Chapter VII

Applied Geomorphology
APPLICATION OF GEOMORPHOLOGY

The term Applied Geomorphology means the application of our geomorphological knowledge in interest of the society or the mankind in general.

This science acts like a bridge to some of the gaps that have separated the various disciplines of the geomorphology.

It covers those aspects of the geomorphology that are directly related to environmental problems and decision making processes which are of value of agricultural scientists, engineers, geologists and hydrologists as well as to geomorphologists". (Jhon, R.H., 1977).

Applications of geomorphology in the study region has been observed in the following aspects:

(1) **Natural hazards**: such as soil erosion, various types of slope failure, sea and river floods, volcanoes, earth-quakes and faulting.

This is sometimes is the use of man techniques unwisely in some way. For example – in case of soil erosion a man made problem.

Earthquakes (Natural Problems) In such conditions the role of professional geomorphologist comes in picture because he has some measure of understanding of the combinations of events that
produced the hazards. He is the only man who can advise on matters of predicting the occurrence of hazards.

He can now suggest the methods of protecting against the hazards or to reduce the effects.

(2) **Environmental management**: Geomorphological principles have been applied in providing solutions to management of physical environment of the region. In this respect natural hazards have been also considered. The setting and building of roads and settlements have also been studied.

(3) **Development of resources**: There is a general concern that we should be aware of the existence of the resources that are available to us and that those resources should be the subject of suitable conservation measures. For example – In the case of soil the geomorphologists with a knowledge of what creates and destroys soil has an important role to play.

By making use of the geomorphological concepts we can get the informations about topographical, lithological and pedeological details of the earth surface, Hails (1978) states that “In the immediate future effective management of the environment will depend upon the results of coordinated feasibility studies.
Such an approach will provide the necessary base-line for scientific data on which long-term research programmes will be planned.

Industrial development, recreation housing and ecological balances are the prime needs of human beings. It so happens sometimes that without having the complete knowledge of geomorphology the work of some agronomists, planner and engineers goes to failure, of such projects.

At the same times wastage of non-renewable resources, destructions of nature and ecological balance occurs. So it is very important for the planners to go in deep of the geomorphology of the area and make use of the latest techniques in human welfare.

In the present study the chapter has been so designed to explain the relationship between topography, soils, agriculture, vegetation, minerals resources, hydrology, engineering projects, hazards with special reference to volcanic activities in the area and land use pattern.

**SOILS**

As we know soils are weathering products and their composition is determined by the parent material i.e. rock type found in the study area under consideration. The soil found in the area is of composite
type formed by the composition of fragmental quartz, felspar and silica mixed with alumina, iron, magnesia, lime and the alkalis.

Clays are found at the lower level of soils. On the other hand sand is found on the higher levels. This type of soils are fertile during the rainy season. They absorb abundant of water and due to precipitations, the water reaches to the deep level of the soil. This nature of the soil is very much favourable for wheat production. As regards to composition of the soil it contains 42-50% clay and rest of sand and up to 6% of organic matter.

The soils found in the study area may be divided in two groups-

(i) Clay soils and (ii) Sandy soils

(ii) **Clay Soils:** In the area under study the clay soils are considered the best and the most fertile soil. It is made of particles of very fine degree of communication and are well decomposed. This type of soil is found near river banks.

The colour of the soil is black are dark grey to dark brown at the surface. The texture of the soil ranges from clay to clayey loam which is friable on surface and coarse massive at the lower level.

Clay soil is also found in patches in some areas which is suitable for growing vegetables. This type of soil is found all along the Katni river banks.
(ii) **Sandy soils**: This type of soil is found at high elevation. It contains almost pure silica. According to the general classification the soil is divided in four categories: (1) Domatta (2) Sehra (3) Mund II (4) Patrua (5) Bhatua.

(1) **Domatta** – This is the mixed type of soil containing both the black soil and the yellow soils. The colour of soil is generally whitish yellow.

This type of soil is generally fertile. Degree of fertility depends upon the proportions of black and yellow soil. It is suitable soil for production of rice.

This type of soil is mostly found in north-east and south-east part of the Murwara basin. The main villages coming under this soil division are Juhla, Kelwara and Kanhwara.

(2) **Sehra** – This type of soil is abundantly found in the area under study. It is found mixed with Domatta soil of the basin. It is mostly found in the southern part of the Katni district, as well as Juhla and Kelwara blocks. This soil is suitable for **rabi** crops.

(3) **Patrua** – It is the light black soil which is considered as the inferior quality of the soil. It is not favourable for production of rice or wheat. It is quite different of domatta, sehra or mund type of soil because they all are fertile.
Bhatua - South and north part of the area is fully of red soil which is called "Bhatua Soil". This type of soil is stony in nature and is found on the slopes of the hills. It is suitable for crop of all seeds.

**NATURAL VEGETATION**

The area under study is rich in natural vegetation which belongs to dry tropical type which is further divided into northern tropical dry deciduous and southern tropical dry mixed deciduous forests. In Murwara and Sleemanabad sections the former type of forest is found which is rich in Saj, Dhaora, Tendu, Lendia, Bija, Mahua and a few other species. Bamboo is also found in these forests.

Teak forests are found in Sihora, Maihar and Murwara district. In other trees found in the area include Saj, Dhoora, Bija, Laldu, Salai, Gunja, koha and Tendu.

This type of forest comes in the categories of southern tropical dry deciduous forests.

**MINERAL RESOURCES**

The understanding of the history of a region and geomorphic knowledge of the landforms may be successfully utilized in the exploration of minerals. According to Thornbury (1984 : 547) the understanding of the geomorphic features and history.
View of alluvial deposits in the Katni River

View of lime-stones with sandstone
(1) Iron Ore: Iron is one of the important mineral found in Murwara basin. It is found mostly in Bijori, Bhadaura, Imlia, Shiri, Kilwara, Khanwar and hills all around Katni town. It is abundantly found in Kanwara hills, in form of pleats of 62 – 70 cm. It is estimated that the total stock of the iron in the form of ore will be about 50 lakh tons.

The ore is lateritic in nature. It is used in production of red-oxide, dry colour, distemper, rubber and cement and other industries.

(2) Bauxite: Another important mineral found in the area is the Bauxite. It is found all over the Katni district. The quality of Bauxite is of better type. The stock of bauxite in the range is ample. The main villages where bauxite is found are Tikuri, Murwara hill, Khujri etc.

It is estimated that approximately more than 50 hectare area is full of Bauxite. Main use of Bauxite is in manufacture of chinaware and sanitary pipe industry. It is also exported to other places.

3. Lime Stone: Katni region is full of lime stones and the town is famous in production of lime. It is found in the form of belt extending from Katni to Sondroni.

It is found indepth from 8 to 15 meters Katni and Jukhi are producing a lot of lime stone in south Murwara Tikurai and Badgon
View of the deposit of Chuna
are main centres for extraction of lime. Kaimur is also full of limestone.

4. **Barytes**: These are found in Murwara and Sleemanabad range. The quality of mineral is not so good to extract in large scale. It occurs in Bijawars. In Sleemanabad it is found mixed with copper and iron ore.

This mineral is found in village Dasi, Hattai and Senga town of the Murwara tahsil. It is used mainly in printing industry and ink manufacture.

5. **Sand Stone**: Vindhyan sand stone are excellent building stone due to there nature of regular bedding and uniform grain and good looking colours. They are used in building construction. Due to lack of cheaper transporation use of these stone has become localized.

6. **Clays**: This is found in south-east in Murwara tahsil and Niwar. It is abundantly found in above two areas. It is of very good quality.

Other minerals found in the area are felsspar, talc, lead, mica, siliminite and pegmetide etc.
View of the Chuna Bhatta near of Katni
DEVELOPMENT OF INDUSTRIES

The mines of the regions are full of minerals and other materials required for the development of the some industries. The availability of raw material and cheap labour in sufficient quantity from the local and neighbouring areas has supported the industries based on minerals. Due to sufficient and easy transportation facilities by railways, roads and road roots the area has developed as an important business centre of the state. The raw material and the finished products like Chuna (lime) and Cement, Pottery and clay material are exported all over the India.

These include cement industries, refractory materials, pottery, bricks, tiles and lime are the main types of the industries.

The forests of the area are full of plants which are of medicinal value, some of these are Harra, Amla, Bija, Mahua, Baheda and Catechu. There plants found in surplus.

A plant known as “Maida (Lakdi)” is also found in the forests of the area which is in its powder form is used as a base material for the manufacture of insense sticks (Agarbatti). This material is exported to other parts of the country where the agarbatti are manufactured, Gumacacia is also a forest product which is used in medicinal industries, food industries and also as a pasting material.
HYDROLOGY

Hydrology of the area determines to a large extent the irrigation capacity of the area, flood situations, ground water level, water pollution etc. This factor is mostly affected by the geomorphology of the area.

Irrigation: Due to the unpredictable nature of the monsoon in the area the importance of irrigation facilities has increased a lot. So for the proper development of the area sufficient irrigation facilities are needed.

This can be attended by construction of new dams and lakes. Improvement of facilities for utilising the river water is also needed. Therefore the construction of the canals is very necessary. The canals development is affected by topographic conditions of the area.

The ground water level and artesian pressure is again affected by the slope elements and geology of the area.

\[ \text{Ground water} \]

Ground water: level of the area is satisfactory. Ground water is mainly derived from either precipitation or from sources like streams and rivers by infiltration into the ground through various lithological units in the area.
The study of the geomorphology provides important clues for prospecting and exploration of the ground water.

The study of slope, drainage density, stream frequency, stream orders, drainage texture, and the drainage pattern system gives a very clear picture of the ground water condition of the area. The research carried out in this field gives the conclusion that the sufficient ground water is present in the area.

The local ground water conditions may also depend on the local structural condition of the rocks such as dips of the belt and joints, permeability and porosity of the rocks found in the area.

These processes depends on the nature of the strata of the land such as porosity and permeability of the rocks formations.

The Gondwana, Bijawars and weathered granites found in the area acts as aquifers. The Vindhyan and granite rocks are aquidudes.

On the basis of lithology the availability of Gondwana, granites and Bijawars in the area supports the availability of good and sufficient ground water in the area.
ENGINEERING ASPECTS

The topographical and weathering conditions play an important role in application of engineering techniques of any area.

Therefore, before planning to any area development it is essential to go through the topographic knowledge of the area, its slope, hills, nature of beds, rate of erosion, gaps and fills are to be taken in consideration. Different types of terrain impose different problems in the implementation of engineering techniques.

In engineering projects like construction of road, railway lines, dams and other important constructions a deep knowledge of topography of area is important because the life of construction and its facilities depends mainly on the nature of the earth surface and the topography of the region.

The plain surface of the central part of the area under study has offered best conditions of roads. The roads connecting to Katni district to Sahdol, Mandla, Jabalpur, Amarkantak, Damoh and many other parts of M.P. as well as routes to other states like U.P. and Chhattisgrah are available from the Katni district. The railway lines passing through the Katni district make it in from of a Junction called “Katni Junction” which provides railway routes to all the four direction. Katni-Allahabad main line passes through...
Construction of dam at Katni River at Katayaghat
the heart of the Vindhyan country. Further the line connecting Katni to Bilaspur passes throw the foot to the maikal range.

The statement of Wadia “the east India railway now called central railway passes through the heart of the Vindhyan country proves completely true.

Due to existence of bridges of low heights, the roads connecting to Katni to other parts of M.P. are often blocked in the rainy season. Some times due to heavy rains. So now it is necessary to develop now bridges of comparative higher heights so that roads may not block in rainy season. This will certainly improve the transportation capacity of the area under study which will result in the development of the area. The hilly tracts are covered with laterite with characteristic nature of low erodability hence such surface are best suited for dame construction and development of irrigation projects.
REFERENCES

New York, pp. 18-52.

