Report on

Implementation of VAQ Programme for Enhancing Visibility, Activity & Quality of Geological Survey of India

[100 × 100 VAQ Programme]

June, 2021

Content

Background

GSI, being the forerunner in the field of Geoscience in the country, has always been put into diverse challenges since its inception. This evolutionary journey kept this organization as a truly vibrant entity, performing diligently the role of geoscientific advisor to the Nation. It is, by no means, an exaggeration to ascribe accolades to GSI for its yeomen service to the nation.
New technologies, changing nature of geoscientific activities, cost and productivity pressures, information explosion, fragmentation and specialization in the geosciences – like all globally relevant earth science organizations brings GSI at the crossroads of getting continuously evolved to remain ever responsive to manage the changes and to meet the growing and diversified needs.

To address certain key performance indices and bottlenecks coming in the way of delivery parameters, GSI with the support of Ministry of Mines has initiated a unique endeavor of introspecting and churning to give core geoscience organization of our country a fillip to evolve and serve the country at its pinnacle of scientific excellence.

At the first instant, the Ministry of Mines selected a small group of 14 middle level high performing officers from all possible domain areas of GSI and conducted a one-day brain storming session at the Ministry Headquarters at New Delhi under the chairmanship of Dr. K. Rajeswara Rao, Additional Secretary, Mines and Shri Bipul Pathak, Joint Secretary, Mines. This exercise gave the initial ideas about major issues, grey areas in technical arena and finally identification of 14 distinct themes viz i) HRD, ii) Planning, Monitoring and mentoring, iii) Geoscience Research and Analytical Facility, iv) Public Good Geosciences, v) Mineral Explorations, vi) Optimisation of Mission-Region Matrix, vii) Enhancing GSI's visibility, viii) Fortification of Baseline Data, ix) Digital Transformation of GSI, x) Marine Explorations, xi) Administrative and Scientific Support Systems, xii) Synergy of Geoscience Data, xiii) Collaboration and Cooperation, xiv) Project Mode and Financial Management.

A group of 111 officers were inducted into 14 groups, making a pool of 125 officers including 14 theme coordinators. Each thematic group were constituted from officers with expertise in diverse domains and representing all Regional and State Unit offices worked in tandem for five months and produced 14 comprehensive base documents which have been true guide for GSI to introspect, follow and find plausible ways to tackle the evolutionary challenges, faced by the Indian Geoscientists.

Subsequently, a two-day VAQ workshop was organized on 19-20 July 2018 at Kolkata where an implementable VAQ Model Programme for GSI within three phases of 100 days each have been conceptualized, deliberated and finalized. Each of the 14 Coordinators made crisp presentations on the main recommendations in the activities of their respective domains. These recommendations were enthusiastically discussed and deliberated by all the participants.

Finally 72 recommendations were accepted for implementation in planned manner as per defined timeline.

On 15th August 2018 i.e. the 72nd Independence day, the VAQ programme was launched.

VAQ Implemantation

Each of the 14 ***Themes*** has specific ***Activities***, totaling to 72. Activities were further subdivided into sub-activities totaling to around 282 numbers of executable tasks to be completed as part of VAQ implementation, as detailed below:

Theme	Activity	Sub-activity
Theme 1: Human Resource Development	8	23
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Theme-wise overview of the implementation of activities/ sub-activities is presented in the following sections along with highlights of achievement:

Theme #1: Human Resource Development

Human Resource Development (HRD) is considered to be the key to higher productivity, better relations and greater profitability for any organization. It makes the integrated use of training, organization and career development efforts to improve individual, group and organizational effectiveness.

For past five decades, various committees constituted to look into functioning of GSI and its operating environment had identified HRD management as a matter of concern. This has happened mainly because; neither the human resource development has been given adequate importance nor the human resource management has been transparent and in tune with GSI's vision.

Two distinct goals and milestones were suggested by this thematic Group, which will bring qualitative changes in the Human Resource Development of GSI.

- GOAL 1: Big bang innovations with formulation of new HRD policies such as Defining roles and responsibilities of all cadres, Deployment policy, Modification of Recruitment Rules etc.

- GOAL 2: Kaizen (Continuous and incremental changes) like Updation of HRMIS data, Drafting of USP documents for state units, Preparation of base documents on various mineral commodities, litho-tectonic provinces, work disciplines etc., Improvement in skill sets and expertise, Identification of domain experts and scripting their roles as mentors, reviewers etc., Online training facilities with 24X7 operations, Training and capacity building through collaboration with reputed institutes etc.

HRD theme listed total 8 activities with 23 sub-activities. The highlights of implementation are as follows:

- Various policies have been prepared by GSI expert committees viz. Creation of Mission HRD with GSI (TI) as one of its components, Roles and Responsibilities of all Cadres & Change in Transfer Policy, Policy on skill sets and expertise development and their linking with promotions/ postings, Training and Capacity Building through sponsorship and collaboration with reputed International Institutes and taking services of Experts of GSI (Retired) on retainer-ship basis under funding from NMET etc. These documents have been submitted to the Ministry and at Ministry level these have been included, wherever applicable, in the Cadre Review, RR modification, DFPR modification etc. For suggestions that involve change

in the financial rule, the approval is as per the procedures and GoI rules laid down by DoPT/Ministry of Finance, Govt. of India.

- 24 x7 online training portal has been established by GSITI.

- USP documents of all states highlighting the uniqueness of geological set up, mineral resource availability, thrust areas of GSI work, future activities etc. have been prepared.

- OCBIS HR database and input forms have been created for entering additional data of officers

- Implementation of competency mapping depends on finalization of Cadre restructure, RR modification as well as skill sets and Roles and Responsibilities. Thus, implementation is possible only when necessary approvals are notified at the Ministry level. Presently, it is kept on hold.

Theme #2: Project planning, Technical auditing and Monitoring

Theme 2 listed total 6 activities with 20 sub-activities. The highlights of implementation are as follows:

- Identification of thrust area, themes, mineral commodities, Consultation of all GSI reports theme wise to identify potential areas, Training etc. have been done on regular basis
- Mission-wise term review has been introduced and reviews are done over VC platform to save cost and time
- Use of software to check plagiarism has been introduced
- APAR related changes will be taken up with upcoming SPARROW implementation and subject to approval of DoPT
- For organizational mentoring program, committee constituted for implementation has submitted report that has been sent to Regions and Missions for implementation. It is done under the existing rules of GoI.
- Various training e.g. Change Management Training, Leadership programme, Project planning and risk management training have been conducted for HAG/SAG level officers.

Theme #3: Public Good Geosciences

Anthropogenic activities on our planet in the post-industrialization are altering many geological conditions and natural processes at alarmingly fast pace. The consequences of such undesirable changes are manifested in the form of increased frequency and severity of natural disasters. Therefore, it is becoming increasingly important to study, understand and guide the societies towards achieving "sustainability". It is precisely in this context, that the domain of "Public Good Geoscience" is gaining prominence wherein a geoscientist activates this delicate link between man and nature.

This theme emphasized on enhancing 'geological literacy" through a well-defined strategy for Public Good Geoscience in tune with the contemporary geoscientific concepts. It proposes GSI to play greater and effective role by offering its services in the field of Public good geosciences such as Engineering Geology, Natural hazard studies, Environmental Geology, etc. GSI, unlike other organization in the country, has the breadth of multidisciplinary geoscientific expertise, the extensive national on-the-ground presence, and the wealth of geoscientific monitoring capabilities and legacy data at all scales, from microscopic to national, which are the essential requirements for any organization to address societal issues which have geospatial underpinning.

Summary Recommendations for this theme include mainstreaming of Public Good Geoscience by taking up Public Good programmes, suo motu, with the same importance as searching for mineral resources; creation of a separate Mission on Public Good Geoscience with functional as well as financial autonomy; working in 'Project Mode' rather than 'FSP Mode'; waiving of charges for Engineering geological consultancy services provided by GSI for large projects such as construction of dams, tunnels, alignment of roads in hilly areas, power plants, etc.; synergy meeting between MoM and MoES for collaborative work on Earthquake studies; opening of 'Quaternary and Environmental Geology Division' in all the Regions; taking up pilot projects on Critical Zone studies, Geo-environmental appraisal, Urban Geochemistry and River Basin Management; domain-specific Training and capacity building programmes; in addition to landslide, earthquake and geotechnical risk evaluations, developing expertise in urban geohazard management etc.

Expertise development requires decades of active work in a particular field. Unnecessary transfers, prevalent during the recent times, needs rethinking for a scientist-dominated organization like GSI.

This theme has a total of 13 sub-activities under 5 activities. The highlights of the achievements are:

- Upgrading all Geotechnical Laboratory has been taken up in a comprehensive manner as continuous process as per fund availability.
- GSITI has conducted 9 courses for 198 participants in collaboration with national institutes of repute viz. Survey of India, Central Building Research Institute (CBRI), Roorkee, Tehri Hydro Development Corporation Ltd.
- Campaign mode GPS projects for active fault studies have been taken up by regions
- Compendium on Active Fault Studies and Seismic Hazard Microzonation have been taken up as regular FSP.
- "Quaternary and Environmental Geology" Divisions created in all Regions.
- Projects on Arsenic/Fluoride pollution and Medical Geology have been taken up in all Regions.

Theme #4: Applied and fundamental research and modernization of analytical facility

This theme focuses on adoption of modern technology and concepts of ***fundamental research*** into the ***applied science*** of prospecting and exploration. It advocates to take mineral exploration as research challenges with complete synergy and feedback mechanism between Mission II (Natural Mineral Assessment) and Mission IV (Fundamental and Multi-disciplinary Science) activities. Developments in technology allow scientists to visualize different dimensions of Earth's processes leading to new concepts and strategies to exploit or adjust to natural processes to suite human needs. The theme 'Applied and fundamental research & modernization of analytical facility' is placed at the core of GSI's VAQ initiatives.

Major issue, as highlighted in base document of this theme, is that since mid-1980s, GSI could not adopt modern technologies, like for example, ICPMS in chemical analyses, making its data unattractive to its users. In contrast, during that period geological science shifted from a qualitative science to a more quantitative one using principally isotope-based techniques resulting in growth of many new concepts. GSI did not match this advancement in geological science and failed to utilize modern techniques and concepts. Its science output, its exploration output fell sharply.

The team dealing with this theme recommended for resorting to quick modernization of its geological lab facilities, to ensure immunity of such labs from bureaucratic ramblings, train its scientific personnel to adopt and apply modern concepts and to use cutting-edge research in all its scientific activities, be it exploration, public good geoscience or understanding basic geological framework of the country. A list of critical instruments needed by GSI for modernization of its lab facilities has been proposed. Also, several research projects that systematically explore mineral potentiality using fundamental and modern geological concepts were proposed.

This theme included 20 sub-activities under 7 major activities. The highlights of achievements are:

- In order to upgrade analytical facilities in GSI 1 IRMS (NCEGR-Bangalore), 1 TEM (NCEGR-Kolkata), 6 Raman Spectrometer (SR, NER, CR, WR, NCEGR- Faridabad & Bangalore), 90 hand held LIBS, 60 handheld XRD, 170 hand held XRF, 1 SSA-MS (NCERG-Kolkata), 4 LA-Q-ICPMS (NCEGR-Bangalore, CR, SR, NER) and 1 EPMA for WR have been approved by CPC on 03.09.2019. Proposal for RAMAN -SEM, portable XRF and XRD has also been planned. These procurements will be done as per procurement plan and fund availability.

- For improving applied research for mineral prospecting and exploration in Green field areas, NCGER, Faridabad has taken up modern concept based project viz. 'Petrogenesis of high

Sr/Y granites from the Leh-Chumathang-Shyok area of Ladakh Granitoid Complex: An assessment of their mineral potential.' As high Sr/Y magmas are associated with major porphyry-type copper deposit worldwide, high Sr/Y granites of Ladakh Granitoid Complex will be evaluated to understand the contribution of crustal sources to the magma, extent of crustal interaction processes in generation of high Sr/Y granites and assess potential of these high Sr/Y granites for hosting Cu-Mo-Au porphyry type/skarn mineralization.

- Applied research in Urban Geochemistry is initiated with two projects on the heavy metal pollutant viz. 'Transport behavior of heavy metal pollutants through water and clay fractions along the Yamuna river and its major canals between Wazirabad barrage, Delhi to Kidawali village, Faridabad, Haryana and 'Characterization of pattern, extent and source of bioaccumulation of heavy metals indifferent food items, cosmetics and in human teeth (and other organs, if feasible) in Kolkata.

- To establish synergy among M-I, II and IV, laboratories of NCEGR have extended help in identification of PGE, REE and other mineral phases to different projects of GSI and also have taken up own projects such as for REE in Gujarat, Fe in Odisha with an aim to develop understanding of genesis of ore minerals.

Theme #5: Modernizing mineral prospecting and exploration programs

Mineral sector, being one of the core sectors of economy, provides basic raw materials to many important Industries. Exploration is the foundation of all mining. The public expenditure on exploration in India needs to be enhanced significantly. Exploration expenditure determines the rate of discovery of future mineral deposits and mines. Exploration in India is mostly restricted to a depth of 50 to 120 meter vs. as deep as 500 meter and beyond in countries such as Australia, Canada and Latin American Countries.

The issues / weak areas identified in this theme are lack of application of modern exploration, exploitation and beneficiation technology; there is very little investment in R&D on mining, exploration and mining technologies, beneficiation, conventional type (based mostly on geological data) exploration activities with limited input from geochemistry, geophysics and remote sensing.

Important recommendations under this theme are classified into three broad heads viz. 1) Modernisation of Exploration Philosophy and Technology like innovations in Ore deposit modelling and Mineral Exploration, probing for deep-seated mineral resources in India, understanding the mechanisms of metal mobility and the role of chemical and biological agents in concentrating and limiting dispersion, identification of reliable vectors to mineralizing systems etc., 2) Geophysics as a key to unlock hidden/ deep-seated Deposits e.g. application of Airborne gravity gradiometers, modern inversions modelling of geophysical data; integration of multiple exploration data sets ; 3D geological models attributed with physical properties may be constructed from primary geological data; 2D / 3D seismic reflection for precise targeting of extensions to existing deposits and mapping new mining targets; 3) Training & capacity Building.

Immediate Steps that have been recommended are Creation of First Hand Geological Potential Domains for Strategic and Critical Commodities viz., Fertilizer, Minerals, Nickel, Cobalt, Antimony, Limestone, REE & RM, Lithium, Bismuth, Vanadium etc.; Creation of Mineral Prospects and Occurrences Atlas of Various Commodities; Revision and Creation of Updated Database and Publishing Map Series On Geological Potential Areas of Commodities Like, Gold, Diamond & Precious Stones, Basemetal, PGE, Iron Ore, Manganese, Chromite, Molybdenum, Coal & Lignite, Tin & Tungsten, Bauxite for The Use of Mineral Industry; Procurement of professional 3D & statistical modelling software for Mineral Resource Estimation and 3D Modelling of the Deposits; Procuring Field and Lab Equipment for Mineral Exploration; Modernisation of Drilling Operations and enhancement of in- house capacity and capability.

There are 17 sub-activities divided under 6 activities. The highlights of achievements are:

- Number of Exploration Projects have been doubled

- Thrust is given to Mineral Exploration Projects from Bundelkhand Craton- NR: 4 M-II projects (Au, REE etc.), one RMT and 01 STM has been carried out in 2019-20. One Gold, One RMT, and One STM has been carried out in the FS 2020-21. CR: Item titled "Regional mineral targeting project for assessment and characterization of the nature of mineralization and mineral potential in parts of Bundelkhand Granitoid Complex (BGC) of Madhya Pradesh" has been taken up for two years.

- Mineral prospect/ occurrence database, overlaying of 50K map and Commodity-wise geology and mineral potentiality maps have been produced.

- 3D modelling software purchased at Mission II HQ, Nagpur and trainings completed.

- Procurement of drilling rigs, field equipment initiated as a continuous process.

Theme #6: Optimization of functioning of Mission-Region Matrix

Current organizational structure of GSI is based on recommendation of a High Powered Committee (HPC) set up on 1st October 2007. The Committee submitted its Report on 31st March 2009 and the Union Cabinet approved this restructuring proposal of GSI on 25th October, 2011.

This theme defines the issues and constraints observed during past nine (09) years of operations of this Mission-Region Matrix in GSI. Important issues included the Nature of Mission structure, Skewed deployment and infrastructure in Missions, Conflicting roles and responsibilities, issues related to appraisal and Financial powers of missions vis-à-vis State Units (SU), Region and CHQ. Because of this, Mission-Region Matrix in GSI is yet to function properly and efficiently as conceptualized in HPC recommendations.
Notable recommendations are 1) creation of new missions for Baseline Marine Geoscience, Geosciences for Society/ Applied Geosciences, HRD and Training, Policy Supports, Quality and Integration, Personnel, Administration and Finance; 2) Formation of National and Regional Expert Group, 3) Renewed Roles and Responsibilities; 3) Delegating Financial powers to Missions etc.

There are 5 activities with 8 sub-activities recommended in this theme. As this involves cadre restructuring many of the implementations are beyond the power of GSI. Highlights of implementation are:

- Revamping the Roles and Responsibilities of Missions will be considered with Cadre review and RR Modification at Ministry level and beyond.

- Expert Groups have been identified and their services are being used as and when required by granting honorarium.

- Delegating financial powers to Mission Heads was not considered by the Committee set up by DG, GSI.

Theme #7: Enhancing GSI's visibility

[105 sub-activities under 10 activities]

Despite GSI's immense contributions towards nation building, its visibility in various fora, especially, amongst the General Public and the recognition, which it duly deserves remains to be oddly wanting. Even for a non-profit government organization like GSI, it is important to be visible and enhance the public profile. Enhancing visibility will help raise and strengthen the programs, garner exposure towards GSI's cause, and attract more interactive stakeholders. Visibility is the presence of the 'GSI' brand amongst public and it is very critical for getting support in work and in making larger impact. The goal is to become a leading / popular name in all intervention areas related to the charter of GSI.

The base document of this theme has defined eight strategies that will enhance visibility of GSI. These are 1) Improving Public and Media Relations; 2) Increasing Online Visibility; 3) Greater Collaboration and Coordination; 4) Quality GSI Products and Services; 5) Connect with the General Public; 6) Connect with the Students; 7) Popularising Geoparks and Museums; 8) Connect with the Employees

This theme has 105 number of sub-activities included within 10 activities. Important highlights of achievement are:

- GSI has engaged professional PR Agency who carries out all the activities in connection with this theme.
- Creation of dedicated "Public Relation & Media cells": PRM Cells at CHQ level and Regional HQ and SU levels.
- Connecting with all target audience through social media / discussion forums / blogs are done on regular basis
- New home page and related second level pages went live on 16th December 2018. Portal home page contains several information sections for general public.
- Search Engine Optimization has been done
- Regular posting of quality content in Social Media accounts by the PR agency
- GSI mobile app has been developed for showcasing GSI products

- e-Newsletters are regularly produced by GSI.

- 500 e-books have been prepared by PRM agency.

- Creation and updating of DID/GID on both energy and non-energy minerals / mineral belts. Updated DID is published as Miscellaneous Publication No. 66 (ISSN 0579 4706) entitled "New Insights on Mineral Exploration Concepts and Guidelines" (advance release) 2018. It contains updated and detailed account of major mineral commodities (Industrial and fertilizer Minerals: Potash, Phosphorite, Graphite, Limestone, Baryte, Dunite, Wollastonite, Andalusite, Kyanite, Sillimanite, Clay Deposits and Dimension Stone; Non-Ferrous & Strategic Minerals: Base metals (Copper, Lead and Zinc), Bauxite, REE and Tin, Tungsten, Molybdenum, Nickel and Cobalt; Precious Metals and Minerals: Gold, Platinum Group of Elements, Diamond, Gemstones; Ferrous Group: Iron Ore, Manganese, Chromite)

- Various coffee table boos have been published

- Involve students actively in celebration of GSI day on 4th March through quiz competitions, essay competitions, earth science model competitions

- All Regions / SUs are engaged with students/researchers in local colleges/universities regularly and initiate regular collaboration using BHUVISAMBAD Platform

- Field training / field based M.Sc. project work guidance are provided to university students.

However, few of the recommendations are not feasible and those involving finance matters have to be done as per GoI rules.

Theme #8: Fortification of baseline data, maps

The collection of "Baseline Geoscientific Data" comprising geological, geophysical, geochemical, and marine geological surveys and mapping, have extensively been used in the domain of mineral resource assessment, earth system science, fundamental research, geotechnical, geo-environmental and natural hazard and risk studies, glaciology, seismotectonics and other issues of concern to the society.

Since geological mapping and other baseline data are of vital importance, there is a need of constantly upgrading the data with new concepts and tools. Important recommendations under this theme are 1) Execution of the project that include, enhanced data collection from field, geochemistry, isotope analysis, 2D/ 3D modeling and integration; 2) Procurement of suitable 2D/ 3D Data integration software by GSITI; 3) drilling for deep stratigraphic boreholes; 4) Planning and formulation of FSP items on Integrated thematic mapping; 5) Regional scale MT survey for the entire country; 6) Update and Publish all volumes of "A Manual of Geology" etc.

This theme contains 24 sub-activities under 8 activities. Highlight of implementation are:

- 11 RMT projects including enhanced data collection from field, geochemistry, isotope analysis, 2D/ 3D modeling and integration have been initiated by the Regions under the guidance of NM-II in FS 2019-20.

- GSITI procured 3D modeling software viz. SURPAC, GEOSOFT TARGET. Officers are being trained regularly in Data integration and modeling.
- 15 data Integration courses for 383 participants conducted by GSITI during FS 2018-19 (2 courses) & FS 2019-20 (13 courses). 14 nos. of 3D Modelling (Surpac, Geosoft etc) programs for 193 participants conducted by GSITI During FS 2018-19 (8 courses) & FS 2019-20 (6 Courses). This is continuous process.

- Stratigraphic drilling project at Southern Region could not be completed due to protest by local villages in Cudappa area, which could not be resolved despite intervention of local administration. Finally, the project is shelved. Similarly in Central Region, one by in-house drilling machine was suspended due to lockdown and 2nd project was abandoned due to drilling difficulty. Further new BH in lieu of abandoned BH could not be started due to water scarcity in the area and due to disagreement by private land owner to allow drilling in his land.

- 6 Integrated Thematic Mapping items, 1 in each region, has been taken up during FS 2019-20. It is a continuous process.

- Proposal for MT survey (Project: IndMAP) is under consideration. It will be initiated in due course of time beyond VAQ timeline.

- Procurement of field equipment is continuous process and done as per requirement and fund availability.

Theme #9: Review and accountability system for STSS, AdSS

This Support System concerns with S&T infrastructure in GSI, viz. Laboratory Networks, Capital Assets Procurement and Management, Drilling, Transport and Survey and Drawing Streams.

Chemical analysis is a crucial component of core activities of GSI like exploration. However, laboratories of CHQ and all the Regional laboratories had acquired respective NABL accreditation but those are not properly networked, hence. The State level laboratories are also needed to be properly equipped, accredited and brought into the network.

The recommendations include1) Induction of new blood in Drilling, APMD & Administration 2) Creation of a non-lapsable standing fund exclusively meant for running operations of the laboratory and drilling units; 3) Upgradation of State Chemical Labs; 4) Streamlining Procurement Process in GSI; 5) Augmenting Drilling Infrastructure

This theme has 16 sub-activities under 6 activities and the highlight of achievement are:

- Induction of new Group B non-gazette and Group C officers in drilling, APMD and administration has been approved. Recruitment will be completed by various authorities.

- Equipment for CHQ, NCEGR and state chemical laboratories (XRF, AAS, PBM) have been procured

- XRF & ICPMS Labs of CCL, CHQ; NCEGR, Faridabad; ERO, Kolkata; WRO, Jaipur; SRO, Hyderabad; CRO, Nagpur got NABL accreditation as per ISO: IEC 17025.

- A “Guidelines to streamline the procurement process in GSI” has been circulated on 1st May 2019 with the approval of MoM, New Delhi for implementation.

- The procurement action of new hydrostatic drilling machines of varying capacities was initiated to be completed in two phases. Two machines of 1000 m are delivered recently. Purchase order for another 2 nos --1000M and 4 nos -- 600M capacities are placed. Procurement is a continuous process to be taken up as per requirement and fund availability.

Theme #10: Digital transformation of GSI

In today's scenario, Information and Communication Technology (ICT) plays a significant role in managing any organization, including management of Geo-information. GSI has successfully adopted ICT in its functioning including data collection, processing and dissemination. IT activities in GSI is performed over a state-of-art IT infrastructure and application platform.

However, GSI is yet to transform into a modern business entity ingrained with digital awareness and skills that make any organization agile, adaptive to changes and capable of delivering what is expected from the national geological organization of the country.

Despite introduction of a novel data management process – OCBIS in GSI with training of end-users and putting in place a 24 x 7 helpdesk system, at the end of the FSP year, it is observed that the usage was far below the desired level. The factors identified as the root cause are 1) Lack of proper IT manpower in various offices at RHQ and State Units; 2) Enforcement; 3) Issues of Application development and 4) Issues of Application adoption.

Important recommendations include implementation of Wireless Network, Secured failsafe 24 x 7 Internet; Collaboration among scientists over web etc.

This theme has 5 sub-activities under 1 activity and the highlights of achievement include:

- OCBIS usage has reached satisfactory level. Apart from regular monitoring, one contributing factor is training and familiarization programmes. Total 03 Core ICT trainings were conducted for 63 participants (OCBIS Nodal Officers) through outsourcing. Also, total 14 OCBIS familiarization trainings conducted for 795 participants.

- Implementation of secure failsafe internet

- Collaboration platform using Skype for Business

- Implementation of wireless network across entire organization will be done beyond VAQ timeline.

Theme #11: Marine Survey and Exploration

In order to meet the ever growing demand for mineral resources, the delineation of Obvious Geological Potential Areas for offshore minerals in EEZ of India was considered important for strategizing future course of detailed marine geological studies and prioritising the concerted action plans for offshore mineral exploration. On the basis of the delineated offshore OGP, Focused Offshore Mineral Exploration (FOME) Cruises are being taken
up for Polymetallic Deposits (PMD) that include REE, Co, PGE, Gold etc., phosphorites and lime mud, heavy mineral placers and construction sand.

Important recommendations are creation of digital library of surface sediment , publishing Vessel movement details and Cruise Summaries of RV Samudra Ratnakar in GSI web site, delineation of construction sand blocks, Lime mud Blocks within and outside offshore CRZ; preliminary evaluation for phosphorites off Chennai (TN) and Okha (Gujarat) within EEZ of India by drilling etc.

There are 7 activities in the theme and the highlight of achievements are:

- Data pertaining to about 10,500 surface sediment samples have been digitized.

- ArcGIS based web application with role based Data entry screen for tracking location of Samudra Ratnakar on a base map has been developed tested and deployed since 5th August 2019. Web page for MCSD with vessel information has been developed in OCBIS.

- Projects on ‘Delineation of construction sand blocks, Lime mud Blocks by outsourcing are planned. Execution will be done as per need beyond VAQ timeline.

- Preliminary evaluation for phosphorite off Chennai (TN) and Okha (Gujarat) within EEZ of India by drilling using NMET fund has been dropped.

Theme #12: Synergy between Geology, Geophysics and Chemistry

GSI, over the years, has become a store house of geoscientific data in the country. The data, thus, generated is being used by GSI and other national and international agencies for various purposes like mineral exploration, geo-hazard management and many other socioeconomic areas. Since, most of the surface/near surface economic mineral deposits have been discovered by surface exploration methods, the focus now has shifted to the discovery of deep-seated deposits. In order to achieve this objective, innovative exploration strategies using state of the art techniques need to be developed and adopted. Thus, synergy between geology, geophysics and chemistry is needed to develop an integrated approach for search of concealed mineral deposits.

The theme emphasizes on the need to adopt execution of FSP items in Project mode by allotting officers of different geoscientific streams project-wise under experienced geoscientists. GSI should stress on thematic data compilation, and multi-thematic data integration work and should take up customized project of such data integration by employing relevant manpower from amongst the Geology, Geophysics and Chemistry streams.

The recommendations include 7 sub-activities under 1 activity and the highlights of achievement are:

- Projects involving data integration as envisaged in the theme are taken up in all regions in FS 2018-19 onwards. These include projects on "Integrated Mineral System Studies"; "Regional Mineral Targeting" projects etc. 4 Data integration items with ground follow up items taken up by RSAS in FS 2019-20 and 4 more items proposed for FS 2020-21

- 15 RMT / Integration courses for 383 participants conducted by GSITI during FS 2018-19 (2 courses) & FS 2019-20 (13 courses).

Theme #13: Collaboration and Co-operation with stakeholders

Initiatives towards collaboration and coordination at national and international levels are pre-requisite for information exchange to keep up with cutting edge technologies and innovations, skill upgradation/ capacity building. Considering the multi- disciplinary nature of projects, no single institution can meet the challenges alone. Hence collaboration and cooperation is the need of the hour.

Key issues identified are integration of policy and project like aligning implementable projects with the recommendations of GAC, making MoUs with foreign governments/ agencies more effective and fruitful, Developing and nurturing Specialisation / Expertise, etc.

Recommendations include identification of gap areas and domain of collaboration; template and module preparation of different types of collaboration Institutional/ PhD/ Data sharing , facilitating provision for higher education in the country and abroad, collaborations with different countries using IGC as a platform, freedom of communication in connection with paper approval / Scientific interaction / post paper interaction etc.

There are 8 sub-activities under 1 activity in this theme and the important achievements are:

- Policy guidelines for publication approval / scientific interaction / Post paper interaction formulated.

- GSI has shortlisted 13 countries to conduct business meeting in IGC 2020. At present MoUs exist with Geoscience Australia, British Geological Survey, Geological Survey of Bangladesh and Geological Survey of Brazil, (CPRM). Apart from the above, draft MoUs with Peru, Finland, Tajikistan is under process of consideration. However due to Covid-19 pandemic, IGC event was postponed indefinitely.

Theme #14:	Financial management and project mode functioning

Financial management is backbone of any business. Presently, project execution in GSI suffers due to poor fund management. Few of the recommendations of this theme are:

- Delegation of financial powers may be revised down the line upto level of Head of Office.
- Financial powers should be re-delegated to HOO to sanction the RCA recoupment bills in compliance of GFR. The powers of DDG shall be increased from Rs. 50,000 to Rs. One Lakh.
- RCA / NRCA guidelines were issued in 2010 which needs to be revised as per present requirements of funds such as NRCA for wages, POL etc.
- Financial stream shall be restructured upto State Unit level
- Vacant posts of finance wing to be immediately filled

There are 9 sub-activities under 1 activity in this theme and the important achievements are:

- Delegation of financial powers was circulated on 28th February 2019 for implementation.
- New Revised Guidelines for RCA/ NRCA has been circulated on 25th June 2019
- Cadre restructuring is part of GSI Cadre review proposal which is under processing in Union Govt.

Outcomes & Benefits

The VAQ activities were planned to bring forth improvement in critical areas of the organizational functioning including 1) exploration activities 2) Procurement of modern equipment and software facilitating field and Lab activities, 3) Policy Formulation, 4) Collaboration and 5) Enhancement of visibility

Thrust on exploration activities on Greenfield and brownfield areas was a significant theme and GSI has almost doubled its projects on exploration during FS 2019-20. Interdisciplinary projects requiring collaborative approaches have been taken up to achieve a common objective of identifying new exploration targets. Significant changes have been brought in the technical operation through establishment of new divisions, taking up environmental geology projects, Smart City project etc during FS 2019-20.

Also, VAQ has been instrumental in revamping laboratories with new capacity and capability enhancement. Procurement of instruments has been carried out on continuous basis. Similarly, to address the issues of drilling, considered as a crucial component of exploration, new drilling machines are commissioned.

On the policy front, fresh insights have been added into “Roles & Responsibilities of all Cadres”, “Strategic deployment of Human Resources”, “Policy on improvement of skill-set and linking that with HR management” etc.

In the area of enhancement of collaboration, GSI has entered into MoU with IIT-ISM, Banaras Hindu University, Guwahati University and University of Mysore for Academics and Training programs which will go a long way in developing skill and expertise of GSI scientists in specialized domains.

A very important theme of VAQ was dedicated on “Enhancing Visibility of GSI”. Under this, PR and Media cells have been opened. Highlights of GSI activities, achievements are being shared with media using press releases, press conferences, social network postings, etc. GSI officers are constantly interacting with students and academia from eminent institutions through lectures, demonstrations, exhibitions and field trainings as part of Bhuvisamvad activity, which has been conceptualized by the Ministry of Mines as a collaborative platform for interaction by various geoscience stakeholders.

VAQ is a learning curve for GSI that helped GSI to introduce innovation, to adapt to changes and to strive for excellence through actions.

Conclusion

VAQ was initiated in 2018 and through this programme GSI carried out recommended implementations. Some of the activities are one time implementation and others are continuous process introduced through VAQ and GSI will continue to do that. Thrust in exploration activities, induction of state-of-art laboratory and field equipment, enhancement of public good activities, collaborative activities, outreach to students, academics are continuing. Induction of PR agency has increased GSI visibility to a great extent. During pandemic training and educative lectures are organized using web platform.

Cadre and RR related matters that involve various Ministries of GoI are put into process at the Ministry level and it will be implemented in due course of time depending upon its approval by the competent authority beyond GSI.

Procurement related recommendations have been considered by the competent authority and several new state-of-equipment include chemical laboratory instruments, HR-SIMS, drilling rigs etc. have been procured that have enhanced the capability of GSI.

For some of highly technical and specialized activities like MT survey, it is not feasible to complete the work within VAQ timeline. However, this activity has been conceptualized as Project 'IndMap' and will be implemented by GSI.

For enhancing visibility, GSI has hired a professional Public Relations and Media management agency. This has resulted into regular feed in various media about activities and achievement of GSI to public and business.

VAQ has served its purpose of bringing a new work culture and impetus into activities fulfilling the objective of enhancing Visibility, increasing Activity and Quality. All actionable activities have been addressed – either implemented or brought under regular and continuous activity of GSI through FSP implementation, procurement cycle; barring a few that are not feasible under the current set of rules and regulations. In short, essence and motivation of VAQ have been ingrained into working of GSI. However, VAQ as a project with defined entity / set of activities have formally been declared as closed with approval of the Director General, Geological Survey of India.

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