.** Under the power conferred on the Central Govt. in the MMDR Act 2017, Govt. of India may issue necessary directives to all concerned and/or formulate necessary Rules for the mandatory sharing of the Geoscientific Baseline Survey and exploration results with the proposed NGDR Admin Cell.

The NGDR proposal is hereby being submitted by GSI to TCC, NMET for consideration and recommendation to EC for necessary funding so that this flagship initiative can be implemented on priority.

National Geoscience Data Repository (NGDR)

Execution Plan and Financial Proposal

Submitted by



**Bhaskaracharya National Institute for Space Applications and
Geo-informatics**

Ministry of Electronics & Information Technology

Government of India

To

Ministry of Mines

Government of India

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Background:

BISAG-N has been established under the Ministry of Electronics & Information Technology to provide the services of Space, Geo-spatial technology, ERP's and other emerging technologies on indigenously developed technologies (to the extent possible). Accordingly, different ministries through a collaborative mechanism now provides problem definition to be solved using above technologies.

The Ministry of Mines, Government of India has conceptualized a comprehensive, multi-purpose programme named as "NGDR" in which the available data sets, investigation, recommendations etc. are to be digitized as per the document evolved and prepared by the Geological Survey of India (GSI).

This will be a multi-dimensional, multi-layer, multiple decision making tool with respect to the stakeholders. The task of development of this system has been assigned to BISAG (N) by the Ministry of Mines, Government of India. The initial scope of work (tentative) was visualized in a meeting, held under the Chairmanship of the Secretary, Ministry of Mines, Government of India on 26th February, 2020 and GSI.

Scope of Work

Develop Digital Infrastructure: Consists of development of digital infrastructure which will host the maps, data, reports, models, analytics and required tools for decision making purpose. Data will be collected from several stakeholders, will be managed centrally and provided to the users through various integrated modules.

System Design and Development: Designing various modules of the NGDR portal and developing the same as per the requirements provided in the document. Adequate attention to proper design facilitates development of a convenient and user friendly system.

System Implementation: Hosting the portal on the server and providing the access of the system to the user agencies for data uploading, validation and final implementation.

Action Plan

1. Digital Infrastructure:

The digital infrastructure includes Servers, necessary software (operating system), geo-spatial technology supporting software, advanced data base software, mobile apps. Space enabled analytical software etc.

It is very important to visualize the amount of data base to be digitized and analyzed, according to that the capacity of server is decided. As per the suggestion mentioned in the document provided

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by GSI, the projected data volume is approximately 70 TB, excluding multi-date satellite data and DEM (the volume will depend upon the resolution of the satellite image).

The disaster recovery plan will be established after discussion.

If MoM desires to establish their own data centre as per their specification, which could be established parallelly, whereas the services of these applications will be available to the stake holders simultaneously. Through this arrangement, what-so-ever data sets are available with MoM organizations and other stake-holders may start populating as soon as the infrastructure is established.

BISAG-N is ISO 9001:2015, ISO 27001: 2013 and CMMI Level 5 certified organization. The confidentiality and security of all the datasets shall be managed as per ISO 27001:2013 specifications.

NGDR application initially shall be made operational on NIC / MeitY IT Infrastructure (MEGHRAJ). Therefore all the technologies shall be on cloud as per the guideline and specifications of MeitY.

In our opinion, the hardware specification should be evolved after operationalization of certain components of the project on MEGHRAJ cloud. This shall provide overall picture and a better insight of the data complexity and hence the hardware requirement will be decided accordingly following MeitY guidelines.

It is recommended to deploy NGDR portal in Linux environment.

Advantages of using Linux for Enterprise Solutions:

1. Open Source and Free to use (Low Cost)

One of the main advantages of Linux is that it is an open source operating system i.e. its source code is easily available for everyone. Linux is freely available on the web to download and use. You do not need to buy the license for it as Linux and many of its software come with GNU General Public License. Total Cost of Ownership (TCO) is reduced.

2. Security

Linux is more secured in comparison to other operating systems compared to other operating systems.

3. Large Community Support

Forums by excited users are made on the web to help and solve the problem any other user is facing. There are a lot of dedicated programmers there to support one whenever and wherever possible.

4. Performance

Linux provides high performance on various networks and workstations. It allows a large number of users to work simultaneously and handles them efficiently.

5. Flexibility

Linux provides a high range of flexibility as you can install only required components. There is no need to install a full or complete suite.

6. Platforms

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It is available for all the platforms while other operating systems have supports only for the defined platforms.

2. Software/Portal:

Parellely, the above data will be integrated with geo-spatial technologies related tools. An advanced data base technology is to be used to integrate such data sets available in different formats and geo-spatial environment and analytical tools such as query modules with different parameters are to be developed. Various reports based on different parameters shall be developed after understanding user requirement from various stakeholders

A decision support system according to the definition may be developed as per requirement coming from time to time and suggestions received from different stake holders.

Accordingly, for the above mentioned task, the methodology will be adopted as per NGDR document without changing anything. However, any change at any point of time, as desired by GSI, the same shall be complied.

During the course of executing the project, what-so-ever need of software development will arise, the same will be arranged simultaneously.

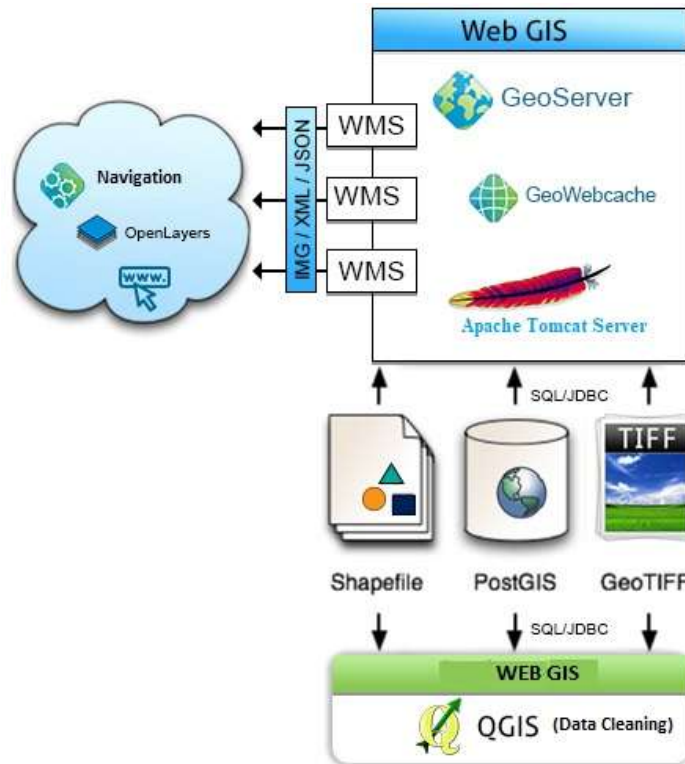
The data entry modules for different stake holders as per NGDR document shall be made available in the web portal, through which the data entry can be started. Or if already available data sets are there, the same may be provided, so that similar data bases could be designed in the portal of GSI. These data sets will be integrated, whatsoever will be the format, under the overall guidance of GSI.

Map rendering Server:

GeoServer is an open-source server written in Java that allows users to share, process and edit geospatial data. Designed for interoperability, it publishes data from any major spatial data source using open standards. GeoServer has evolved to become an easy method of connecting existing information to web-based maps such as OpenLayers, Leaflet, Google Maps and Bing Maps. GeoServer functions as the reference implementation of the Open Geospatial Consortium Web Feature Service standard, and also implements the Web Map Service, Web Coverage Service and Web Processing Service specifications.

Action taken for the above task :

A GIS based portal is being developed with the capability of storing and sharing earth science data of different formats and themes related to mineral exploration. It provide tools for criteria based search and download of various data, reports and maps. Mechanism is developed to integrate mineral exploration data coming through various stakeholder agencies in different formats through a standardized metadata format.



3. Database:

The data available in GSI portal is being downloaded and categorized into 3 major categories i.e. Baseline data (geological, geochemical, geophysical including Ground and Airborne and Geomorphological data), Geological Reports and Mineral Exploration data.

- **Base data/layers:**

Base layers are generated by BISAG-N using high resolution satellite imageries on large scale (1:5,000 to 1:10,000 scale). These layers include Administrative boundaries (State, District, Taluka/Block and village), Road network, Railway line, Rivers and waterbodies, Settlement locations and Agriculture.

- **Geological data:**

Geological and surface geochemical data that serve as the basis or foundation for further study that is necessary for mineral exploration. The Spatial Vector Data is being downloaded from the GSI portal in the form of GIS layers on different scales along with attribute data. Data for Gujarat state is being integrated into the portal for demonstration which can be visualized along with one time satellite data. Mechanism for role based dissemination of data is developed based on the document. A list of data layers is attached herewith as **Annexure I**.

- **Geological Reports:**

Scientific and technical reports of investigations and surveys related to Geological, Geochemical and Geophysical surveys, Geomorphological mapping, Mineral Resource Assessment, Geo-Engineering and Geotechnical Projects, etc in different formats such as

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pdf, jpg, xls, xlsx, doc, docx etc. are stored in the database and a retrieval system is developed to download the reports through search criteria such as toposheet, administrative boundary, mineral, location, etc.

- **Mineral Exploration data:**

Organisations involved in mineral exploration activities collect various datasets during field surveys and observations in specific block or area including geological, ground geophysical, ground geochemical and borehole data. The data available with GSI is in process of download for Gujarat State from the portal. Further, a module is developed to integrate the data available with other stakeholder agencies through a standardized metadata format. The metadata that need to be filled through the templates will consist of various requisite entries for Dataset Details, Area Details and Additional Metadata details. The capturing and conversion of Mineral exploration data into database requires input from subject expert. . It is proposed to provide data along with appropriate guidelines through elaborate discussions with concerned officials to understand the requirement and to bring out the desired output.

Action taken for the above task:

- Base layers for the whole country are integrated in the portal
- Geological data available in GSI portal is downloaded for Gujarat state and integrated in the web portal
- Geological reports pertaining to Gujarat state is in process of downloading and will be completed and will be integrated
- Template for integration of mineral exploration data is designed as per the document and will be made available in the NGDR portal.

4. Metadata Server with browser:

A metadata template is created for the various data types such as Spatial data, Geophysical data, Exploration data and the Reports which will enable the user to search and find a list of data pertaining to the search criteria given.

- User-friendly interface.
- Multi-criteria metadata search facility including Keyword search
- Location based Search
- Toposheet and Administrative boundary based search

Mineral Exploration Reporting Template (MERT) provides a platform to capture the metadata for the files getting uploaded to the NGDR portal and at the same time facilitating the search of the uploaded data through the same metadata search facility. The primary datasets that will be captured, maintained and disseminated are categorized into the following broad groups.

Baseline Data: Geological and Surface Geochemical data that serve as the basis or foundation for further study that is necessary for mineral exploration.

Exploration Data: Data that is essentially collected during mineral exploration in a specific block or area, including geological, ground geophysical, ground geochemical and borehole data.

Geophysical Data: Data acquired from any kind of geophysical survey conducted from air, surface or along boreholes, which aid to mineral exploration.

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Additional Exploration Data: Any other mineral exploration related dataset that is not included into the above three categories, such as, large scale compiled map, alteration map, remote sensing derived products, mineral belt map, lineament map, land use/land cover map, geo-morphological map etc.

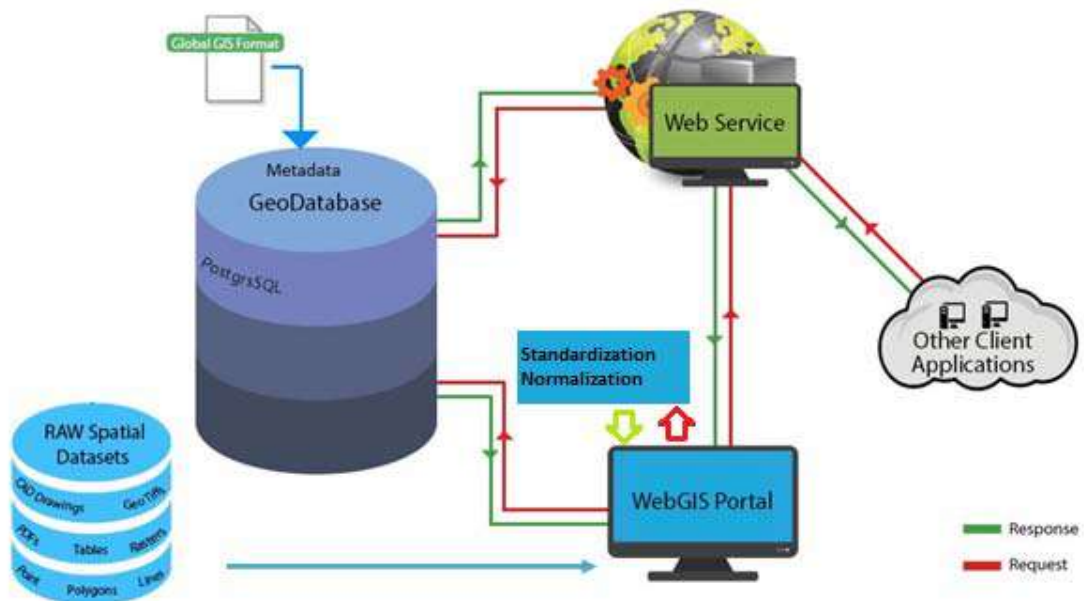
For each of the above mentioned data groups the data could be in the form of Reports, Maps, Images, Tabular data or any other files. That will constitute a single project data. All the respective metadata for each of the file types will be captured (for GIS maps – the projection system, for borehole data – collar information, if present.)

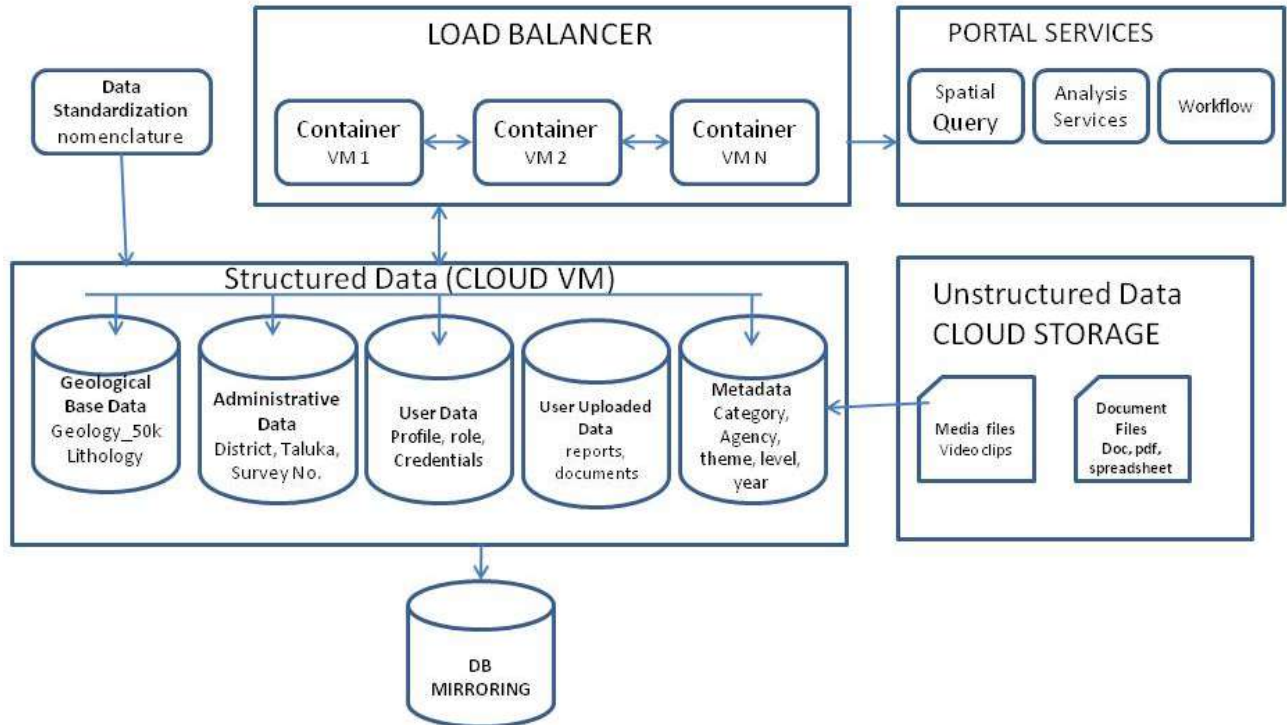
An overview of Mineral Exploration Reporting Template (MERT) form

The screenshot shows a web browser window with the URL 192.168.6.153:8081/GSI_30_6/admin/pointGeomModule. The page title is 'Add MERT Details'. The form is titled 'Contact Details' and contains the following fields:

- User ID: 1
- Name: Enter Name
- Organization: Enter Organization
- Department: Enter Department
- Designation: Enter Designation
- Address: Enter Address
- Country: Enter Country
- E-mail: Enter E-mail
- Telephone: 0
- Fax: Enter Fax

NGDR System Schematic diagram 1





5. Application development:

The application development will follow the guidelines established by Ministry of Electronics and Information Technology (MeitY), GoI. Latest software development and re-engineering guidelines for cloud ready applications are followed for the development of the system. However, guidelines for strategic control in outsourced project are not followed as no component of this task is outsourced.

Functional Requirement:

Functional Requirement of the NGDR portal is given as below.

SR	REQUIREMENTS
	LOGIN AND BASIC FUNCTIONALITIES
1	Allow to register intended users (permission of a specified group i.e. General user, Data Uploader, Data Curator, Data Dissemination and Administrator)
2	Role based Authorization and Authentication to the user
3	Compliant to W3c, ISO and GIGW Matrix and 256 bit SSL
4	Unicode based Hindi and English support
6	Provide SMS based services to users (PUSH/ PULL)
10	General Help for Portal and Help for all respective modules
11	Provide links for important Government websites like “Bhukosh”, “Bhuvan”, MTS, MECL, SOI, etc.
12	Any user should be able to download Data Standards, Data Dissemination Policy, Instructions for MERT, Data Dictionary, Portal User Manual, etc. in the portal.
13	Should have dynamic counter for no. of visitors in the portal
	COMMON MAP VISUALIZATION FUNCTIONALITIES

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1	Navigation Tools – Pan Zoom, Current Location, Go To, Full Extent, Zoom Previous
2	Measure Distance
3	Identify
4	Layer Management
5	Attribute Tool Tip
7	Redlining
9	Whitespace Management: This will restrict the layers to get displayed only at the desired viewing scale rang thus preventing a cluttered visualization experience.
9	Print Map
	Data uploading functionalities
1	Reporting Template must be available to preview and download for the user to get familiarize with the format and requirements.
2	The metadata that need to be filled through the templates will consist of various requisite entries for Dataset Details, Area Details and Additional Metadata details.
3	There should be option for the user to save the entry in the middle of the transaction. If the user logs out of the system, he should be able to continue from the last saved option upon re-login.
4	There should also be reset option for the user to clear all previous entries and enter fresh details. However this should only be enabled prior to the final submission.
	Dataset Details:
	In few metadata entries such as Key-Word, Agency name, Commodity and Districts, the user must have option to key in additional names if the same is not already available in the dropdown list. The Master list should be periodically updated to incorporate the valid inputs from the users considering the same.
	Area Details:
	Toposheet Grid:
	Administrative area
	Defining the Area Boundary through Coordinate Entry
	File Upload:
	For each of the document category to upload such as Reports, Images, Maps, Pictures, Tabular data and any other file types pertaining to the exploration data. Shp files can be in zip file (ensure that supporting files are available) Pdf or jpg can be in zip file (ensure that only one file is attached) Storing and sharing structured & unstructured earth science data
	Spatial & Parametric Search functionality
	State Boundary (Multiple)
	District Boundary (Multiple)
	SOI Topo Map Grid
	User defined area through coordinate entry (DD or DMS)
	Key Location entry(Similar Search), by nearby settlement (alpha numeric search textbox) and zoom map
	Map click based area selection
	Metadata Search
	Search by pre-defined fields like Project type, Project Title, Commodity, Agency Search, Year of Publishing, Survey Theme, Survey Instrument Thematic or regulatory category, Ministry of Mines or other Agency, code or attribute of theme, Details of Level or by Approval of Level, By year, By dissemination category

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	Note: It is assumed that location is provided in thematic map Intelligent Search for various GIS and non-GIS data
	Search Parameters
	Attribute search: Baseline Data, Exploration Data, Geophysical data, Additional exploration data. For baseline, provide following options to choose from: 1:500000 Geological maps 1:25000 Geological maps NGCM point locations Mining Lease Boundary For other, provide following options to choose from: Commodity, Key words, Year of Publishing, Citation (Name of organization)
	Submit Search: Process search: spatial intersection of the spatial layers of the area of interest defined by the user and the defined spatial layers in the portal. Map Component: Render the portion of the map based that corresponds to defined area of extent.
	Visualization/ Preview Individual file contents should have checkbox functionality for selection for the file preview. Portal should have functionality to clip/ subset from larger dataset to the requested area of interest. Provision for tooltip for description display The map for the area of the interest defined by the user should be downloadable in jpg or pdf formats.

The software application is planned as per the document provided by GSI. However any change, modification or addition of new functionality if required or suggested by GSI will be taken care of during the implementation of the project and will be integrated into the system.

- **Customization**

Technologies used:

JAVA Model View Controller (MVC) using Spring Framework:

- Java works on different platforms (Windows, Mac, Linux, Raspberry Pi, etc.)
- It is one of the most popular programming language in the world
- It is easy to learn and simple to use
- It is open-source and free
- It is secure, fast and powerful
- It has a huge community support (tens of millions of developers)
- Java is an object oriented language which gives a clear structure to programs and allows code to be reused, lowering development costs

- **3D**

A general 3D visualization and DEM is provided in the portal for the entire country. However, specific 3D model at large scale for local areas can be developed as per the requirements. The system is capable of visualizing DEM and contour maps for advanced exploration activities.

Exploration reports containing borehole data in the forms of PDF, XLSX etc will be mined. AI based models will be used to extract information and will be converted into geo-database. The plotting of borehole dataset in 2D and 3D environment will be rendered using open source tools and will be integrated in the web portal. The data input model for 3D borehole information shall be provided by GSI.

Technology used for 3D visualization: Cesium

CesiumJS is a JavaScript library for 3D maps on the web. Cesium ion is hub for discovering 3D content and tiling own data for streaming. CesiumJS and ion work together to enable user to build world class 3D mapping applications.

6. Mobile application

Development of user friendly Mobile apps on Android platform will be developed and integrated with the portal. Designing and development of the Dashboard for various stakeholders will be accomplished. After development, the app shall be tested for performance, functional requirements, security and integration in portal. The app will be upgraded as and when required by the ministry.

6.1	Mobile App
	User will be able to view general menu contents such as home, about, Policies, guidelines, Important links, summarized list of exploration reports, list of pre-composed maps in jpg/ pdf formats
6.2	Offline Mode
	Since most of the geological works is done in remote areas where internet connectivity may not be available. Therefore offline mobile App is being developed to identify the location of the object along with the information of respective geological features.

7. System Validation mechanism:

Initially, the general customization of the system shall be done. The portal will be made available to respective stake holders in their premises through a net-work. If any comments are there, may be submitted to the Ministry and a consolidated improvement, modification, up-gradation shall be implemented accordingly. This may be a multi-time effort and also you can change the same as per your requirement.

8. Capacity Building

Capacity building program will be conducted in a phase manner. The first phase will comprise the basic operation of the software application to the concerned officials of the Ministry, GSI and related stakeholders. The second phase of capacity building will comprise the data sharing and uploading

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mechanism using MERT template and creation of metadata. Capacity building will be conducted through online mechanism until COVID- 19 is under control. BISAG-N also has state of the art educational/training DTH TV broadcasting facility which includes recording studios and content generation infrastructure. This facility may be utilized after mutual agreement. Moreover, in-campus training programs may be organized when the pandemic is over.

Time Schedule:

The project is proposed to be completed in one and a half years and thereafter support for operation and maintenance will be provided for additional five years. A detailed component wise time schedule is given in **Annexure II**.

Man Power:

Man power dedicated to this project with their roles and responsibilities is given in **Annexure III**.

Financial Proposal

Sr. No.	Item List	Cost in INR (Cr)
1	IT H/W (CAPEX) *	3.0
2	Network Cost (CAPEX)	Included in Item 1
4	S/W (CAPEX)	10.0
5	S/W (Yr 0 to Yr 6.5)	1.5
6	O&M	0.5
7	Total Bandwidth Cost	5.0
8	Development Cost	1.0
9	Digitization Cost	5.0
10	Database creation and standardisation	1.5
	Sub-Total	27.5
	GST (@ 18 %)	4.95
	Total Cost	32.45
Amount in words : Rupees Thirty Two Crore and Fourty Five Lakh only		

* Cost may vary as per the cloud service provider policies and will be charged as per the actual cost.

Note: 1) Other Satellite data, if required, will be procured time to time from NRSC as per the requirement and will be charged as per the actual cost.

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- 2) A separate account book shall be maintained which can be checked at any point of time.
Actual cost may vary due to availability of existing data or modules.
- 3) The above cost includes 5 years of operation and maintenance cost after implementation of the project.
- 4) Twenty percent (20%) amount of the total project cost should be released at the initiation of the project.
- 5) It is proposed to constitute a committee from GSI to evaluate the project and to release the remaining fund. The remaining fund should be released in parts as and when the activities are completed after evaluation of the project components.
- 6) A payment model, as suggested by GSI, specifying milestone wise deliverables and the payment to be released against each milestone is enclosed as **Annexure IV**.

Annexure I

It is attached separately.

Annexure II

It is attached separately.

Annexure III

It is attached separately.

Annexure IV

It is attached separately.

Annexure I (Data Available in Bhukosh Portal)

Sr.No	Map Service Name	Layers Present in Map Service
1	Geology 2M	Fault_2M
2	(Geology in 1:2M scale)	Thrust_2M
3		Geology_2M
4	Geology 50K	Archiological Site
5	(Geology in 1:50K scale)	Other Point Element
6		Non-Oriented Point
7		Morphological Element Point
8		Mineralization
9		Mine Quarry
10		Fossil Occurrence
11		Surface Secondary Point
12		Oriented Structure Line
13		Oriented Structure Plane
14		Morphological Element Line
15		Shear Zone
16		Fault
17		Fold
18		Dyke
19		Lithology
20		Morphostratigraphic Unit
21		Morphostratigraphic Surface
22		Morphological Element Poly
23		Paleo Channel
24		Surface Secondary Poly
25		Zonal Structure
26	Geochemistry	NGCM_Stream Sediments
27	(Geochemical point data with oxide and trace elements in 1:50K scale)	Soil Regolith
28		Soil C Horizon
29	Geomorphology 250K	Geomorphology 250K
30	(Geomorphological data in 1:250K scale)	Lineament 250K
31	NGLM	NGLM_Lineament_Type
32	(National Geomorphology and Lineament data in 1:50K scale)	NGLM_Geomorphology_Origin
33		NGLM_Lineament_Form
34		NGLM_Geomorphology_Unit
35		NGLM_Magnitude_of_Lineament
36		NGLM_Geomorphology_Landform
37	Gravity Images of India	India_Gravity_5mGal_10Km
38	Ground Geophysics	Gravity
39	(Ground Geophysical point data in 1:50K scale)	Magnetic
40	Airbourne Geophysics Status	BRGM Project Areas
41		OHR Project Areas
42		NGRI Project Areas
43		OGP Project Areas
44		NRSA Project Areas
45		TOASS Project Areas
46	Landslide Inventory	Landside Point
47		Lineament Landslide
48		Degree Sheet
49	NLSM	

50	(National Landslide and Susceptibility Mapping in 1:50K scale)	Susceptibility
51		Landslide
52		Point of Interest
53	Seismotectonic	CMT 1977-2016
54	(Earthquake and related data in 1:1M scale)	CMT Pre 1977
55		Isoseismal
56		Hot spring
57		EQ (Earthquake)
58		Volcano
59		Active Fault
60		Bathymetry
61		Basement Depth
62		Bouguer Anomaly
63		Moho
64		Structural Discontinuities
65		SAISAT Sheets
66	Marine EEZ	T F magnetic anomaly
67		Bathymetry
68		Coast
69		Sedimentary Distribution
70		Map Boundary
71		NHO Chart
72	Marine Geophysics	CT_TW_EC_Magnetic
73		EEZ_EC_Magnetic_CT
74		MagneticTrack_EEZ_East Andaman
75		Magnetic_EEZ_Eastcoast_Inz
76		Mod_Andaman_Inz
77	Marine TW	Bathymetry Contours
78	(data in 1:50K scale)	Sed Bed Sediments
79	Geothermal	Geothermal Spring
80		Geology_2M
81	Mineral	Deposit
82		Thrust_2M
83		Fault_2M
84		Geology_2M
85	Tectonic	Thrust Tectonic
86		Volcano
87		Fault Tectonic
88		Trench Tectonic
89		Suture Zone Tectonic
90		Spreading Ridge
91		Shear Zone Tectonic
92		Bathymetry Tectonic
93		Bouguer Gravity Anomaly Tectonic
94		Fold Tectonic
95		Lineament Tectonic
96		Basement Depth Tectonic
97		Tectonic Framework
98	Geochronology	U_Pb
99	(age data for different systematics)	Sm_Nd
100		Rb_Sr
101		K_Ar
102		Geology_2M
103	Meteorite	Meteorite

Annexure II

Time Schedule for NGDR project

Sr. No.	Activities	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16	Month 17	Month 18
1	Development of Digital Infrastructure *																		
2	Software Development (core engine and platform environment development)																		
3	GIS Based Decision Support																		
4	Database Standardization and Integration																		
5	User Interface design																		
6	Portal designing through UX																		
7	Metadata Search Engine																		
8	Application Development *																		
9	Integrated System Testing and Validation																		
10	Mobile Application Development																		
11	Mobile App testing and deployment																		
12	System Integration and Go live																		

* Some Activities may be extended in parallel.

Below mentioned activities shall be done in consultation with GSI and ministry.

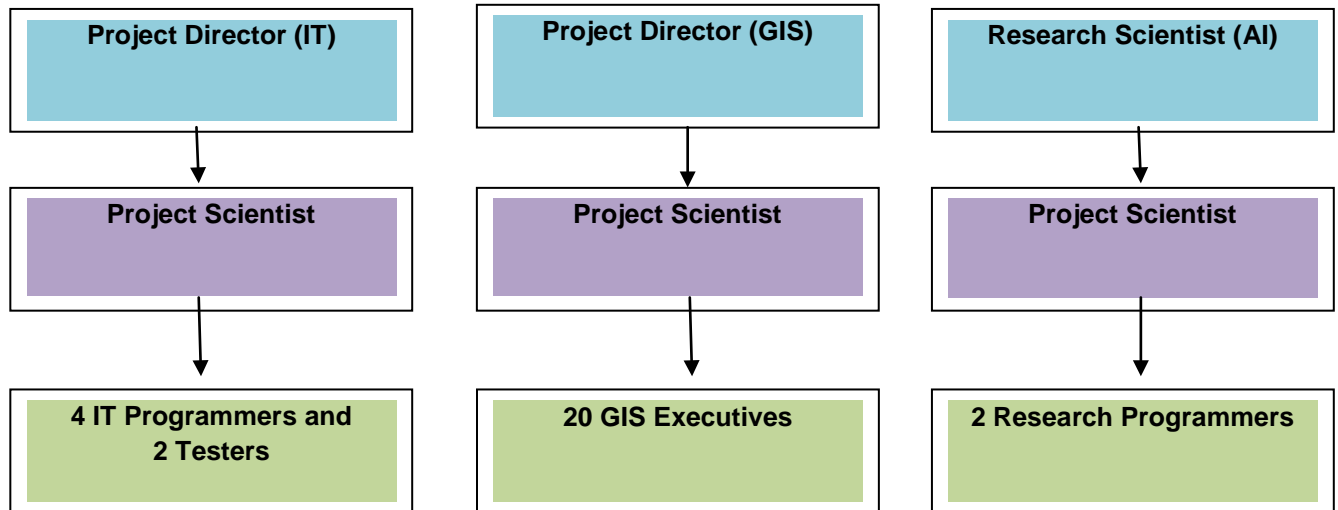
- Evaluation of the system at different levels.
- Modification in modules.
- Addition of parameters (if any).
- Security audit.
- Capacity building.
- User manual.

Annexure III

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Project Team



Roles and Responsibilities:

Project Director:

- Participates in and approves project plan and Deliverables
- Manages, reviews, and prioritizes the project work plans with objective to stay on time and on budget
- Provides status and progress reviews to DG
- The project director are also entitled to manage and supervise the following resources:
 - Project manager
 - Project leaders
 - Team leaders
 - Team members
 - Manages project resources
- Reports status to and receive feedback from Sponsor/DG.
- Collaborates with project leaders to resolve issues within individual projects
- Brings issues to the Sponsors/DG as needed
- Recommends resource and policy changes to the Process Group/Team
- Identifies required project team members and constructs project teams
- Meets with project leaders and project team members to regularly review issues and monitor progress
- Motivates and coaches project managers and team members
- Conducts risk management analysis

- Meets facility and resource requirements
- Reviews and approves deliverables

Project Scientist/Research Scientist:

- Assigned full or part time to participate in project team activities
- Responsible for contributing to overall project objectives and specific team deliverables
- Manages specific project plan activities and contributes to project plan development in collaboration with project director
- Meets with project team members to regularly review issues and monitor progress
- Responsible for risk analysis and implementation of research activities
- Responsible for the design and development of the web application
- Reports status to and receive feedback from project director
- Coordinates documentation, testing and training efforts related to project plan

Designer/Programmer:

- Assigned full or part time to participate in project team activities
- Responsible for contributing to overall project objectives and specific team deliverables
- Designs systems from a user perspective, human factors (windowing, ease-of-use), externals (screens, reports, forms), usability of the application, application software components, including programs, modules and run unit tests
- Acts as technical design specialist
- Designs Prototypes, develops and performs unit/system/integration/regression tests of application software components or fragments
- Develops against accepted institutional development standards using system wide QISMS policies
- Application documentation

GIS Executive:

- Creation of Geo-database from various sources
- Development of common platform based on user requirement
- Creation of attribute data and codes
- Setting up of data inter-operability mechanism
- Creation of lookup tables for database linkages
- Standardization of geo-spatial datasets
- Internal quality check of composite layers
- Management of layer styles and thematic map templates

Testing Team:

- Testing team performs system testing using testing automated tools. Team prepares test cases and executes prepared test cases.
- They submit testing results to respective project managers and re-verify result.

Two persons with adequate skills are proposed to be deployed at Kolkata headquarter who will work in tandem with GSI officials. One IT person is required to carry out IT operations. Another person of Geo-Informatics preferably with Geology background is required to handle geospatial applications.

Annexure IV

Milestone wise deliverables and Payment Model

Milestone	Timeline	Deliverables	Payment in % to be released by GSI	Remarks
M1	T0 + 1 month	Geo-spatial Portal development	20%	
M2	T0 + 3 months	MERT Template Development and Integration in the portal	10%	
M3	T0 + 6 months	Mobile Application Conceptualization and Development MERT Workflow development and assigning of role based privileges Multi-criteria Intelligent Search	10%	
M4	T0 + 12 months	3D Borehole Visualization and Intgration Module for creation of database from exploration report Integration Testing and Third Party Audit	10%	
M5	T0 + 18 months	Go Live System stabilization and hand holding etc.	10%	
M6 to M10		Rest 40% in annually equated installments during the O&M period of 5 years, i.e. 5 installments	8% in each year - totalling 40%	

EXECUTIVE SUMMARY OF PROJECT PROPOSAL

Title of the project: National Geoscience Data Repository (NGDR) Project by Ministry of Mines, Government of India. It was conceptualized by the Ministry of Mines (MoM) as part of the National Mineral Exploration Policy (NMEP), 2016 (Section 8 of the Policy Document deals with the concept of NGDR).

Purpose: Make available all geological, geochemical, geophysical and mineral exploration data in public domain on a digital geospatial platform collaborating knowledge from various central and state government agencies and mineral concession holders on a single truth geospatial database which will be available to the interested stakeholders through a single window. The greater goal of this initiative is to increase the investment attractiveness of the mining sector in India.

Key Stakeholders: Ministry of Mines, GSI, IBM, MECL, NMDC, NALCO, State DGMs, PSU, private and public sector organization, other research institutions are just a few big names among other stakeholders.

Goals & Scope of Work: To disseminate the reliable geo-scientific data free of cost at the public domain; to expedite the exploration activity in the country by making the baseline geo-science data available to the potential investors; to establish a centralized repository of baseline and mineral exploration information; data reporting through MERT; align stakeholders to a common semantic, schematic and syntactic standard. To develop various modules of NGDR portal with user friendly interface and providing access to user agencies for data uploading, validation and implementation.

Project Implementation Plan

Digital Infrastructure: The digital infrastructure includes servers, operating system; geo-spatial technology supporting software, advanced data base software, mobile apps, space enabled analytical software etc. The projected data volume to be digitized and analyzed is considered to be 70TB, excluding multi date satellite data and DEM. The confidentiality and security of the data will be managed as per ISO 27001:2013 specifications. The NGDR initially be operational on NIC and MeitY (Ministry of Electronics and Information Technology) IT infrastructure cloud called MEGHRAJ. The NGDR portal will be on Linux environment.

Software/portal: The portal will be GIS based which will store and share the mineral exploration data. To standardize the metadata from different stakeholders to a common schema, the standardize metadata format has been created. The data entry modules for different stake holders as per NGDR document will be made available in the web portal, through which the data can be populated and if already available data sets/legacy data are present, the same will be migrated/integrated under the guidance of GSI. The map rendering server here is *GeoServer*, which is an open source server and in Java script, which will allow user to share, process and edit geospatial data.

Database: BISAG-N will develop layers of *administrative boundaries (State, District,*

Taluka/Block and village), road network, railway line, rivers and water bodies, settlement locations and agriculture on large scale (i.e 1:5,000 to 1: 10,000 scale) using the high resolution satellite imageries. The baseline data (Geological, Geochemical, Geophysical including Ground and Airborne and Geomorphological data), geological reports and mineral exploration data including block or area wise geological, ground geophysical, ground geochemical and borehole data, available in BHUKOSH portal of GSI will be the other source of database.

Metadata Server with browser: The metadata template for various data types such as Spatial data, Geophysical data, Exploration data and the Reports which user will be able to search based on keyword, location and toposheet and administrative boundary, whereas MERT or Mineral Exploration Reporting Template (MERT) is the platform by which the metadata will be uploaded in NGDR portal, facilitating intelligent search. The primary data services here is any baseline data, exploration data, geophysical data and any additional exploration data which involves alteration map, mineral belt map, lineament map, large scale map, etc.

Development of Application: The application development will be after guidelines by *Ministry of Electronics and Information Technology (MeitY), Govt. of India*. The application will be developed as per the functional requirements of GSI and any modification or addition of new functionalities will be taken care of during development / testing / usage of the application and will be accordingly integrated into the system. *A 3D visualization and DEM will be provided for the whole country in the portal.* Specific 3D model at a large scale can be developed based on requirement. For the borehole data which are in 2D environment viz. pdf or xls format, AI based models will be engaged to extort information and will be converted to geo-data base. The data input model for 3D boreholes will be provided by GSI. The CesiumJS java script library will be used for creation of 3D maps on the web.

Mobile application: The mobile application will be developed on Android platform and will be integrated with the GIS portal. The said mobile app will also work on offline mode. The app will be updated as and when required.

System validation mechanism: After the general customization, the portal will be available for stake holders and as per requirement, enhancement, modification and up-gradation will be attended accordingly.

Capacity Building: Capacity building will be accomplished in two phases by BISAG-N. The first phase will comprise the basic operation of the software application to the concerned officials of the Ministry, SI and related stakeholders. The second phase involves data sharing and uploading procedure using MERT template and creation of metadata.

Time Schedule: The NGDR project will be completed in 18 months and operational support and

maintenance will be provided by BISAG-N for subsequent five years.

Financial Overview: The total cost of the project as estimated by BISAG-N is **INR 33.00 Crore (INR Thirty Three Crore only, Excluding all applicable taxes)**. The estimated budget includes the cost of IT H/W(CAPEX), Network cost(CAPEX), S/W(CAPEX), S/W (Year 0to year 6.5), O &M, Bandwidth cost, Development cost, Digitization cost, Database creation and standardization. The details of the financial proposal are given below in table format:

Item List	Cost in INR (Cr)
IT H/W (CAPEX) , Network Cost (CAPEX)	3.0
S/W (CAPEX)	10.0
S/W (Yr 0 to Yr 6.5)	1.5
O&M	0.5
Total Bandwidth Cost	5.0
Development Cost	1.0
Digitization Cost	5.0
Database creation and standardization	1.5
Sub-Total	27.5
Contingent (20%)#	5.5
*Total Cost (Excluding all applicable taxes)	33.0
Amount in words : <i>Rupees Thirty three Crore only</i>	

Note:¹For additional Satellite data, if required, will be procured whenever necessary from NRSC and will be charged extra as per the actual cost. ²The above cost includes 5 years of operational and maintenance cost after implementation of the project.

* The cost estimation does not include expenditure related to the establishment of NGDR Data Management and Analysis Centre (NDMAC) in GSI Central Headquarter.

The contingent amount is included because of the variable nature of the cost of components like Cloud hosting charges, bandwidth charges, satellite imagery procurement, etc.

Cost Estimation Sheet

- I. Title of the project:** National Geoscience Data Repository (NGDR) Project by Ministry of Mines, Government of India.
- II. Sponsoring Agency (Ministry of Mines):** To be Funded by National Mineral Exploration Trust (NMET) to be executed by Geological Survey of India, 27 JawaharlalNehru Marg, Kolkata -700016 under Ministry of Mines.
- III. Total Cost of the proposed project:** Approximate cost for implementation in the one and half year and Operation-cum-maintenance for five years post implementation is **INR 33.00 Crore (INR Thirty Three Crore only, Excluding all applicable taxes)** as per the project proposal submitted by BISAG-N to GSI.
- IV. Nature of the project:** It is a project to be funded by National Mineral Exploration Trust (NMET).
- V. Whether a New or a Continuing project? In case of Continuing project, Whether the Old project was evaluated and what were the main findings:** It is a New project to be funded through National Mineral Exploration Trust (NMET).
- VI. Cost Analysis:** The total cost of the project will be estimated at **INR 33.00 Crore (INR Thirty ThreeCrore only, Excluding all applicable taxes)**. The estimated budget includes the cost of IT H/W (CAPEX), Network cost (CAPEX), S/W (CAPEX), S/W (Year 0 to year 6.5), O &M, Bandwidth cost, Development cost, Digitization cost, Database creation and standardization. The details of the financial proposal are given below in table format:

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Database creation and standardization	1.5
Sub-Total	27.5
#Contingent (20 %)	5.5
*Total Cost(Excluding all applicable taxes)	33.0
Amount in words : Rupees Thirty three Crore only	

Note: (1) For additional Satellite data, if required, will be procured whenever necessary from NRSC and will be charged extra as per the actual cost. (2) The above cost includes 5 years of operational and maintenance cost after implementation of the project.

* The cost estimation does not include expenditure related to the establishment of NGDR Data Management and Analysis Centre (NDMAC) in GSI Central Headquarter.

The contingent amount is included because of the variable nature of the cost of components like Cloud hosting charges, bandwidth charges, satellite imagery procurement, etc.



28 February 2021

Self-contained Note on National Geoscience Data Repository (NGDR)

National Geoscience Data Repository (NGDR) is a flagship initiative conceptualised by Ministry of Mines as a part of National Mineral Exploration Policy (NMEP), 2016 for hosting all exploration related geoscientific data for dissemination to all the stakeholders so as to expedite, enhance and facilitate the exploration coverage of the country. Geological Survey of India is selected as the nodal agency for the implementation of NGDR. In this regard M/s PWC was engaged to prepare the Detailed Project Report (DPR). The cost of development, commissioning and maintenance of NGDR system, as per the DPR, worked out to be about Rs. 155 Cr (exclusive of taxes) with a majority cost component towards hardware and software for the system.

Extensive stakeholder consultation was carried out during the formulation of this Detailed Project Report (DPR), where detailed discussions were undertaken through VC, e-mails and in person visit to stake holder premises, including 29 state DGMs, 31 public and private sector entities and academic institutions. Such interactions were also held between the stakeholders and regional headquarters of GSI. Based on these interactions a standard template, namely Mineral Exploration Reporting Template (MERT), was prepared to ensure the data uniformity, semantic homogeneity and accordingly functional system requirements have been designed.

During this process, in an apex level meeting in Ministry of Mines it was decided that a project of such national importance as NGDR can be implemented by Bhaskaracharya National Institute for Space Applications and Geo-Informatics (BISAG-N), a Centre for Excellence under Ministry of Electronics and Information Technology (MeitY). In order to prioritize and identify the scope of work, a committee was formed to interact with BISAG-N and DPR of NGDR was shared with BISAG-N under the directive of Ministry of Mines. Thereafter, interactions between BISAG-N and GSI were made through VC and in person visit of GSI officers in BISAG-N office at Gandhinagar, Gujarat, where every aspect of NGDR implementation was discussed. During these discussions the following salient building blocks was elaborated:

- The NGDR will be implemented in Cloud hosted platform as per the preferred procedure and guideline of MeitY.
- The NGDR will be developed through open source software, thus significantly reducing the overall cost.
- The NGDR will be implemented through LINUX operating system for better security.

Based on the shared DPR and the discussions with GSI officers, BISAG-N submitted an "Execution Plan and Financial Proposal" (**Annexure-I**) for implementation of the NGDR. Basis this proposal an "Executive Summary" is prepared by GSI (**Annexure-II**).

During discussion, it was also decided that all the legacy data of all stakeholders will be brought in to the system through digitization and all the exploration related data will be converted into GIS compatible / machine readable formats for application of emerging technologies like AI and ML. It was also decided that considering the concept of MERT, the standardization of Data will also be taken care by BISAG-N. Being the Centre of Excellence under MeitY and the leading organization in the field, GSI in coordination with BISAG-N will ensure compliance of all the protocols as per the guidelines by MeitY.

Given the scale of the project and involvement of number of stakeholders, the project is envisaged to be implemented in 6.5 years, including the initial implementation period of 1.5 years and subsequent 5 years of operation and maintenance by BISAG-N. Being a project having significant implications on the mineral industry sector, it was decided that GSI will actively remain engaged with BISAG-N, where in a dedicated team from National Mission-III will participate in every stage of the implementation process, viz. requirement gathering, user acceptance testing, data migration, commissioning, etc. to ensure fulfilment of the functional requirement as well as in-house capacity building with a primary aim for seamless transition in the future.

Basis the submitted proposal by BISAG-N, the cost-estimate works out to be Rs. 33.0 Crores + applicable taxes. This cost is estimated primarily based on the man-hour efforts of BISAG-N because the major component of the work involved software development and customization as per the functional requirements. Since the project will be hosted through NIC/MeitY cloud infrastructure, for which the cost-estimate submitted by BISAG-N is primarily indicative in nature and will be finally based on actual expenditure involved (cost of cloud hosting varies from time to time and also depends of the capacity required). The in-house efforts of GSI are also not included in cost estimation.

Once NGDR is established and data population gains steam, there will be concurrent need for a state-of-art centre, for data visualization, exploration, analysis and management. This requisite NGDR Data Management and Analysis Centre (NDMAC) will be developed by Mission III at CHQ, which will include creation of IT infrastructure for which a cost of additional

Rs. 5.0 Cr is provisioned. NDMAC will be manned by a team of resource persons both from GSI (GIS experts and Mineral exploration domain specialists) and BISAG-N (software engineers, data scientists)

Considering the scale and complexity of the project and the multiple variables including the variable cost related to cloud hosting, bandwidth and change management throughout the time line of 6.5 years, a contingency of 20% is also envisaged. Thus the total estimated cost works out to be as under:

- 1) NGDR implementation cost (based on proposal by BISAG-N): (Rs. 27.5 Cr. + Rs. 4.95 Cr GST) = Rs. 32.45 Cr.
- 2) Contingency of 20%: (20% of Rs. 27.5 Cr) = Rs. 5.5 Cr.
- 3) Establishment of NDMAC (by GSI): Rs. 5 Cr. (GSI In-house expenditure)

Funding requested from NMET is **Rs. 33 Cr. + applicable taxes** (i.e, Rs. 27.5 Cr + 20% of Rs. 27.5 Cr). The cost estimation for utilising NMET fund prepared by GSI is attached herewith (**Annexure-III**).

The NGDR proposal is hereby being submitted by GSI to TCC, NMET for consideration and recommendation to EC for necessary funding so that this flagship initiative can be implemented on priority.