

**TECHNICAL FEASIBILITY OF HEAVY MINERALS IN
SOUTHWESTERN AND NORTHEASTERN ONSHORE
AND OFFSHORE REGIONS OF SRI LANKA**

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Degree of Master of Philosophy

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Sri Lanka

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Philosophy

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DECLARATION

“I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a Degree or Diploma in any other University or other institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text.

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ABSTRACT

Beach sediments in Sri Lanka consist of industrial grade heavy mineral occurrences. Most of the previous studies have targeted to identify mineral compositions rather than the provenance of these beach sediments. In this study, the offshore and onshore sediments were collected for identifying heavy minerals compositions. In addition, the long-term coastal morphodynamic changes were analyzed in the coastline of Sri Lanka, with the monsoonal changes. These coastal morphodynamic changes were used to identify the coastal sediment accretion and depositional trends, and its relationship to the heavy mineral provenance. Results suggest the concentration of detrital Ilmenite, Zircon, Garnet, Monazite and Rutile in onshore and offshore sediments in varying concentrations. The heavy mineral potential of the northeastern coast was high (average about 45-50% in the Verugal and 70-85% in the Pulmoddai deposits and 3.5-5.0% in the offshore samples from Nilaveli to Kokkilai (in w/w)), compared to the southwestern sediments (average about 10% in onshore and 2% in offshore Gin River mouth). Therefore, no high economic-grade heavy mineral placers have been discovered by offshore investigations. However, it may be possible to occur concentrated heavy minerals in paleo-river channels that were developed due to glacioeustatic sea-level changes. Observed high concentrated heavy minerals in beach and low concentrated offshore sediments suggest the panning system in the surf zone to form enriched placer deposits. The monsoon-derived longshore currents suggest that the sources of heavy minerals in the Pulmoddai and Verugal deposits may have probably influenced by clastic sediment supply in eastern India and Sri Lanka (the Mahaweli River), respectively. Heavy minerals in the western coast can probably derive from Precambrian metamorphic rocks and supplied to coast through river systems in Sri Lanka. The results obtained are well satisfying for the exploitation of the Verugal deposit and the mine plan was described with the considerations of analytical outcomes.

Keywords: Heavy minerals, Verugal deposit, Mine plan, Mineral economics, Sediment dynamics, Sri Lanka

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LIST OF ABBREVIATIONS

AEA	Atomic Energy Authority
EEZ	Exclusive Economic Zone
GPS	Global Positioning System
GSMB	Geological Surveys and Mines Bureau
HMS	Heavy Mineral Sands
IRZ	Ilmenite Rutile Zircon
MSL	Mean Sea Level
NE	North East
SG	Specific Gravity
SW	South West
UNRFNRE	United Nations Revolving Fund for Natural Resources Exploration

UV	Ultraviolet
ZTR	Zircon-Tourmaline-Rutile

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