



**Gem and Jewellery Research  
and  
Training Institute**

**Annual Report**

**2014**

Gem and Jewellery Research and Training Institute  
No.382, New Kandy Rd,  
Malabe.  
29.12.2015

Hon. Minister of Environment and Renewable Energy  
Ministry of Environment and Renewable Energy  
Sampathpaya,  
No. 82,  
Rajamalwatta Road,  
Battaramulla.

Dear Sir

**Annual Report – 2014**

In terms of sub section 14 (2) of the Finance Act No.38 of 1971, I submit the following documents.

1. The Administration Report of the Gem and Jewellery Research and Training Institute for the year 2014
2. Income and Expenditure Statement for the year ended 31<sup>st</sup> December 2014, Balance sheet as at 31<sup>st</sup> December 2014 and Cash Flow Statement for the year ended 31<sup>st</sup> December 2014
3. Report of the Auditor General for the year 2014

**Yours Faithfully,**



**T.M Sirisoma**  
**Chairman**  
**Gem and Jewellery Research and Training Institute**

# VISION MISSION & GOALS



## VISION

“ To the Regional Center of Excellence in Research and Training in the Gem and Jewellery Industry while facilitating the Growth and Development of the Industry in Sri Lanka”

## MISSION

“ To enhance the Competitive capability of Sri Lanka Gem & Jewellery Industry by providing high Quality Research & Training Services leading to Exploration of Gem Deposits, Technological Innovation, Skill and Competency Development and Quality Improvement for the satisfaction of our Stakeholders ”

## GOALS

“ Harness the Gem Resource of Sri Lanka through sustainable methodologies, introduce innovative methods, and train new set of tradesmen for the industry to uplift the country's economy ”

## **2. Brief profile of the Directors and Senior Management**

### **2.1 The profile of the Board of Directors, of the Institute during the year 2014 was as follows.**

01	Mr. T.M Sirisoma (Chairman)	Chairman of the Board of Directors since 17.04.2013 to 16.12.2014
02	Mr. SenerathJayasundara	Board Member since 30.04.2013 to 16.12.2014 (Chairman-Geological Survey and Mines Bureau)
03	Mr. M.A.S.H Perera	Board Member since 29.01.2014 to 16.12.2014
04	Mr.M.K.G.K Nammawatta	Board Member since 25.04.2013 to 21.05.2015

### **2.2 Senior Management**

Tilak Dharmaratne - Director General of the Institute  
(B.Sc, M.Sc in Gemmology (SL), M.Sc (UK) (01.08.2000 – to date)

### **3. Review by the Chairman outlining the Opportunities and Constraints faced in the year under review.**

#### **3.1 Opportunities**

- **Increase in the demand for Research and Training.**

The demand for the services of the institution is being increased. The cause for this increment is the high demand for the skilled labour of this field. Another reason to increase this demand is the steps which have been taken to upgrade the quality of the service provided by the Institute of Gem & Jewellery. There is no any other institution which provide training services relevant to all the aspects of this field. In the same way there is no any service provider fulfilling the research necessities of rapidly developed North East areas.

- **Unfulfilled needs.**

We can still see the Unfulfilled needs which have been failed to completed by the service providers in this field. These include Gem ore exploration, recognizing primary gem deposits, innovating and processing a technology to extract primary gem deposits and training for designing and computer aided designing.

- **Technological advancements**

There is an opportunity to invent and introduce new machines to excavate of gem deposits and enhance the colour of gems.

- **Growth of the Institute.**

There is a necessity to develop this institute as to Gem and Jewelry University of Asia Pacific region to provide service to the customers from around the world.

- **Other Facilities.**

This is a pioneer institute for providing service for this field by establishing Geuda Heat Treatment Centers in the other localities and facilitating to carry out researches.

- **Joint Programms for industry Development**

There are opportunities to work co-operation with various development projects of other government institutions such as National Gem and Jewellery Authority and lead in to eco friendly methods for gem industry with environmental authorities.

- **Publicity.**

The programs should be launched to enlighten the public on the service provided by the institution. Awareness programms, papers and leaflets, audio visual presentations on gem & jewellery can be used.

#### **3.2. Constraints**

- **Infrastructure facilities**

The machines equipments and modern facilities have not been developed sufficiently in the training centers. The steps should be taken to develop the knowledge and skills necessary for the development of the industry through providing such instruments to these training centers. Outsmart machines should be introduced for gem lapidary, gem cutting unit and jewellery manufacture training center. Furthermore a unit to determine the standard of metals should be established and associated courses should be introduced. As diamond cutting is a special part of this industry a training unit should be introduced and steps should be taken for the betterment of that industry.

- **Physical Resources.**

A lack of necessary vehicles and equipments to carry out the works of the researches and training section of the institute can be seen.

- **Laborer mentality of the workers / poor attitudes**

Since recent past the employees are bearing negative attitudes.

- **Duplication of work by sister organizations**

e.g. Our trainings, Lapidary service etc.

- **Human Resources.**

The necessary requirement as in the recruitment procedure of the institute have been fulfilled to fill carder vacancies according to the Department of Management's circular number 30. It is a known fact that the number of academic staff members in the institute is not sufficient to meet the existing demand for educational programmes in the industry. This matter of staff has born with the backgrounds on unavailability of relevant training programmes locally, lack of academically sound personnel in the field are some highlighted reasons. The end result of the situation is not beneficial for the future of the industry, and will be a cause to reduce the demand for trainings. Therefore, the staff of the institute are required to be given training programmes offered by locally as well as internationally available institutions. Institute has been facing many administrative difficulties since the times its head office had been established in Ratnapura. As such, necessary actions were taken to bring and establish Head office of the institute in Colombo for effectiveness in operations avoiding the existed administrative problems.

- **Financial Resources**

Sufficient fund contribution to carry out the works of the institute in a spreaded level is not granted by the treasury. The financial provisions needed to recruit the essential staff have not been granted by the treasury.

- **Emerging private sector training institutes.**

The interference of private sector for education and training of gem and jewellery industry has been developed.

- **Lack of incentives to certain sections of the industry.**

e.g. Service cutting section

- **Lack of geologist & training experts.**

- **Lack of training opportunities for researchers and trainers for advance training and the staff gap between the Director General, Research Staff, Training staff and other supportive staff**

#### **4. Directors Report**

##### **4.1 Objective**

The Gem and Jewellery Research and Training Institute was established by the gazette notification No 882 of 28 July 1995 in terms of section 25 (1) of the National Gem and Jewellery authority Act No 50 of 1993 enacted for the purpose of the development of Gem and Jewellery industry.

Major objective of the institute is the regulation, improvements and development of the Gem and Jewellery industry by providing the necessary training and research facilities.

## **4.2 Powers of the Institute**

Powers of the institute assigned thereto by the gazette notification No. 882 of 28 July 1995 are as follows.

- (i). To conduct surveys regarding gem minerals and gem deposits in Sri Lanka and to carry out research relating to the followings.
  - i. The location of Gem Deposits
  - ii. Their Identification
  - iii. Methods of enhancing the value of gem stones.
  - iv. Matters related to other fields concerning the institute.
  
- (ii). To provide technical and other advices regarding the digging of gem pits, Lapidary, Manufacture of Jewellery and methods of treatment of gem stones for the developing of the Gem and Jewellery industry including the production of machinery required for the industry.
  
- (iii) To provide training facilities in the following fields.
  - i. Gem Cutting, Polishing and Identification
  - ii. Jewellery Manufacturing
  - iii. Gemmology including Diamond
  - iv. Jewellery Designing
  - v. Colour Enhancement of Gem Stones by Heat Treatment.
  - vi. Other matters relating to the Gem & Jewellery industry.

## **4.3 Activities and Efficiency**

### **4.3.1**

Measures that are crucial for prompting the gem and jewellery training activities in the country were effectively implemented. Accordingly, it was possible to maintain increment in youth attraction to follow gem and jewellery courses introduced by the institute.

#### **4.4 Progress of the Training Division 2014**

Course	No of Students
Gemmology	120
Geuda Heat Treatment	86
Gem Cutting & Polishing	122
Gem Colour Grading & Marketing	195
Jewellery Designing	27
Jewellery Manufacturing	49
Total	599

No	Date	Exhibitions & Workshops	Venue
2014			
1	2014.02.21/ 27	Deyata Kirula Exhibition	University of Wayaba
2	2014.04.01	Workshop organized by Export Development Board	Export Development Board – Galle Center
3	2014.04.27	Trade & Education Exhibition organized Nivithigala Provincial Secretariat Office	Nivithigala Provincial Secretariat Office
4	2014.05.05	Awareness programme conducted to Nivithigala Youth Corp Students	Nivithigala
5	2014.05.23/ 24	'Ruwanpura Tharunodaya' Exhibition	Seevali Ground - Nivithigala
6	2014.05.29	Awareness programme conducted in Embilipitiya Mahaweli Zone	Embilipitiya
7	2014.06.05	International Environment Day Exhibition	Royal College, Colombo 07
8	2014.10.10/11	World Tomorrow Exhibition & Trade Fair	Boys Model School , Malabe
9	2014.10.11	Workshop Conducted in Balasooriya Company Pvt.Ltd	Kandy
10	2014.12.10	Awareness programme conducted to Gampola Youth Corp Students	Gampola



#### 4.5 Human Resource Development

<b>Name</b>	<b>Disignation</b>	<b>Workshop / Course</b>	<b>Institute</b>	<b>Date</b>
Mr.Naleen Jayasinghe	Head(Research)	Practical Aspect of Bid Evaluation	SLIDA	2014.03.13-14
Mr.Wasantha Gamlath	Asst(Director) (Gemmology)			
Miss.Rangi Senevirathna	Information & Doc. Officer	Trainees for Trainers	Skill Development Fund Ltd	2014.05.05-09
Mrs.Inoka Rajapasha	Asst(Director) (AD &HR)	Lab our Law & Industrial Relations in the Private Sector	SLIDA	2014.05.29-30
Mr. Sajith Muhandirum	Asst(Director) Finance	Cash Flow & Cash Management	Skill Development Fund Ltd	2014.06.30
Mr.Danushka Raveendrasinghe	Research Officer	Effective Letter Writing & Written Communication Techniques	National Institute of Business Management	2014.06.03-04
Miss.Samudra Wjewardana				
Miss.Jayamali Mahakuburage				
Mr.Chandima Wewegedera				
Mr.Sisira Kumara	Management Assistant	Leave, Leave Report and Personnel File Management	Skill Development Fund Ltd	2014.09.01-02
Mrs.Dammi Rupasinghe	Management Assistant	Losses Reporting, Losses write-off	Skill Development Fund Ltd	2014.09.11
Mr.Sajith Muhandirum	Asst(Director) Finance	Financial Reporting in compliance with the Sri Lanka Public Sector Accounting Standards	Skill Development Fund Ltd	2014.10.08
Mrs.Dammi Rupasinghe	Management Assistant			2014.11.04

## **Research Project -2014**

### **1) Exploration and Assessment of Gem Deposits in Sri Lanka**

Sri Lanka falls within the five highest gem bearing countries in the world; hence it contains 90% of Gem bearing gravel itself. But, identification of gem deposits and their potentiality is a key issue in the gem industry.

To address this issue, Gem and jewellery Research and Training Institute (GJRTI), introduced this project in order to complete the National Gem Deposit Survey. Main aim of this project is to make gemological maps available covering Sri Lanka and an inventory of gem deposits which will be beneficial for all stakeholders of gem and jewellery industry in the country for sustainable development. A comprehensive proposal was submitted to the cabinet in year 2008 and the necessary approvals and funds have been obtained for the project. Hence, this project was started from Monaragala District, Uva province (figure 01) and currently research activities are being carryout in this area.

At the year of 2014 this project was started in Badalkumbura, Medagama, Bibile, Siyambalanduwa, Monaragala and Madulla DS divisions in Monaragala District. The final Gem Potential map of the Monaragala DS divisions (figure 02) was completed during the year and the Badalkumbura Gem potential map (figure 03) is being completed.

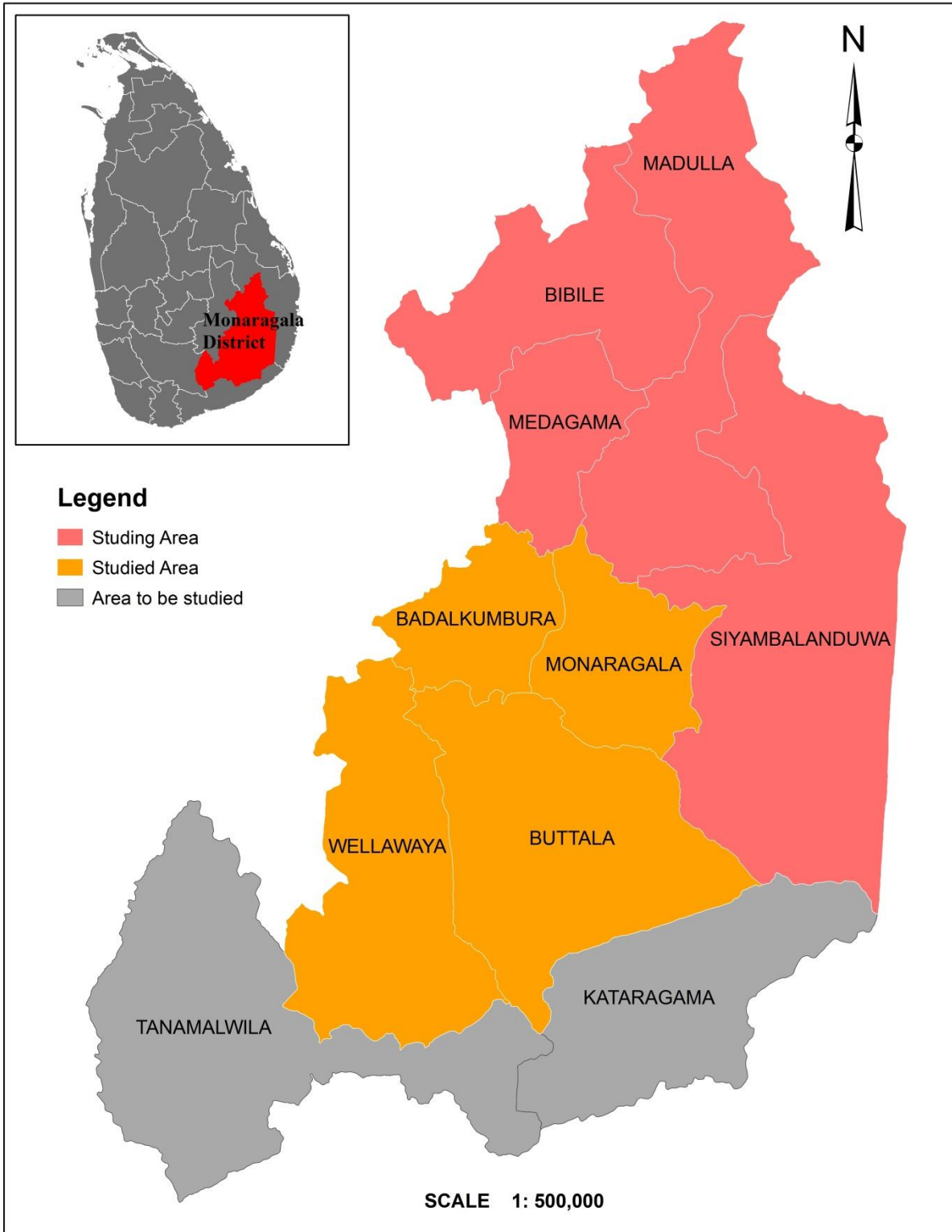


Figure 01: Study Area



Figure 2- a: At the Field in Monaragala

Draft

# SRI LANKA 1:50 000 Gem Potential Map Series MONERAGALA DIVISIONAL SECRETARIAT

MAP NO.7205

### RATIONAL

Sri Lankan gem deposits are mainly found as primary or in-situ deposits and secondary or sedimentary deposits. Sedimentary deposits can be classified into (1) residual, (2) eluvial, and (3) alluvial formations. Presently, in Sri Lanka mostly trapped sedimentary deposits concentrating main gem fields of Sri Lanka such as Rathnapura and Elahera. Formation of these secondary or sedimentary gem deposits are controlled by several factors such as geomorphology, geology, drainage pattern and climatic conditions. Some sources showed that only 10% of gems have been trapped yet. Available literature showed that both precious stone (corundum family and beryl) and semi-precious stones can be exploited from Sri Lankan gem fields.

The in-situ or primary gem deposits can be classified into two classes: 1) metamorphic deposits and 2) magmatic deposits. Metamorphic deposits mainly confined to high grade metamorphic terrain i.e. Highland Complex and formed from skarn reactions between calcic and silicate rocks and granitic pegitic gneisses. Magmatic deposits mainly associated with pegmatites. Thus most of primary gem deposits in Sri Lanka are structurally and lithologically controlled.

From historic periods, Sri Lanka has been well known for its mineral resources. Gems are still the most valuable found in the country. The large number of gem varieties found in Sri Lanka can be categorized as precious, semi-precious and endemic varieties. Precious varieties such as sapphire, ruby, corundum, chrysoberyl and semi-precious varieties such as topaz, beryl, opal, zircon, garnet, tourmaline etc are found mainly in three major gem fields of Sri Lanka restricted to narrow zone of the Highland Complex.

Every year gems bring about 80% of the total mineral-based foreign income of Sri Lanka. Recent scientific investigations have revealed that about 50% of the total landmass of Sri Lanka is gem bearing sources. Except Northern Province of the country, all other provinces have the possible gem occurrences. However, very few areas are still being mined. The main technique of gem exploration as well as mining in Sri Lanka is still use mostly traditional methods. The discovery of new gem bearing locations is largely fortuitous and expansion of the industry is hampered by the lack of understanding of the exact sources of gems and of guidelines for gem exploration. Therefore, updating the gem location inventories and exploring new gem bearing areas using appropriate scientific tools is an important project at present. Exploration and exploitation of these deposits will hasten the economic development of the country for the future, save much needed foreign exchange in the country and also create employments.

Gem and Jewellery research and training Institute is being conducted project for exploration and evaluation of gem minerals deposits which are known and possibly unknown valuable mineral deposits in the country and to investigate and prepare a detailed inventory of the gem occurrences in the country with sufficient data to guide development of investment profiles. Under this project, all divisional secretariat areas are covered and compiled separate gem information system. This map is in connection with Moneragala Divisional Secretariat.

### LOCATION

#### a. Administrative Information

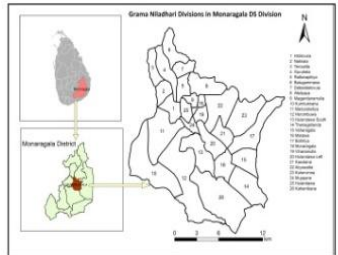
Moneragala Divisional Secretary area falls in Moneragala district of Uva province. Sri Lanka lies in between 0° 45' 45" North and 81° 15' 41" 20" East coordinates. The area is bounded by Baddegama Divisional Secretary area to the West, Baddegama Divisional Secretary area to the East, Madulla and Metagama Divisional Secretary areas to the North and Butala Divisional Secretary area to the South. Moneragala Divisional Secretary comprises 29 Grama Niladhari Divisions.

#### b. Area

Total land area of the division spreads around 268.4 km<sup>2</sup>. General elevation of the Division varies from 400 ft to 3000 ft and the highest elevation is 3040 ft at Aelion Mountain. Five streams continues except Aelion Mountain chain, and mountain chains at southern and eastern boundaries of the division (elevation above 1000 ft).

#### c. Accessibility

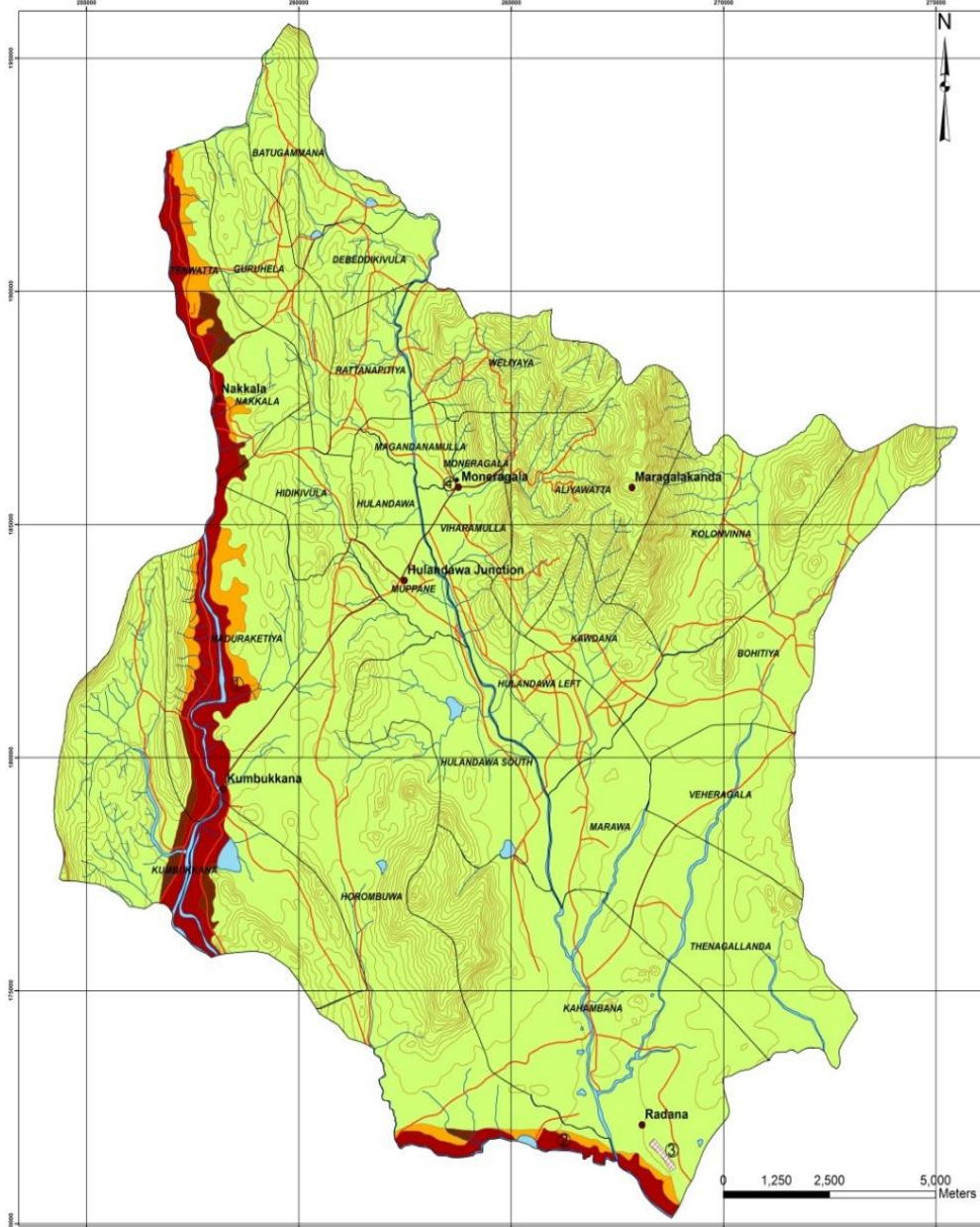
Moneragala Divisional secretariat can be accessed through Wellawaya by A4 main road from Colombo (located approximately 242 km away from Colombo). A4 and A22 main roads intercept each other in Moneragala DS division at Hulandawa Junction. A4 main road crosses the division and runs towards Ampara and Batticaloa to the eastern coast. Several minor roads and Jeep tracks are available for access the villages in the division and however, minor roads have been developed at good conditions recently.



### GEOLOGY

Moneragala divisional secretariat area is underlain by metamorphic rocks belongs to Vijayan lithological complex in which hardly bare gem minerals. Rock suits in this area strikes mainly into North-South direction. Hornblende biotite gneisses and migmatites are the dominating rock types in the region and Moneragala range has formed by augen gneiss. Granite gneisses, quartzite and allanite feldspar granite gneisses are the other rock varieties underlain in the area. Minor occurrences of calc-gneisses could also be seen in the area. Major fracture or a joint system trends into Southwest-Northeast direction and spreads toward the southern part from the centre of the area. (Source: Moneragala - Palana. Geology map published in 2002 by the Geological Survey and Mines Bureau). Provenance of gems may from Highland Complex and source rocks for genesis of the gems could be predominantly khondalite, garnetiferous gneiss and calc gneiss (skarn mineralization).

Study Area with respect to the Geology of Sri Lanka



### Legend

- GN Division
  - Road
  - Terrain
  - Stream
  - Tank
- Gem Potentiality**
- Primary- High Potential
  - Secondary- High Potential
  - Secondary- Moderate Potential
  - Secondary- Low Potential
  - Eluvial- High Potential
  - Least Potential

### GEM FIELDS

- 1 Kumbukkana Oya Gem Field
- 2 Kumbukhampa Gem Field
- 3 Radana Primary Gem Field
- 4 Moneragala Eluvial Gem Field

### Potential Classes

- A. High potential areas: Gem occurrences are recorded in this class and very often mining activities are being carried out. Mostly precious gems are found. There is adequate evidence for occurrence of gems which are economically viable gem deposits. But detailed on site studies should be carried out on local environmental and social impact and design the mine plan before start any mining activities for sustainable mining project.
- B. Moderate potential areas: The evidence based on geological and geomorphological setting it gives evidence for occurrence of gems in the area. Also according to sample analysis it shows some potential for gem occurrences. But it is hardly found on going gem mines in these areas. Thus some more detailed explorations are needed to located high gem potential sites on these areas.
- D. Low potential areas: Geological and geomorphological evidence give some evidence for occurrences of gems in these areas. But there are no any ongoing mining activities and sample analysis also not give firm evidence for occurrence of gems in these areas. There is a possibility of occasional gem occurrences in these areas. Thus much detailed geological and geophysical studies are needed to locate them.
- E. Least potential areas: Geological and geomorphological evidence are not shown for gem occurrences in these areas. However, there are some occasional small gem occurrences but may be semi-precious stone.

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- [2] Mendis, D.P.J., Rupasinghe, M.S., Dissanayake, C.B. 1993. Application of Structural geology in exploration for residual gem deposits of Sri Lanka. Bull. Geol. Soc. Finland 65, Part 1, 31-40.
- [3] Silva, K.K.M.W., Srinwardena, C.H.E.R. 1989. Geology and the origin of the corundum bearing skarn at Bakamuna, Sri Lanka. Mineral. Deposita 23, 196-19.
- [4] Vithanage, M., Rupasinghe, M. 2004. Mechanical mining vs. traditional mining in Sri Lanka. A note on gem mining in Kumbukkana-Olkariyapaya gem field. Canadian Gemologist, 25(3): 96-103.

Date for all levels is the Mean Sea Level  
Elevations are in metres  
Transverse Mercator Projection  
Origin of the projection is 200,000metres South  
And 200,000 metres West of Pihulapalaya  
(7°00'11.707N, 80°48'18.140'E)

Contribution:  
Project Director: T.S. Dhanarathne  
Consultant: H.M.R. Premaratne  
Head (Research Div.): Geologist: R.M.N.P.K. Jayasinghe  
Research Officer: W.G.C.N. Weeragoda



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2014



Figure 03: At the Field Badalubura

## **(02).Eco Friendly Gem mining Techniques for Sustainable Development**

Gem mining and associated activities inevitably give rise to substantial environmental and social impacts. The responsibility of our institute is to minimize these environmental and social impacts and introduce new Eco friendly gem mining Techniques.

According to the “Mahinda Chinthana vision” this project was started in 2013.

In the year 2014 this project was conducted in the Divisional Secretariats in the Badulla district, and the field visits were completed (Figure 04) while preparing the final report and the final map (Figure 05) including the new recommendations according to minimize the identified environmental and social impacts.



Figure 04: Identified hazardous locations.

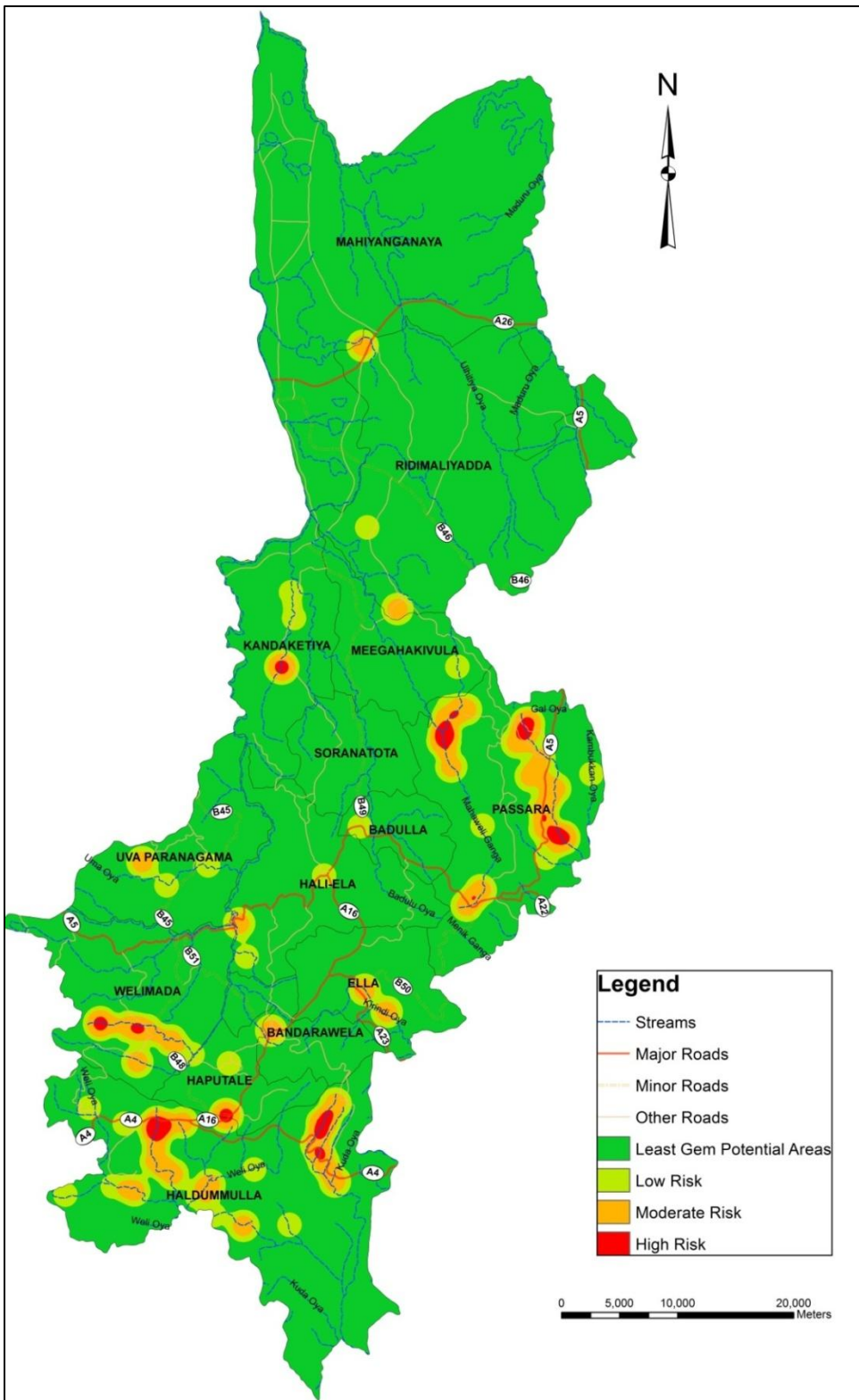


Figure 05: Map indicating the hazardous mining areas

### 03) Publications

Five Research publications relevant to the above mentioned projects were published in the National and International journals.

1. R.M.N.P.K. Jayasinghe, S.V.T.D. Raveendrasinghe, G.G.M.S. Wickramasinghe, T.S. Dharmaratne, 'Evaluation of Favourable Factors for the Formation of Gem Deposits: A Study in Ambanganaga Area in Naula, Sri Lanka', Proceedings of the International Forestry and Environment Symposium 2014 of the Department of Forestry and Environmental Science, University of Sri Jayawardanapura, Sri Lanka, 2014, pp 96.
2. M.K.C. Jayamali, S. Wijewardane, R.M.N.P.K. Jayasinghe, T.S. Dharmaratne, G.H.S.R. Siripala, 'Scientific Eco-Friendly Gem Mining Techniques for Sustainable Development – A Study From Badulla District', Proceedings of the International Forestry and Environment Symposium 2014 of the Department of Forestry and Environmental Science, University of Sri Jayawardanapura, Sri Lanka, 2014, pp 97.
3. S.V.T.D. Raveendrasinghe, R.M.N.P.K. Jayasinghe, T.S. Dharmaratne and H.M.R. Premasiri, 'Provenance of the Gem Deposits in Badalkumbura Region, Sri Lanka', Proceedings of the International Forestry and Environment Symposium 2014 of the Department of Forestry and Environmental Science, University of Sri Jayawardanapura, Sri Lanka, 2014, pp 98.
4. Wewegedara W.G.C.N., Jayasinghe R.M.N.P.K., Dharmaratne T.S., Premasiri H.M.R., 'Occurrences of Gem Deposits In Kumbukkan Oya Alluvium Deposit in Monaragala', Proceedings of the International Forestry and Environment Symposium 2014 of the Department of Forestry and Environmental Science, University of Sri Jayawardanapura, Sri Lanka, 2014, pp 99.
5. G.G.M.S. Wickramasinghe, S.V.T.D. Raveendrasinghe, R.M.N.P.K. Jayasinghe, T.S. Dharmaratne, 'Geomorphological and Spatial Analysis on Depositional Environment of Gold Bearing Gem Deposits of Kelani River Bed Around Kumarimulla, Pugoda, Sri Lanka', Proceedings of the International Forestry and Environment Symposium 2014 of the Department of Forestry and Environmental Science, University of Sri Jayawardanapura, Sri Lanka, 2014, pp



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## Provenance of the Gem Deposits in Badalkumbura Region, Sri Lanka

Raveendrasinghe S.V.T.D.<sup>1\*</sup>, Jayasinghe R.M.N.P.K.<sup>1</sup>, Dharmaratne T.S.<sup>1</sup>, Premasiri H.M.R.<sup>2</sup><sup>1</sup>*Gem and Jewellery Research and Training Institute, Malambe, Sri Lanka*<sup>2</sup>*Department of Earth Resources Engineering, Faculty of Engineering, University of Moratuwa, Moratuwa, Sri Lanka*

\*07tdanushka@gmail.com

**Abstract**

Badalkumbura divisional secretariat which belongs to the Monaragala district of Uva province is the well known for gem occurrences situated on the South-Eastern slope of central uplands. Kumbukkan Oya and Menik Ganga are the main surface streams which are annually recharged with mostly North-Eastern monsoonal rain flows across this region. Also, both stream courses were supported by widely distributed perennial and seasonal drainage network. According to the Monaragala - Panama 1:100000 geology map published by Geological survey and mines bureau, Sri Lanka, this area belongs to the Highland Complex close to the boundary of Highland and Vijayan complexes. With the aid of preliminary field explorations, both primary and secondary gem occurrences were identified as gem fields. Furthermore, extent and distribution of the identified gem fields were analysed using GIS and Remote Sensing, and detailed maps were prepared. Based on this map, exploratory auger sampling was carried out in selected sites representing particular gem field. Then, the gem bearing gravel layer of each site was carefully selected from the sampled geological successions and sieve analysis was carried out. Then graphical representation of particle size distributions of each sample was compared with available references.

According to the field observations, garnet sillimanite graphite gneiss and impure marble are the source rocks which were formed under silica under-saturate conditions at the Precambrian times to occur both primary and the secondary gem deposits. Due to high weathering susceptible mineralogical composition of both parent rocks give rise to form residual primary gem deposits until they expose for denudation. On the other hand, denudation on such primary residuals ends up with the formation of secondary gem deposits following the local drainage network. Also, geomorphology along these drainage networks is the governing factor to form a gem deposit at a specific localized point or a region. Ridge and valley uneven topography of Northern and the North-Western region of the study area comprise mostly weathered residual type gem deposits with the combination of secondary colluvial type gem deposits. Due to violence nature of young stage river courses grab debris with gems from those deposits and secondary alluvial type gem deposits were form when they meet the planer morphology. Continuation of this process during the long period of time form extended secondary gem deposits. Well graded particle size distribution curves also prove that provenances of primary gem deposits and the secondary colluvial type gem deposits. Well sorted particle size distributions are characterized by the identification of secondary alluvial type gem deposits in this region.

**Keywords:** Gem, Provenance, Highland Complex

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**Gem Occurrences in Kumbukkan Oya Alluvium Deposit in Monaragala District**

**Wewegedara W.G.C.N.<sup>1\*</sup>, Jayasinghe R.M.N.P.K.<sup>1</sup>, Dharmaratne T.S.<sup>1</sup>, Premasiri H.M.R.<sup>2</sup>**

<sup>1</sup> Gem and Jewellery Research and Training Institute, Malambe, Sri Lanka

<sup>2</sup> Department of Earth Resources Engineering, Faculty of Engineering, University of Moratuwa, Moratuwa, Sri Lanka

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**Abstract**

Estimation shows nearly one fourth of the total land area of Sri Lanka is potentially gem bearing. Gem mining has been mostly confined to terrains predominantly underlain by highland complex high grade metasedimentary rock suites. However, secondary gem deposits are found in many parts of the island. Alluvium of Kumbukkan Oya is one of the major favourable areas for secondary gem occurrences in Moneragala district, Sri Lanka.

Mining history was studied and stream sediments were collected during primary field visits in the study area. Sieve analysis was performed and mineral identification were carried out under the polarising microscope. Kumbukkan Oya stream originates from Lunugala area and flows along well developed valleys and foremost tributaries intercept it at Badalkumbura area. Its' pertinent catchment area belongs to Highland Complex. Topographic altitude changes at lower rates towards Monaragala area making the river up to matured phase and allowing heavier clastic sediments to be deposited more easily with alluviums. Thus the alluvium deposits composed of gem gravels due to their favourable depositional environment. Gem mining is being carried out along either river banks in Badalkumbura, Nakkala, Kumbukkana and Okkampitiya areas.

Two tributaries with the same name 'Kuda Oya' that originate from Badalkumbura area, bare less transported gem stones within poorly sorted sediments with preserved crystal shapes which may be derived at the vicinity. Sub angular to rounded stones are observed with moderately sorted sediments, dominantly towards Monaragala division that may have transported from distances. Only alluvial forms of gem deposits are found in the areas underlain by Vijayan rock suites, which are metamorphosed under the amphibolite facies condition.

According to the field observations and the Monaragala-Panama 1:100000 geology map published by Geological Survey and Mines Bureau the source rocks for genesis of the gems may be predominantly khondalite, garnetiferous gneiss and calc gneiss (skarn). Mining in paleo river bed could be observed that consists of sandy clay, clayey silt and soil above the gem bearing sediment bed. Depth to the gem bearing gravel beds varies from 2 to 7 meters which are much shallower than the common Ratnapura gem beds. Therefore the deposition may be a younger event or the upper profiles have been washed by the runoff. Yellow sapphire, blue sapphire, geuda, tourmaline, spinel and garnet gem varieties are most commonly identified in the Kumbukkan Oya gem field.

**Keywords:** Alluvial, Flood plain, Paleo river bed

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**Scientific Eco-Friendly Gem Mining Techniques for Sustainable Development – A Study from Badulla District**

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**Abstract**

Gem mining in Sri Lanka has been laid into the practice using traditional techniques since its commencement around twenty centuries earlier. Substantial environmental and social impacts caused due to gem mining and associated activities, which has been arisen along with the increment of the population density with respect to the land area. Management of these impacts in a responsible manner is a huge challenge to the industry. Badulla district as one of the major gem mining districts was the selected for the study. This study is a scientific approach to assess the current gem mining methods with their environmental impacts with the view of introduces eco-friendly gem mining methods. Approximately 98% of Gem potential areas are belonging to Highland Complex of Sri Lankan metamorphic units and rest of them lie on boundary between Highland and Vijayan Complexes. The area exhibits an undulate morphology with an irregular network of streams which are controlled by the underling geology and structures. Gems are being mined mainly from alluvial deposits in river-cut valleys and in-situ deposits. They have been found mostly on steep sloppy areas which directly cause for landslides as well as cutting failures.

There is no scientific systematic method for gem exploration has been used and traditional methods based on penetrating ground with a pointed steel rod (*illamkoora*), historical mining records, practical experiences, hypothesis, and oblations as well have been applied. About 50% of Illicit gem mining closer to small stream beds and natural forests such as Dummala Ara, Namunukula areas have high impact on environmental strata. Favorable areas for gem deposits can be scientifically investigated by using classification of remote sensing data, depth as well as extent of the gem gravel bed in particular areas can be demarcated using geo technical (Core drilling) and geo physical (GPR survey, Resistivity survey) survey. This will minimize the environmental impacts due to unsystematic mining. Further, illicit mining and malpractices should be discouraged and be introduced measures to mitigate their impacts through awareness programs. Establishment of silt traps and pollution control dams may minimize soil erosion, land degradation and excessive sedimentation in water bodies. River dredging should be extremely limited to prevent river course alteration, to minimize bank erosion and to control floods. Releasing mine drainage to water bodies is permissible only after a systematic purification. A buffer zone may be demarcated around archaeological and cultural sites. Further, proper systematic backfilling and compaction of the mined areas, construction of retaining walls, soil nailing on unstable slopes are introducible in rehabilitation of mined land. Mining at the toes of old landslides should be avoided. Eventually, the industry could be redirected by publishing the gem potential maps resultant from the identified scientific techniques and introducing community the environmental friendly gem mining techniques facilitating sustainable development, according to national development guidelines.

**Keywords:** Gem mining, Eco friendly, Environmental Impacts

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**Geomorphological and Spatial Analysis on Depositional Environment of Gold Bearing Gem Deposits of Kelani River Bed around Kumarimulla, Pugoda, Sri Lanka**

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**Abstract**

Kelani river bed in Pugoda area has been dredged for sand as a construction material for many decades mainly during dry seasons. Recently, a rush has been created among villagers of this area, when they found gold and gems in considerable amounts in the very bottom of the river bed believing it as a sudden fortunate gift from a God. It aroused the scientific curiosity and therefore this study was conducted for the determination of scientific background of the depositional environment for this valuable gem deposit mainly focusing geomorphology and other spatial factors.

Geology, geomorphology, structural geology and fluvial system of the area, and the mineralogy of the gold and gem bearing layer were scientifically examined and integrated using GIS to identify the possible factors for the formation of the deposit. According to the microscopic mineralogical analysis of the gold and gem bearing layer, gold flakes and gem minerals such as corundum, tourmaline, spinel, garnet and zircon were observed in all sieve fractions of 2mm, 1mm, 500 $\mu$ m, 250 $\mu$ m and 125 $\mu$ m in varying percentages. Further, sedimentological analysis revealed that, the sediments are poorly sorted and have been transported a long distance for a long period, as indicated by their substantial roundness. According to fluvial morphometric interpretations based on topographical and satellite imagery data the bed-load and suspended materials which have been accumulated from hilly areas due to erosion, has tended to get deposited in this favourable lower-lying area. Moreover, it was observed at the particular location that, the river has bent and a ridge of the bed rock lies from left river bank up to the middle of the river flow path right after the bend. They have made this location a great calm depositional environment for the sediments. This tends this location for the deposition of gold and gem bearing sediments considerably. Therefore, it is concluded that geomorphology and other spatial factors have significantly contributed for the formation of this alluvial gold and gem bearing deposit.

**Keywords:** Alluvial deposit, Geomorphology, Fluvial system, Gem

**Financial Information for last 05 years**

	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>Operating Revenue</b>					
Treasury Grants	25,885	27,420	29629	32,113	43,357
Other Contributions	8,322	12,500	13853	13,020	13,862
Course Fees	2,397	3,256	5228	3949	6,941
Income From Services	24	25	30	15	
Income From Geological Services	-	-	-	-	
<b>Total Operating Revenue</b>	<b>36,628</b>	<b>43,201</b>	<b>48,740</b>	<b>49,097</b>	<b>64,161</b>
Other Revenue		44	223	38	303
Interest	159	166	309	406	309
Other Income	164	205	140	54	
<b>Total Revenue</b>	<b>36,952</b>	<b>43,616</b>	<b>49,412</b>	<b>49,595</b>	<b>64,773</b>
<b>Less: Expenses</b>					
(a)Personnel and Administration	28,629	30,328	35,403	37,260	44,558
(b)Depreciation and General	9,102	12,905	14,217	13,452	17,572
<b>Total Expenses</b>	<b>37,732</b>	<b>43,233</b>	<b>49,619</b>	<b>50,712</b>	<b>62,130</b>
<b>Surplus/(Deficit)</b>					
	<b>(779)</b>	<b>383</b>	<b>(207)</b>	<b>(1117)</b>	<b>2,643</b>

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**STATEMENT OF FINANCIAL PERFORMANCE FOR THE YEAR ENDED 31ST DECEMBER – 2014**

	2014(Rs.'000)		2013 (Rs.'000)	
<b>Operating Income</b>				
Recurrent Grants - Treasury		43,357.0		32113.2
<b>Other Income</b>				
Income from Training Courses		6941.2		3,948.8
Geuda Heat Treatment Service Charges				15
Geological Research services				
Interest Income		309.3		406.9
Sundry Income		303.6		53.7
<b>Total Income</b>		<b>50,911.1</b>		<b>36,537.5</b>
<b>Less: Operating Expenses</b>				
Personnel Emoluments		23,092.9		20998.8
Traveling		279		403.3
Supplies and Consumable Items		1,753.3		1,291.6
Maintenance Expenses		2,676.2		1,978.6
Contractual Services		14,588.1		11603.3
Training Programme Expenses		1,321.1		782.7
Other Operating Expenses		759.7		182.2
<b>Total Operating Expenses</b>		<b>44,470.3</b>		<b>37240.6</b>
<b>Surplus / (Deficit) From Operating Activities</b>		<b>6,440.8</b>		<b>(703.1)</b>
Less: Finance Cost		(88.2)		(19.5)
<b>Grants- Capital Expenditure Portion</b>	7,382.5		6,567.8	
<b>Other Receipts</b>	7,382.5		6,567.8	
Less: Depreciation and Amortization Expenses	(11,092.2)	(3,709.7)	(7000.7)	(432.9)
<b>Other Capital Investment Grants</b>	6480.4		6452.1	
Less: Capital Investment Expenditure	(5357.4)		(5299.8)	
Improvements of Capital Assets	(1123.0)		(1152.3)	
NET Expenditure on Other Capital Investment				
<b>Total Non-Operating Revenue</b>		(3797.8)		(452.4)
Add: Gain on Sales of Assets				38.3
<b>Net Surplus (Deficit) Before Extra-Ordinary Items</b>				
		2642.9		(1117.2)
Extra Ordinary Items				
<b>Net Surplus / (deficit) for the period</b>		<b>2642.9</b>		<b>(1117.2)</b>
<b>Add:</b>				
Net Surplus / (Deficit) from previous years	(63955.78)		(62,840.0)	
Less: Prior year Adj.		(151.1)		1.4
<b>Net Surplus / (Deficit) C/F</b>		<b>(61,464.0)</b>		<b>(63,955.8)</b>



**GEM AND JEWELLERY RESEARCH  
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STATEMENT OF FINANCIAL POSITION AS AT 31**

Description	2014	2014	2013	2013
	(Rs.'000)	(Rs.'000)	(Rs.'000)	(Rs.'000)
<b>ASSETS</b>				
<b>Non Current Assets</b>				
<u>Property, Plant &amp; Equipment</u>				
Contribution (LT)	69,830		27,696	
Gratuity Fund	1863	71,693	1770	29,465
<b>Differed Expenditure</b>				
Partitioning & Modification				
<b>Current Assets</b>				
Stock & Consumables	833		1256	
	(648)		(648)	
Less: Provision for Write Off				
	186		608	
Books for Sale	62		67	
Investment (ST)				
Loan and Advances	977		707	
Deposits (Gratuity)	3,610		3355	
Deposits	2,700		675	
	616		40	
Trade & Other receivables				
Prepayments	114		110	
Bank & Cash Equivalents	16,295	24,559	14708	20,272
<b>Total Assets</b>		<b>96,253</b>		<b>49,737</b>
	240		257	
Payable				
Accrued Expenses	2,364		3,327	
Differed Income -OPS Income (b)				
Creditors	119		119	
PAYE Tax	1		14	
Accrued Traveling Expenses	231	2,955	0.67	3,718
<b>Non- Current Liabilities</b>				
Control Account - NGJA	3,179		3,179	
Grants-Other Institutions	232		232	
Provisions for Gratuity	9,908		9,385	
Staff Security Deposit	10	13,329	10	12806
		16,285		16,523
<b>Net Assets/Equity</b>		<b>79,968</b>		<b>33,214</b>
Contributed Capital		50,000		50,000
Reserves		4500		3000
Other Contribution		850		850
Staff Circulating Fund (Loan)		834		819
Differed Income –Capital Grants (a)		85,247		42,500
Accumulated Fund		(61,464)		(63,956)
<b>Total Net Assets/Equity</b>		<b>79,968</b>		<b>33,214</b>



**GEM AND JEWELLERY RESEARCH AND TRAINING INSTITUTE  
STATEMENT OF CASH FLOW FOR THE YEAR ENDED 31ST DECEMBER –  
2014**

	2014	2013
<b>Cash Flows From Operating Activities</b>		
Surplus/(Deficit) from Operating Activities	2,642.7	(1,155.5)
<b>Non Cash Movements</b>		
Depreciation	11,092.5	7,007.7
Write-off Capital Expenses	6,480.3	(6,452.1)
Differed Capital Provision	(13,862.4)	(13,020.2)
Prior Year Adjustment	(151.1)	-
Increase/Decrease Payables	(993.0)	(604)
Increase in other Non current Liabilities	232.0	(208.2)
Increase in Employee cost	524.0	411.5
Increase in Other Current Assets	(2,703.0)	808
<b>Net Cash Flow from Operating Activities</b>	<b>3,262.0</b>	<b>(315.7)</b>
<b>Cash Flow from Investment Activities</b>		
Purchase of Property Plant and Equipment	(30,127.7)	(11,195.5)
Increase of Gratuity Fund	(93.0)	(470)
Sales of Investment	(6480.3)	(6452.1)
Increase of contribution to reserves	15.0	22
Proceeds from sale of Fixed Assets	(21,599.0)	38.3
<b>Net Cash Flow from Investment Activities</b>	<b>(58,285.0)</b>	<b>(18,057.3)</b>
<b>Cash Flow from Financing Activities</b>		
Capital grant Special Levy to Government	56,610.0	29,550.0
<b>Net Cash Flow from Financing Activities</b>	<b>56,610.0</b>	<b>29,550.0</b>
Net Increase /(Decrease) in Cash and Cash Equivalents (a)+(b)+(c)	1,587.0	11,177.0
Cash and Cash Equivalents at Beginning of period	14,708.0	3,531.0
<b>Cash and Cash Equivalents at End of Period</b>	<b>16,295.0</b>	<b>14,708.0</b>