Relief and Structure of Madhya PradeshL--

In graphically, Madhya Pradesh state located at middle of India in plains between latitude 21°04'N-26.87°N and longitude 74°02'-82°49' E, Madhya Pradesh state is exactly located in center of the India map so it known as the "Central Region" of India and also known as the "Heart of India" or " Central India" . In area wise Madhya Pradesh is second largest state of India, with Rajasthan being the first, before making "Chhattisgarh" till year 2000, it was the largest state of India in area-wise. Madhya Pradesh is sixth largest state in population wise. Madhya Pradesh lies in the middle of India with sharing its border six bordering state. Its south-east border touch "Chhattisgarh", south-west border touches "Maharashtra", western border touches "Gujarat", north-west border touches "Rajasthan", and north-east border touches "Uttar Pradesh". Madhya Pradesh not shares their state border with any other coastal line or country. The total area of Madhya Pradesh state covers is 3,08,254 sq km separated with the 50 districts of the state. The state covered a wide area of the Indian knap region. Madhya Pradesh consists largely of knap dotted with the hill range of the Vindhyas and the Satpuras. The hills give rise to the main river systems; the Narmada and the Tapti, running from east to west, and the Sone, Chambal, Mahanadi, Betwa and the Indravati west to east. And other many rivers flow in state. Thus, with the mountain ranges, rivers beside with the plains, Madhya Pradesh have various physical features.

The Madhya Pradesh state can be geographical separate out into various regions which based on the different cultures and languages of these area. For example, in north-west of the state Malwa region, the south-west portion of the state is Nimar (Namar) region, and the northern part of the state is well known as Bundelkhand region, and the northeast part of the state is Baghelkhand region. Mahakoshal (Mahakaushal) is the southeastern portion of the state and last the center Vindhya and Satpura region.

Different area-wise divisions of Madhya Pradesh:-

Area-wise, the state is divided into 10 broad divisions of Bhopal, Gwalior, Chambal, Hoshangabad, Indore, Rewa, Jabalpur, Sagar, Ujjain and Shahdol. However, in total, Madhya Pradesh comprises of 50 districts, which are Anuppur, Balaghat, Alirajpur, Ashoknagar, Betul, Barwani, Bhopal, Burhanpur, Bhind, Chhatarpur, Chhindwara, Damoh, Datia, Dindori, Dewas, Dhar, Gwalior, Guna, Harda, Hoshangabad, Indore, Jabalpur, Katni, Jhabua, Khargone, Mandla, Khandwa, Mandsaur, Neemuch, Morena, Narsinghpur, Raisen, Panna, Ratlam, Rewa, Rajgarh, Sagar, Seoni, Satna, Sehore, Shajapur, Shahdol, Shivpuri, Sidhi, Sheopur, Singrauli, Umaria, Tikamgarh, Vidisha and Ujjain.

Drainage System:-

Madhya Pradesh contains the source of some of the most important rivers in the Indian peninsula: the Narmada, the Tapti (Tapi), the Mahanadi, and the Wainganga (a

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tributary of the Godavari). The Chambal forms the state's northern border with Rajasthan and Uttar Pradesh. Other rivers include tributaries of the Yamuna and the Son (itself a tributary of the Ganges [Ganga]).

The principal river systems which traverse the enormously big area of this part of India are the:

- Chambal
- Betwa
- Sindh
- Narmada
- Tapti
- Mahanadi
- Indravati

Some of the other rivers flowing through the state of Madhya Pradesh are as follows:

- Kanhan
- Ken
- Pench
- Penganga

Topographical condition of Madhya Pradesh:-

The topography of Madhya Pradesh is defined by the Narmada Sone Valley. It is a narrow and long valley extending through almost the whole of the state from east to west. Sone valley forms the upper part; Shahdol and Sidhi districts lie in this valley. The lower part forms the Narmada valley. It has an average elevation of 300 m above MSL and is covered with alluvial soil. Jabalpur, Mandla, Narsinghpur, Hoshangabad, Raisen, Khandwa, Khargone and Barwani districts lie in this region. The Sone valley is narrower than Narmada valley and alluvial deposit is also comparatively poor and thin, therefore Narmada valley is more important than Sone valley for agricultural activities. To the north of this valley lie the Central Highlands, to the south the Satpura-Maikal ranges and to the south-east, the eastern plateau. These three form the natural physiographic regions-into which the state is divided. The Central Highlands are spread between the Narmada-Sone valley and the Aravali ranges to the west in a triangular form. The highlands slope towards the north and drain into the Yamuna. The central highlands region in the state includes the following uplands:

Rewa-Panna plateau:-

The Rewa-Panna plateau is one, also known as the Vindhyan plateau, lies in the north-eastern part of the central highlands. The main rivers flowing in the area are Ken, Sonar, Barna and Tons. Rewa, Panna, Satna, Damoh and Sagar districts lie in this region.

Bundelkhand plateau:-

The other is Bundelkhand plateau located to the north-west of the Rewa-Panna plateau. Datia, Chhatarpur, Panna, Tikamgarh and parts of Guna and Shivpuri districts forming the northern part of the state lie in this

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region. The plateau is bounded in north-east by Vindhyan escarp lands or Rewa-Panna plateau. The average height of the region is 350-450 m above MSL and general slope is towards north. The main rivers flowing in the area are Betwa, Dhasan and Jamner which finally join Yamuna.

Central India plateau:-

Central India plateau is the third that lies to west of Bundelkhand plateau. Shivpuri, Morena and Gwalior districts exist in this region. This plateau has an average elevation of 450 m on highlands and 150-450 m above MSL in valleys. Chambal, Kali Sindh and Parvati are the main rivers flowing in this area.

Malwa plateau:-

The fourth Malwa plateau covers almost the entire western Madhya Pradesh. The plateau is bounded in the north by Chambal and in south by the Narmada. The average elevation ranges between 300-500 m above MSL. Shajapur, Dewas, Indore, Ujjain, Dhar, Ratlam and parts of Sehore and Jhabua districts lie in this region. Bhopal is situated at the eastern edge of the Malwa plateau. Shipra, Parvati, Kali Sindh, Gambhir and Chambal rivers flow through the Malwa plateau. It also forms the water divide between the Ganga and the Narmada basin. The soil in the area is black cotton as a result of weathering of basalts.

Satpura-Maikal ranges:-

Satpura-Maikal ranges lie to the south and the eastern plateau regions to the north- east of the Narmada - Sone valley. Chhindwara, Betul, Seoni, Balaghat, Mandla and parts of Khandwa and Khargone districts lie in the Satpura-Maikal ranges. Average height of these ranges is 300 m ; but there are several high peaks; the highest peak of the state, Dhoopgarh that rises to 1360 m above msl lies in these ranges. The slope is sharp in south face and gentle on northern side. The eastern part, the Satpuras, is wider than the western part which stretches in the form of a semi-circle and is known as the Maikal ranges. The Maikal ranges include the Amarkantak plateau, which is origin of both Narmada and Sone rivers. The other rivers in the area are Johila, Macherwa, Denwa and Choti Tawa which join the Narmada.

Eastern plateau:-

The eastern plateau region comprises Baghelkhand Plateau lying between Maikal ranges and Chhattisgarh plain area with an elevation of 1033 m above MSL.

Based on the climatic conditions and physical features, the topography of Madhya Pradesh includes the following agro-climatic zones:

- Northern Plain
- Narmada Valley
- Wainganga Valley
- Malwa Plateau
- Kaimur Plateau
- Nimar Plateau
- Vindhyan Plateau
- Jhabua Hills

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- Satpura Hills
- Gird Region
- Bundelkhand Region

The elevation of Madhya Pradesh ranges from 300 to 3,900 feet (90 to 1,200 metres). In the northern part of the state the land rises generally from south to north, while in the southern part it increases in elevation toward the west. Important ranges of hills are the Vindhya Range, in the west, and its northern branch, the Kaimur Hills, both of which reach elevations of 1,500 feet (460 metres), and the Satpura, Mahadeo, and Maikala ranges, in the south, which have elevations of more than 3,000 feet (900 metres). The Dhupgarh Peak (4,429 feet [1,350 metres]), near Pachmarhi in south-central Madhya Pradesh, is the state's highest point. Northwest of the Vindhya Range is the Malwa Plateau (1,650 to 2,000 feet [500 to 600 metres]). Other features include the Rewa Plateau, in the rugged eastern region of the Vindhya Range, the Bundelkhand Upland, north of the Vindhyas, the Madhya Bharat Plateau, in the extreme northwest, and the Baghelkhand Plateau, in the northeast.

Climate of Madhya Pradesh:-

Climate of Madhya Pradesh is heavily influenced by the Tropic of Cancer that passes through the state. Climatic conditions of Madhya Pradesh are highly variable. The summers are extreme hot, the winters are extreme cold and the rainfall is either extreme or drought situation prevails.

Like other parts of India, Madhya Pradesh also has three major seasons - Summer, Monsoon and Winter, but the duration varies. During summer (March-June), the temperature in the entire state ranges above 29.4°C. In general, the eastern parts of Madhya Pradesh are hotter than the western parts. The regions like Gwalior, Morena and Datia record temperature of over 42°C in the month of May. The humidity is relatively very low and the region usually experiences frequent mild dust storms. The south-west Monsoon usually breaks out in mid June and the entire state receive a major share of its rainfall between June and September. The south and south-east regions tend to experience a higher rainfall whereas the parts of north-west receive less. Mandla, Balaghat, Sidhi, Jabalpur and other extreme eastern parts receive more than 150 cm rainfall. The districts of western Madhya Pradesh receive less than 80 cm rainfall.

In the state Winters and rainy seasons are very short, while summers are comparatively long. The Tropic of Cancer passes through the middle of Madhya Pradesh. Thus, along with the shifting of the sun towards the northern Hemisphere and the Southern Hemisphere, climatic conditions change on a large scale. The impact of the Great Himalayas takes place extensively throughout Madhya Pradesh particularly during the winters. At the same time, Tropic of Cancer also has a great influence on the climatic conditions of the state.

Summer:-

The summers start around middle of February and end in July where the first

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outbreak of monsoon takes place. During the summer season, the temperature reaches more than 45 degree Celsius. The southern part of Madhya Pradesh (south of Tropic of Cancer) receives much solar energy in which Khandawa, Khargone, Ujjain, etc. are the hottest places. North Gwalior receives large amount of solar energy and it is the hottest place of the northern part of the state. Morena district, Gwalior, and Datia receives around 42.5 degree Celsius isotherm, while 40 degree Celsius isotherm passes in western part of Madhya Pradesh including, Shajapur District, Dewas District, Ratlam District, Mandsaur District, Mandla District, Seoni, etc. The hill towns of the state such as Pachmarhi and Amarkantak experience around 34 degree Celsius temperature. When the Sun shifts towards the Northern Hemisphere, Madhya Pradesh experiences tremendous heat till the month of July. The temperature reaches up to 49 degree Celsius in some parts of Madhya Pradesh while the average temperature remains at 40 degree Celsius.

Monsoon:-

The state also experiences monsoon rainfall. The winds blow from Bay of Bengal and cover the entire state. The intensity of the rainfall reduces towards the west. The highest rainfall occurs in the extreme east. The maximum rainfall is about 152.4 cm, while the minimum is about 20 to 25 cm. The duration of rainfall also varies. In the last week of June, the monsoon outbreak and reaches the eastern part of the state, while, in the extreme western part, the monsoon reaches in the middle of July. In the western part, during winters, the rainfall occurs due to western disturbances whereas in the eastern part during the similar period, rainfall occurs due to easterlies, the wind blowing from the plain of Siberia. Cities like Jabalpur followed by Rewa district and Sagar experiences maximum rainfall. While Indore, Ratlam district, Gwalior and Bhopal experiences comparatively lower rainfall. Interestingly, the intensity of rainfall is very less in the entire state and most of the districts are drought prone. Rainy season varies from east to west. In the eastern part of Madhya Pradesh, the first outbreak of monsoon takes place in the mid June, while in the west monsoon reaches up to mid July. Most of the rainfall occurs due the winds blow from Bay of Bengal. Only few part of the western region of Madhya Pradesh rainfall takes place due to the winds blowing from the Arabian Sea. Jhabua district, Dhar district, Khargone, and Rajgarh district receive below 6 cm rainfall. In the hills of Satpura, the average rainfall recorded is 23 cm during the month of August. The state has experienced both flood and drought conditions. Winters are very short. Winters start in the mid November and lasts up to the mid February. Impact of winters is just negligible. Rainfall also occurs during the winters due to western disturbances.

Winter:-

During the winters, when the entire country is swamped by cold waves, the temperature of Madhya Pradesh is regulated by the same waves coming from the Great Himalayas and an average of 15 degree Celsius is recorded throughout the state. The winter season starts from the month of November. The temperature remains low in the northern

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