

GROUNDWATER CONFIGURATION IN THE UPPER CATCHMENT OF MEGHADRIGEDDA RESERVOIR, VISAKHAPATNAM DISTRICT, ANDHRA PRADESH

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Introduction

- Water supply is the basic requirement for sustainable development of the every human community.
- For the last few decades groundwater is being excessively used for all economic activities in India, particularly for agriculture.
- With the advent of remote sensing technology, groundwater resources evaluation and estimation became easy through derived thematic information such as geomorphology, geology, lineament pattern, and land use/land cover, etc.

Study area

- The Meghadrigedda reservoir catchment that occupies 374 km² falls under Visakhapatnam District and a small upper catchment comes under the jurisdiction of Vizianagaram District, Andhra Pradesh.
- The topography of the reservoir catchment is characterized by hills, valleys and plains.
- The Meghadrigedda river has two tributaries namely, Borrammedda and Naravagedda.
- Average annual rainfall of the area is 1200 mm.

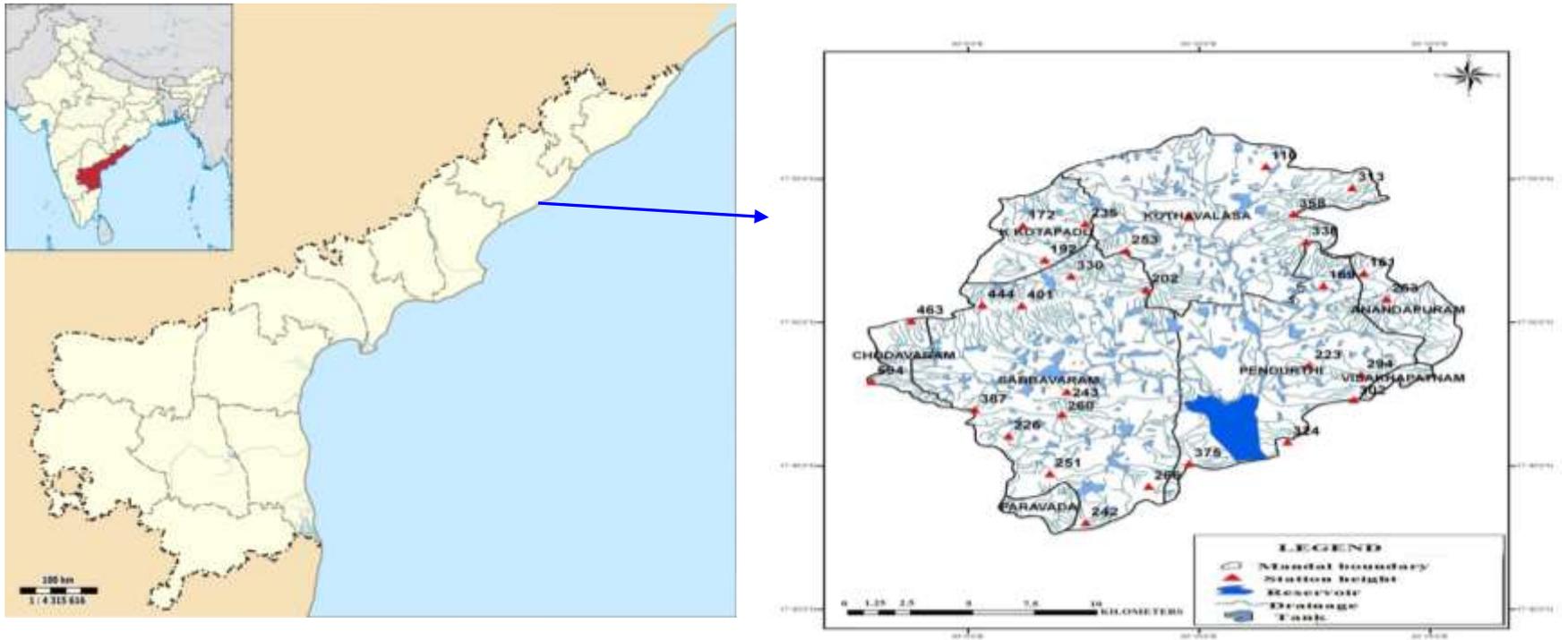


Figure 1: Location map -Drainage pattern, Mandal boundary and station heights in Meghadrigedda reservoir catchment

Stream order	No. of streams	Type of erosion
First order	752	Rill
Second order	352	Rill and gully
Third order	49	Gully
Fourth order	11	Gully
Fifth order	9	Stream
Sixth order	3	River course

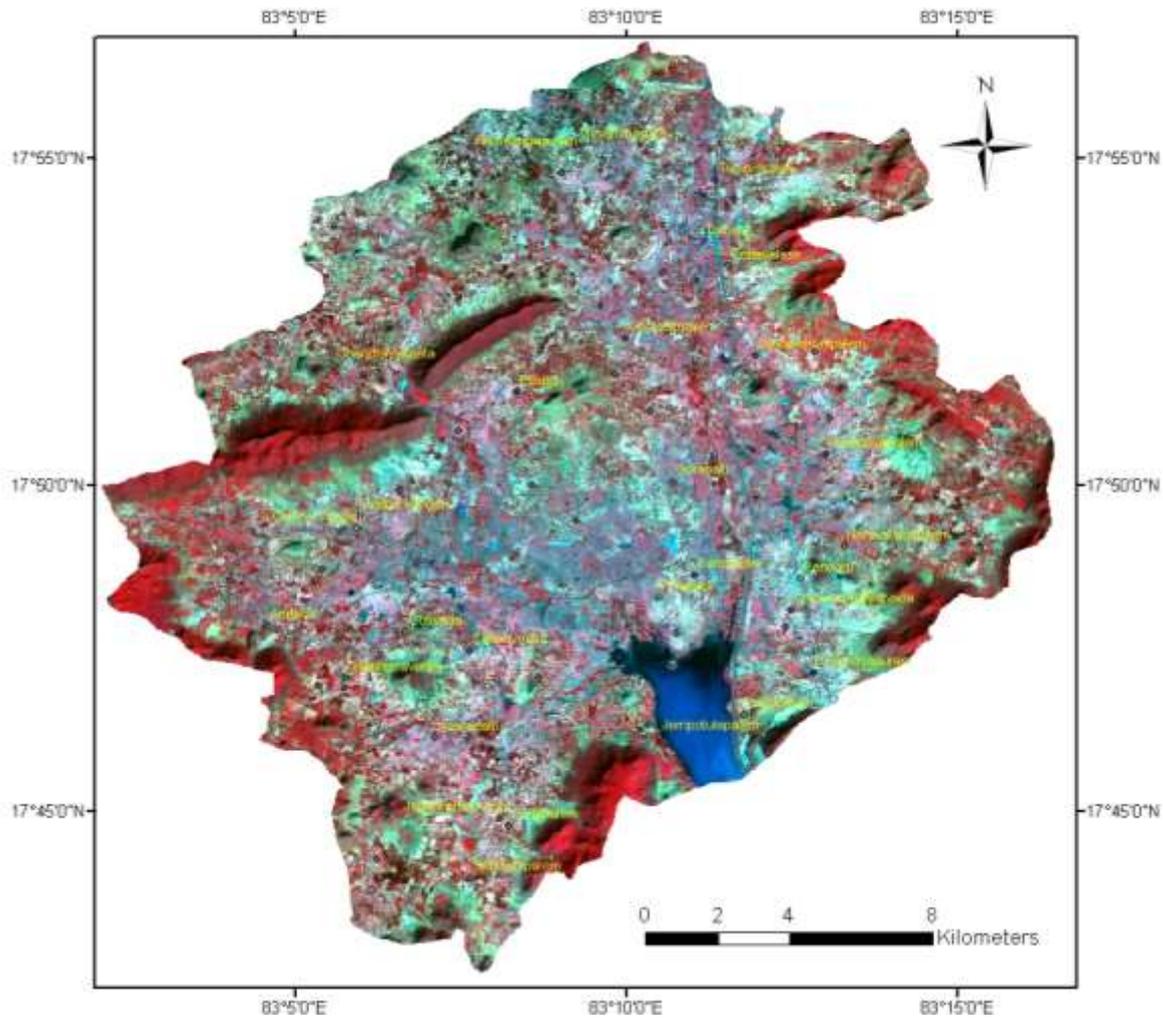


Figure 2: Study area as viewed on IRS-ID-LISS-III, November, 2001)

Data used

Satellite data

Satellite	Sensor	Row/Path	Date of pass
IRS-ID	LISS-III	105/59	January, 2011
IRS-ID	LISS-III	105/59	6-November, 2011

Toposheets- 65 O/1, 65 O/2&3 and 65 O/5 on 1:50,000

Well inventory-Pre-monsoon and Post-monsoon of 2013 and 2014

VES-10 soundings carried out - Schlumberger method

Software used

Erdas-Imagine -9.1

ArcGIS-9.2

WinResis-2

Geomorphology

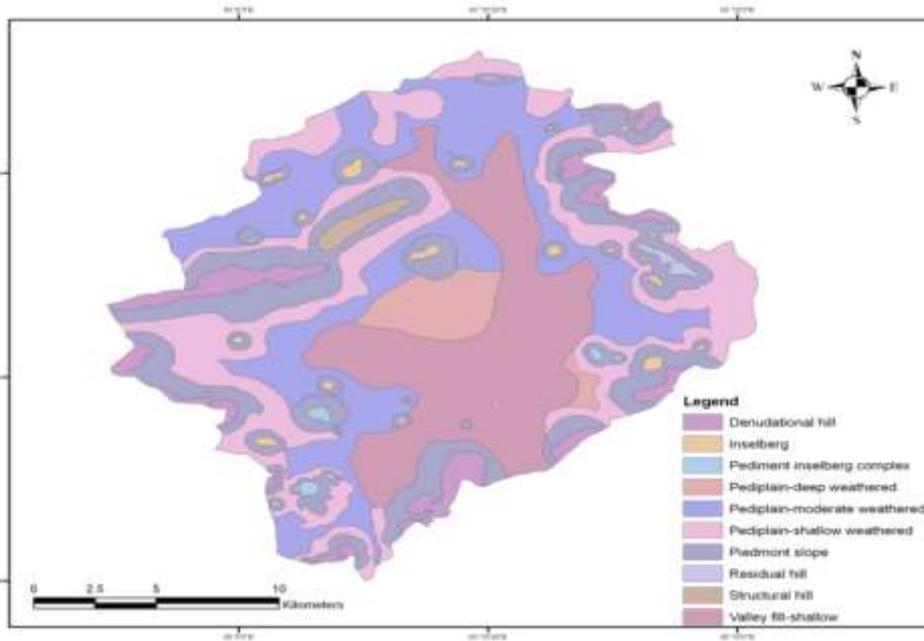


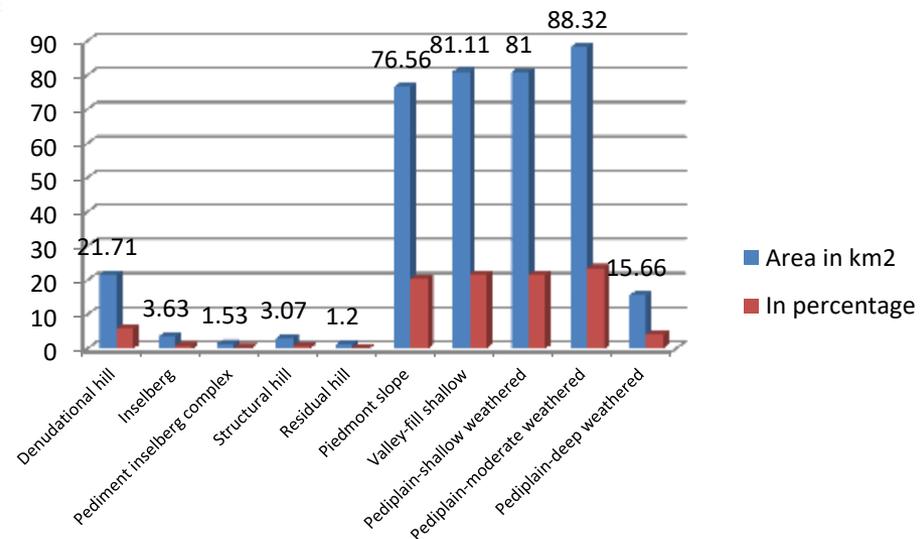
Figure 2: Geomorphology of the study area

Run-off hill features are in the northeast and northwest part, whereas inselbergs, and pediment inselberg complexes occurs at places.

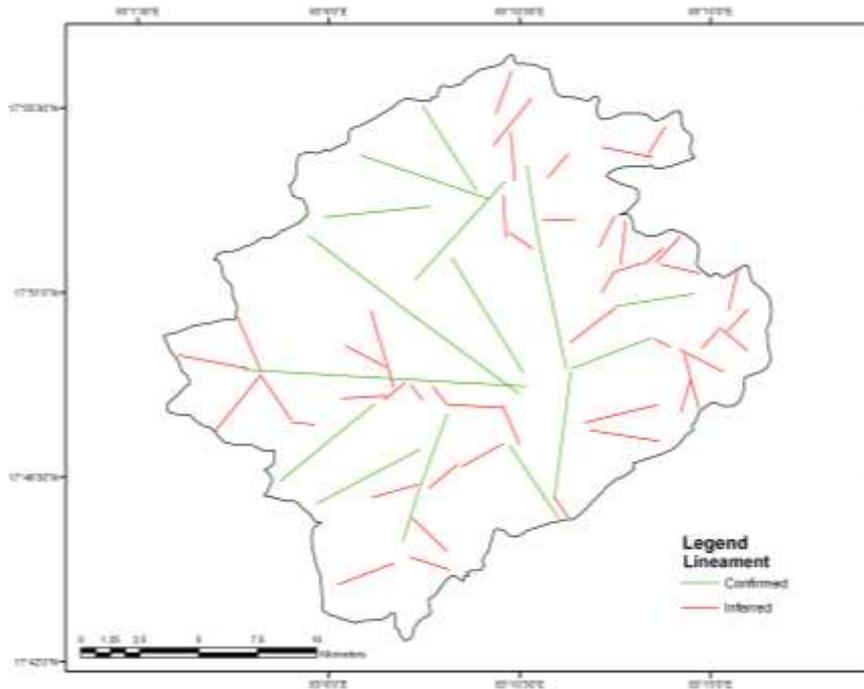
Observed, shallow water table in pediplain shallow-weathered contrasts with deep and moderate pediplain-weathered.

Piedmont slope is covered by colluviums the occurrence shallow water in foot hill areas

About 10 erosion and fluvial geomorphic classes in the area were delineated following the visual interpretation techniques on IRS-ID-LISS-III satellite image (RGNDWM, 1990)



Lineaments



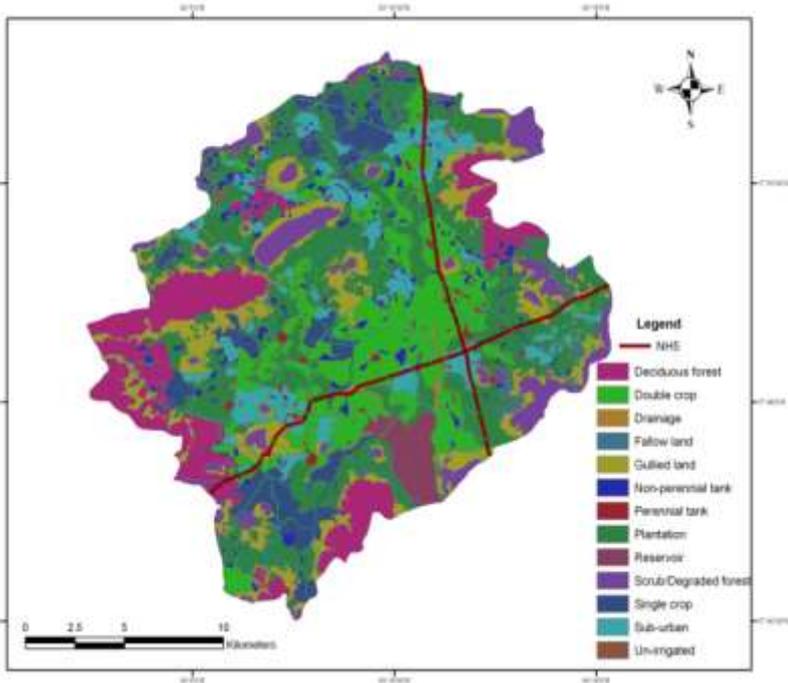
The major lineaments are delineated on toposheets, considering the major and structurally controlled drainages.

The trend of major lineaments is in NE-SW direction.

Criss-cross of lineaments are the good groundwater zones.

Figure 3: Lineament pattern

Land Use/Land Cover

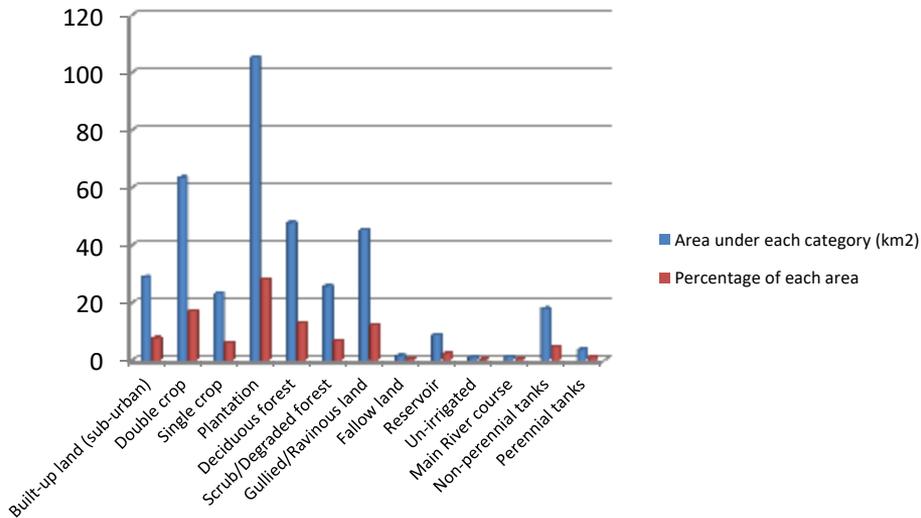


In this thirteen types of land use/land cover classes were delineated on IRS-1D-LISS-III January, 2011 and April, 2011 digital satellite data, through standard visual interpretation techniques.

In this, level-1 and level-2 categories were identified following the NRSC (1990) guidelines.

Because of boom in real-estate, most of the plantation areas are being converted into urban layouts resulting in deforestation.

There is a huge demand of building materials for constructions in Visakhapatnam and surroundings.



Geophysical investigations

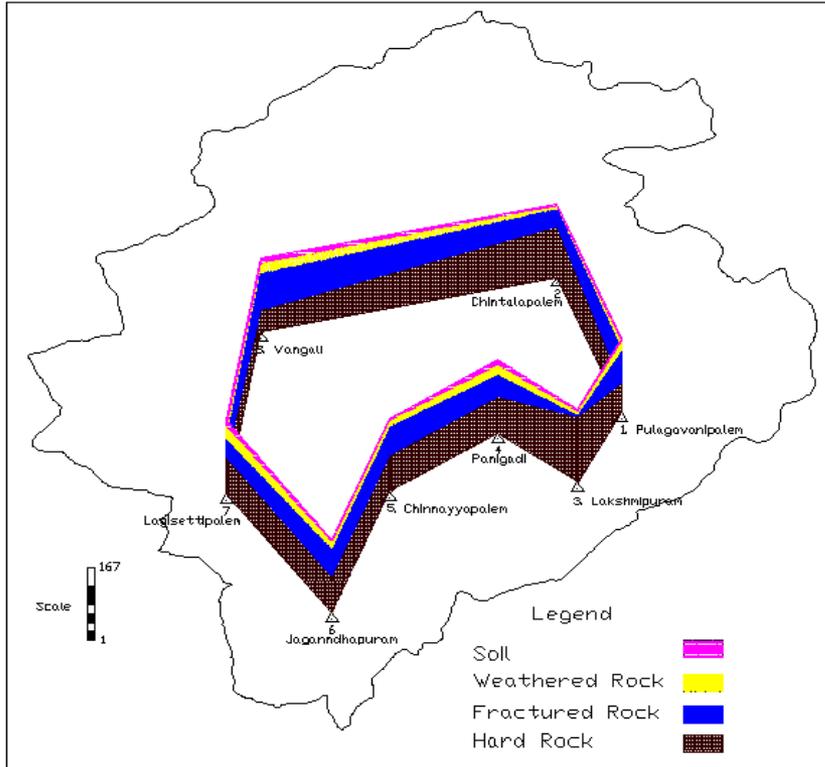


Fig 5: Fence diagrams of the study area

Eight Vertical Electrical Soundings (VES) were carried out in different geologic and geomorphic units.

In this study, Schlumberger array was adopted with maximum electrode separation ($AB/2$) restricted to 100 meters.

Shallow groundwater zone where weathered zone yields water to the wells (dug wells).

Deep groundwater zone where deep fractured zones yield water to the wells (Dug cum bore and Bore wells).

Well inventory

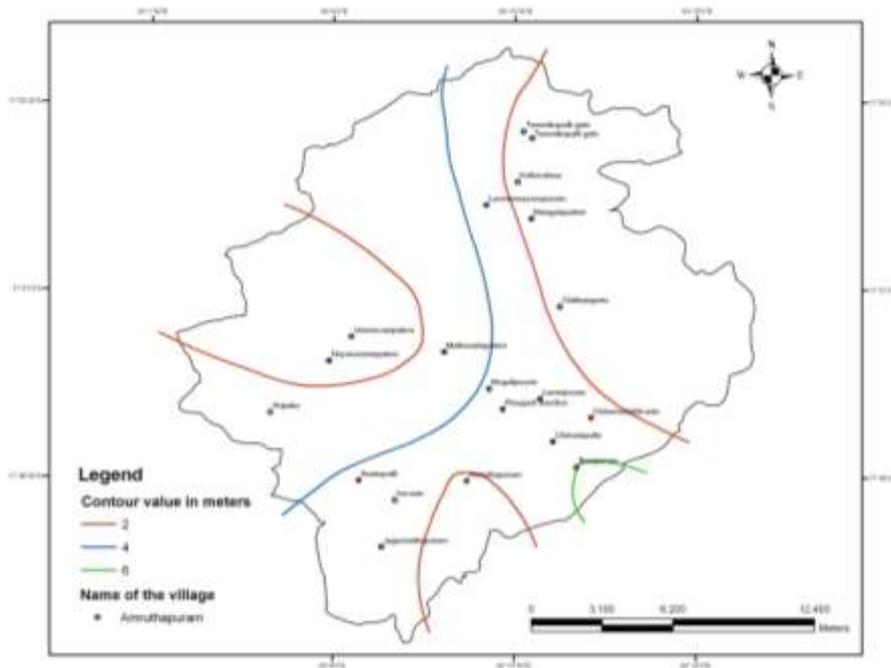


Fig. 6: Groundwater fluctuation in 2010

About 20 dug wells have been monitored during pre- and post-monsoon during 2014.

The water table occurs in unconfined to semi-confined conditions.

Weathered zone thickness in the area varies from 3 to 25 meters.

This zone is underlined by thick fractured rock.

These two zones which are the underground reservoirs, yield moderate quantity of groundwater for drinking and irrigation.

Results

The Meghdrigedda reservoir catchment, is unique in terms of topography and groundwater conditions.

The area has sufficient soil moisture, supports agriculture during kharif season, rabi season groundwater is the major source.

The water table adjacent to hilly areas in the vicinity of Meghadrigedda reservoir has shallow water table.

Occurrence and distribution of groundwater in the area is controlled by groundwater demand and fluvio-morphological conditions.

Observed, shallow water table in pediplain shallow-weathered contrast with deep and moderate pediplain-weathered.

Real-estate boom, most of the plantation areas are being converted into urban layouts resulting in deforestation.

Anthropogenic activities and quarrying have an impact on drainage and landmass denudation.

Thank you for your kind attention