ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug803

Gold Deposits in the Kelani River and Seethawaka Oya Riverbeds: Identification and Assessment of Potential Gold Deposits in their Catchment Areas

L.P.S. Rohitha[1]; W.G.S. Kokila[2]; S.K.P. Dikkumburage[3]

[1]University of Moratuwa, Katubedda, Moratuwa.
[2;3]Geological Survey and Mines Bureau, No 569, Epitamulla Road, Pitakotte, Sri Lanka.

Publication Date: 2025/08/22

Abstract: The study focuses on the estimation of the incidence, distribution, and potential of gold deposits in Kelani River and Seethawaka Oya, and their likely gold-bearing zones in catchment areas around them. It is significant that because of economic significance and application in sustainable natural resource management, the occurrence of gold in the region is best interpreted for future prospecting. To ensure an integrated appraisal, the study applied a multidisciplinary approach through the combination of geological, geochemical, and remote sensing techniques. Field activities were thorough with sampling and laboratory analysis of river sediments and soil to determine gold content and associated elements. Laboratory testing facilitated quantification of concentrations as well as determination of geochemical signatures for mineralization. Application of GIS and remote sensing methods played an important role in mapping the areas of mineralization, bringing aboard the big picture regarding probable gold deposits. The findings supported the presence of gold deposits in the riverbeds, which was in agreement with previous history of gold discoveries in the area. The research also reported a number of potential zones in the catchment areas to be further explored. The findings are of great significance to the understanding of regional mineral wealth and provide important information for future mining prospects and utilization of resources. Besides, the research advocates for careful exploration and management of resources to provide that any expected economic benefits match environmental conservation and sustainable development targets. The conclusions of the study provide a solid foundation for the future gold exploration projects, in order to guide policymakers, geologists, and investors in taking effective decisions.

Keywords: *Gold Deposits, Kelani River, Seethawaka Oya, Catchment Areas, Mineral Exploration, Geochemical Analysis, Remote Sensing.*

How to Cite: L.P.S. Rohitha; W.G.S. Kokila; S.K.P. Dikkumburage (2025) Gold Deposits in the Kelani River and Seethawaka Oya Riverbeds: Identification and Assessment of Potential Gold Deposits in their Catchment Areas.
International Journal of Innovative Science and Research Technology, 10(8), 877-883.
https://doi.org/10.38124/ijisrt/25aug803

I. INTRODUCTION

Gold deposits in riverbeds constitute an important area of study for their economic significance and geological implications. The Kelani River and Seethawaka Oya are major rivers in Sri Lanka that have been historically reported with placer gold deposits. This study aims to systematically identify and assess the potential gold deposits within these riverbeds and their catchment areas through multidisciplinary approaches.

As ever, gold occupies the place of kings; distinguished by its rareness, it could endure the most inhuman treatments, for scribes now and later find it not just in its economic effects. In place of deposits, value, and extraction of the gold deposit lead towards the monuments of civilizations, economies, and societies as a whole identification. Apart from the above, Sri Lanka records occurrences of gold in several other places-the Kelani River and Seethawaka Oya recognized as historically significant places for placer deposits. Originating from the highlands in the centre, these rivers flow through geologically diverse terrains conducive for forming and concentrating gold-bearing sediments.

Determining and evaluating gold deposits in riverbed areas and their catchment areas can further improve development in understanding the mineral potential of the area. The evidence is found among the placer deposits that formed as a result of an eroded primary gold source where deposits were concentrated within river sediments, probably a result of water currents. On economic grounds, the focus of these deposits is in itself study, although it speaks to the geological history and processes of mineralization that may take place in that area.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug803

To investigate systematically the distribution, geochemical characteristics, and possible areas for gold deposits from the Kelani River and Seethawaka Oya riverbeds, as well as to discover possible gold-bearing areas within their catchment areas. Integrating geochemical analysis, remote sensing, and GIS techniques, this study would carry gold resources into the fold of sustainable exploration and management in Sri Lanka.

II. LITERATURE REVIEW

➢ *History*

Sri Lanka's tale of gold mining is not one of great gold rushes but it is still a fascinating read. Beverage or food places you are already familiar with used to have gold. Sri Lankans are not into gold. But it says a great deal about the island's history and economy. From ancient times through right now, it's been a tale of little labors, some prospecting, and the notion that more gold might yet be out there.

The association of gold to Sri Lanka is quite ancient. Gold appears to refer to something valuable in old texts, so it was important to people at the time. But they weren't excavating a lot of it. Instead, people likely discovered gold in rivers and streams, panning for it themselves. Rivers such as the Kalu Ganga (Black River) were known to produce pieces of gold. Gold would be extracted from the sand and rocks in rudimentary ways.

Sri Lanka used to spend more time trading and farming, so gold wasn't a thing back then. Gems, spices and what they grew on the island made money. Foreign traders just craved those things. Gold was good to have then, but it wasn't the important thing.

The situation changed with the arrival of Europeans in the 1500s, but gold-mining remained low on the list of priorities. The Portuguese (1505–1658) and the Dutch (1658–1796) were more interested in keeping trade routes under their heels and stealing cinnamon, gems and elephants. Not a lot to indicate they were searching for treasure.

Later, when the British took control (1796–1948), they paid closer attention to Sri Lanka's minerals. They performed survey work and identified some places where they thought they might find gold. But they didn't believe there was enough to warrant going after large mines. So, they focused their efforts on tea, rubber, and coconut plantations, which became big money-makers.

From the 1900s on Sri Lanka continued to focus on other minerals such as gemstones, ilmenite, and graphite, respectively. Gold mining did remained small, and mostly done by individuals themselves.

Somehow there are those wondering in Sri Lanka whether the country has more gold than imagined. But better surveys — and mining tech — lets you get a better look. So there are a few decent areas in the midsection and southwest that bring some optimism. But for now, there's no tremendous gold rush because the gold located is not worth the price of big mining operations.

Gold mining in Sri Lanka today is still small-scale, with people digging in the countryside. They don't have the best tools, and there are environmental and legal issues. The government does seem interested in non-destructive mining, but that's currently more focused on the gems and other minerals that Sri Lanka has abundantly.

As far as mining is concerned, the environment is a big discussion. We have a lot of species in Sri Lanka so we need to be cautious. Mining gone bad can lead to deforestation, ruin the soil, and poison water, harming environments as well as the human lives living in those environments.

Sri Lanka's gold mining story is one of small beginnings and a question mark over what might be. The island never became a gold mecca, but the precious metal, found in its soil and rivers, has always tantalized people. Whether you're talking about long ago when people were digging by hand or these days with explorers, there's something about gold. Now, as Sri Lanka continues to go through its minerals, what lies ahead for gold mining will be navigating money, nature and new tech. For now, gold is a minor but cool chapter of Sri Lanka's history and natural treasures.

➢ *Geological Background*

- *Regional Geology*

The research site is found in the Highlands Complex; here, where highly metamorphic rocks that are rich in quartzite, marble, and garnetiferous gneisses dominate, thus, who are known to other parts of the country. The country of Sri Lanka exhibits a variety of lithological units and that is where the gold mineralization is mainly found. More precisely, the Kelani River and Seethawaka Oya cross the southwestern part, which is the soul of this Highland Complex with metamorphic rock assemblies and some of the most unique structural features. The area's geology is so diverse and it shows many tectonic processes such as folding, faulting, and shearing, which are related to the attraction of mineral deposits in the region.

The primary lithological units, which can be found along the Kelani River and the Seethawaka Oya, consist of the following rock types: quartzite, biotite gneiss, and charnockitic rocks. Typically, amount of Quartzite, a very resistant type of rock, takes place and it serves as the potential hosting rock for gold. Quite often, biotite gneiss, which is both foliated and textured, gets distributed here and there and is also related to some mineral deposits. The presence of such pegmatite veins within the gneissic rocks will certainly make it a good point for the gold to come up as these veins often contain significant sulfide minerals and precious metals.

Besides, the area's structural geology, such as fault zones and shear zones, is also a perfect path for hydrothermal fluid movement and gold deposition., Thus, the favorable conditions provided by the structural feature have been the

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug803

major cause of the mineralization in the area. High-resolution satellite images and field mapping were used to identify geological features to superimpose on gold prospects.

➢ *Previous Studies*

Gold exploration in Sri Lanka has a long history, dating back to the colonial era with a focus on British rule from the 19th to early 20th centuries. The British carried out first geological studies to determine the mineral wealth of the island. The surveys had defined gold traces in alluvial deposits, especially in river systems including Kalu Ganga and Kelani Ganga. Gold deposits proved to be small and fragmented, making large-scale mining economically possible. Consequently, British derived their experiences more to other minerals like gemstones, graphite, and ilmenite, which were more common and profitable.

After independence, the government's key institution to manage exploration for minerals in Sri Lanka was the Geological survey and mines bureau (GSMB). In addition, the GSMB carried out a series of gold potential studies in relation to both alluvial and hard rock deposits in the country.

Alluvial Gold: The GSMB discovered the alluvial gold deposits that are found in riverbeds, especially in south-western and central Sri Lanka. Such deposits are commonly associated with heavy minerals like ilmenite, rutile, and zircon. The gold traces were found mostly in the Kalu Ganga and Kelani Ganga basins.

Hard Rock Gold: GSMB also investigated the potential for hard rock gold deposits on the Precambrian basement rocks of Sri Lanka. These ancient rocks make up most of the island's geology and have long been known to host gold in quartz veins and sulfide minerals. But the scope and economic feasibility of these deposits are still uncertain.

From the late 20th and early 21st centuries mining companies from countries such as Australia and Canada were carrying out exploratory surveys in Sri Lanka. These companies utilized sophisticated geophysical and geochemical methods to discover prospective gold districts.

Ruhunu Province: In the southern Ruhunu Province you have signs of gold in quartz veins and sulfide deposits. These findings piqued interest in the region's gold potential, but further exploration was needed to evaluate the size and quality of the deposits.

Gold in the Central Highlands: The central highlands, especially those areas with Precambrian rocks, also reported positives in surveys. But just as in previous findings, the deposits were deemed too small or low-grade for large-scale commercial mining.

III. METHODOLOGY

An approach based on a connection of field surveys, laboratory at the same time the remote sensing method, which the resources of the earth studied without having to be in the direct contact were showed that to identify and estimate gold deposits in the study area to some extent the following information is presented by the different steps:

The work here presents findings of a careful assessment of the gold mineralization in the selected sites of the Seethawaka River basin(Fig 1). Field checks were carried out to systematically collect samples from the sites, and they were taken to the lab for analysis to confirm the existence of gold and quantify its value. The outcome is an assurance of a bright future for the mineralization of gold in the region.

Fig 1 Study Area Map

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug803

➢ *Laboratory Analysis*

The samples obtained were subjected to analysis at GSMB laboratory. Gold was quantified using Acid Digestion followed by Atomic Absorption Spectrophotometry (AAS), which enabled the accurate and reliable determination of gold concentrations.

Picture 1 – Sample Collection Arrangement

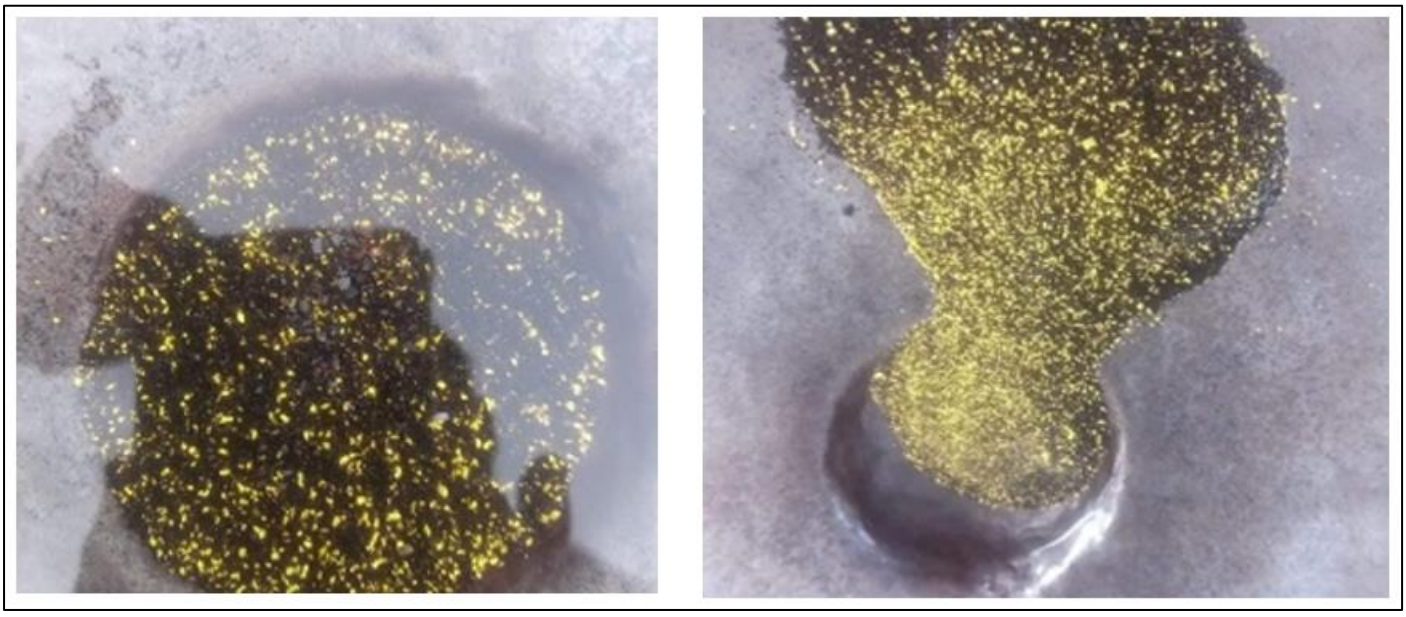
➢ *Sample Collection*

Sediment samples were collected in a purposeful manner at predetermined locations that were distributed over the length of the Kelani River and Seethawaka Oya riverbeds. According to the geomorphological features like meander bends, confluence points, and zones of reduced velocity.

Two key water bodies of the study region, Kelani River and Seethawaka Oya, both major tributaries, were studied systematically for the collection of samples. Specifically, two sampling locations were designated on the Kelani River as Sample Point 1 (SP1) and Sample Point 2 (SP2). These points were strategically located in order to assess the potential downstream transport and deposition of gold-rich sediments originating from the upper reaches.

The other sample points were placed along the Seethawaka Oya, which is a significant tributary entering the Kelani River. Based on its geological and hydrological features, the Seethawaka Oya was chosen as a very prospective area for gold mineralization. The positions of the sampling points along both rivers were for acquiring a general understanding of the gold distribution spatially within the river system and to evaluate the contribution of each tributary towards the overall mineralization pattern in the Seethawaka River basin.

Which might cause grounds for the concentration of the heaviest minerals, primarily gold, sampling sites were selected. Also, more stream sediment and soil samples were collected from catchment areas to further assess the potential upstream sources of gold. All samples were marked clearly, placed in sealed containers, and transported to the lab for analysis.



Picture 2 – Collected Sample

Gold can be deposited in rivers through various processes. One common method is the erosion of gold-bearing rocks due to weathering and erosion over long periods of time. As the rocks disintegrate, the gold particles are released and carried downstream by the flow of the river. This process, known as placer deposition, results in gold accumulating in certain areas of the riverbed or along the banks.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug803

When searching for gold deposits in rivers, it is important to look for specific features that can indicate the presence of gold. These features include:

- Behind large boulders: Gold particles are often trapped behind large rocks in the river, as they settle out of the flowing water.
- Right after sudden widening sections: When a river suddenly widens, the velocity of the water decreases, causing the gold particles to settle out and accumulate in these areas.
- On bedrock or below false bedrock: Gold can be found on top of bedrock or even underneath layers of false bedrock in the river. False bedrock is formed when sediment accumulates on top of bedrock and hardens, creating a layer that can trap gold particles.
- In natural moss: Gold particles can get trapped within the dense mats of moss that grow along the riverbanks.
- Below waterfalls: Waterfalls create turbulence and agitation in the river, causing heavier gold particles to settle out and accumulate downstream from the waterfall.

It's important to note that gold deposition in rivers is highly variable, and successful gold prospecting requires a good understanding of the local geology and the specific characteristics of the river. Additionally, it is always important to adhere to legal regulations and obtain the necessary permits before engaging in any gold prospecting activities.

➢ *Geochemical Analysis*

The dried, sieved, and analyzed with the help of gold as well as related elements samples were subjected to geochemical analysis to define their gold levels. Atomic Absorption Spectroscopy (AAS) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) were utilized to measure gold and trace elements as well as a few other heavy metals like arsenic, copper, and lead. In particular, the pathfinder elements analysis, in particular, to offer effective interventions that the geologists will use in interpreting the geochemical signatures for potential gold zones. A complete procedure for quality assurance that included the utilization of certified reference materials, and duplicate samples were executed to achieve accurate and reliable analytical results.

➢ *Remote Sensing and GIS*

Remote sensing data such as satellite imagery and digital elevation models (DEMs) are the geological context provided by this intervention to assess the geomorpholayers and the structural lineaments as a diagnostic tool. The systematic insertion of remote sensing proofs in GIS technology has allowed for the determination of the geochemical layer, remote sensing data, and the distribution of geographical map traces per linear foot for their intersections. The application of spatial analysis methods was missing at first when looking for the possible areas of gold deposits in the topography and geology and chemical residues. An interdisciplinary discussion has formed the basis of this innovative approach and correspondingly the zones of low crime hazards are aimed at, leading them to further exploration as well.

➢ *Data Interpretation*

Data were interpreted analytically to delineate the spatial distribution of gold concentrations, geochemical anomalies, and association with geological and geomorphological characteristics. Data were compared to previous studies in order to verify conclusions and identify new areas with potential for prospecting gold.

IV. RESULTS AND DISCUSSION

Table 1 Sampling Locations

Locations	X Coordinate	Y Coordinate	Content mg/kg
sp1	437574	497643	3461
sp2	438270	497399	980
sp3	438475	497125	680
sp4	435641	497262	720
sp5	438856	495610	475
sp6	439580	494868	289
sp7	440195	495532	390
sp8	440264	495259	175
sp9	442042	495532	240
sp10	442287	495366	310
sp11	444564	494535	210
sp12	445023	492112	115
sp13	445092	491633	95

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug803

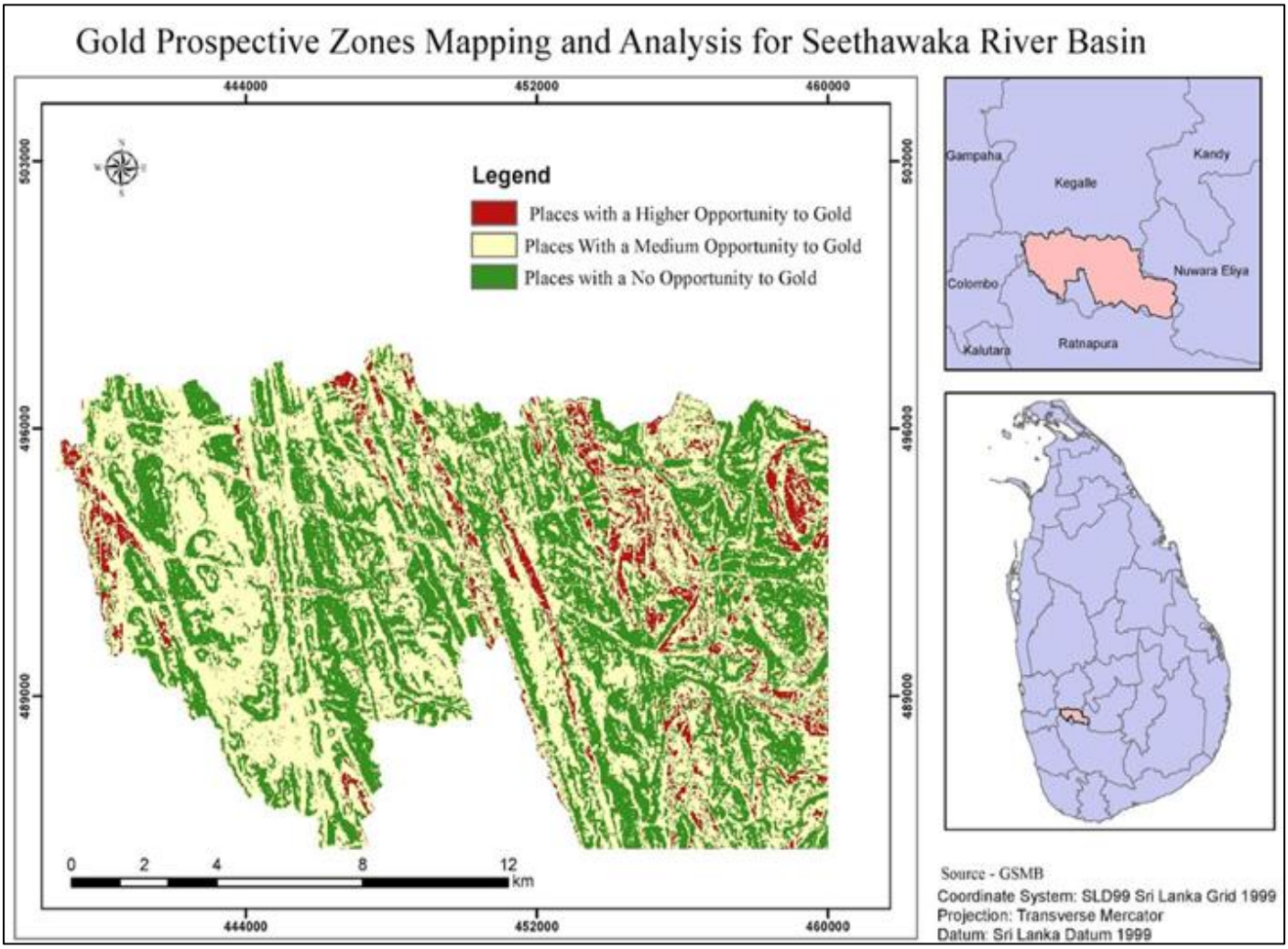


Fig 2 Gold Prospective Zone Map

➢ *Gold Distribution in Riverbeds*

Preliminary results indicate the presence of gold in fine sediments, with higher concentrations observed at specific locations along meander bends and confluence points.(Table 1 and Fig 1)

- *Depositing and Transport with Water*

✓ *Weathering and Erosion:*

Over time, weathering processes break down the rock containing gold into smaller particles. Physical, chemical, and biological weathering contribute to the disintegration of the rock, releasing gold particles from their host material.

✓ *Transportation:*

Once released from the source rocks, gold particles are transported by natural agents such as water, wind, and ice. Water is the primary agent responsible for transporting gold in most cases. Gold particles are carried by rivers, streams, and glaciers, and they are subject to erosion, abrasion, and sorting during transportation.

✓ *Sorting and Deposition:*

As gold particles are transported by water, they undergo sorting based on their size, weight, and density. Heavier gold particles tend to settle faster in areas with slower-moving water, such as riverbeds, stream banks, or the bottoms of lakes and oceans. These areas are often called placer deposits. Over time, the accumulation of gold particles leads to the formation of gold-rich deposits.

➢ *Geochemical Signatures*

Gold concentrations range from trace amounts to economically significant levels. The presence of pathfinder elements such as arsenic and copper suggests potential primary gold sources upstream.

➢ *Catchment Area Assessment*

GIS-based analysis identified several prospective zones within the catchment areas, particularly in regions with favorable geological formations and structural lineaments.

The study confirmed that, in most cases, the source of gold deposits is attributed to the Seethawaka Oya. Gold did not come up in the samples taken at the upper points of the Kelani River, particularly at the point of confluence where the Seethawaka Oya and the Kelani River join and beyond. Gold deposits, therefore, are predominantly found at the Seethawaka Oya and catchment area. The observations are that the mineralization is localized in the Seethawaka Oya and draining watershed but not transported downstream from elsewhere in the Kelani River system.

ISSN No:-2456-2165 https://doi.org/10.38124/ijisrt/25aug803

V. CONCLUSION

The results of this study suggest that some gold deposits have been encountered at the bottom of the Kelani River and Seethawaka Oya riverbeds, whereby marked concentrations have been noted at certain geomorphological sites. The combination of geochemical analysis, remote sensing, and GIS techniques has made it possible to identify several prospective zones in the catchment areas, thus adding evidence for the potential for gold exploration in the future(Fig 2). Some of these results help develop a broader understanding of gold mineralization in Sri Lanka and provide useful scientific input for further explorative and resource management efforts. It is recommended that explorations should be widened in the future to detailed geological mapping, geophysical surveys, and drilling of the deposits in order to quantify their economic potential. Moreover, environmental impact assessments shall accompany exploration activities in furtherance of sustainable resource utilization.

RECOMMENDATIONS

- Detailed geological mapping and trenching in identified prospective zones
- Geophysical surveys to delineate subsurface structures
- Environmental impact assessment prior to any large-scale exploration

ACKNOWLEDGEMENTS

The authors would like to thank the Geological Survey and Mines Bureau of Sri Lanka for providing geological data and field support.

REFERENCES

[1]. Cooray, P.G. (1984). An Introduction to the Geology of Sri Lanka. National Museums of Sri Lanka.
[2]. Pitawala, H.M.T.G.A. et al. (2013). Geochemical Investigation of Alluvial Gold in Sri Lanka. Journal of Geoscience Research.
[3]. Wijayananda, N.P. (1997). Gold Exploration in the Highland Complex of Sri Lanka. Geological Survey and Mines Bureau.
[4]. Economic Geology, Society of Economic Geologists, 2019,
[5]. https://pubs.geoscienceworld.org/books/book/2035/chapter/114143643/Introduction-to-gold-nugget-and-lode-gold-deposits