CHAPTER VII

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The present work deals with the study of floods and its effect on settlements of Dhule district. The human settlements are influenced by topography, climate, soil, land use, sources of water, natural calamities and natural vegetation.

Dhule district occupied over an area of 8061 sq. km. Dhule district is a headquarters. Dhule includes four tehsils. There are three urban centers in the district. The study area comprises four tahasils, namely Dhule, Sakri, Shirpur, and Shindkheda. Dhule district contributes 2.62 % total geographical area of the Maharashtra State. It is only district in the state having such less number of tehsils except Mumbai city and Mumbai Suburban district. This region is well endowed with the drainage network including Tapi and her major tributaries like Panzara, Kan, Burai, Aner and Arunavati river system. The study area is triangular in shape. The study area is located in the northern part of the Maharashtra state. It occupied over an area of 8061sq. kms. It is extended from 20° 38'11" N to 21° 39'11" N latitudes and from 73° 50'11" E to 75° 13'11" E longitudes. The study area was previously known as the West Khandesh lies in the upper Tapi basin in the North West corner of Maharashtra State.

In the present study out of 681 settlements 92 Settlements get prone to floods every year at the time of heavy rainfall. These settlements attracted to the researcher for the study of flood impact on streams site settlements.

7.1 DISCUSSION AND CONCLUSION:

Following are the major Discussions and Conclusions of the present study.

- Floods are one of the most widespread and destructive natural disaster. When the water level is higher than the river bank, the water comes out from the river, there will be flooding. Flood is resulting from extreme geophysical event to create an unexpected threat to human life and property. Death, disease, injury, displacement of people and economic loss are the usual consequences of flood.

- The Tapi River experience high flood magnitudes occasionally. The flood duration of Tapi ranges between 6 to 10 days. This fact is highly hazardous for
the district. The development and management plan preparation process was identified for 92 of the 681 villages in the district spread in four tehsils prone to floods every year. All these flood affected settlements in the study region are located on the banks of Panzara, Kan, Burai, Tapi, Arunavati, and Aner river. The maximum Flood affected Settlements are in Shindkheda and Shirpur tehsil, respectively 28 and 31. Out of 92, 45 flood affected settlements are situated on Tapi river bank because it is Major River in the study region.

- During the floods of 2007, 30 villages located on the river bank were flooded and they require immediate rehabilitation at the safe location, which is free from floods.
- In 19th century Dhule district was famous for the production of pure milk obtained from milch cattle fed on a special diet. Customers in Delhi once upon a time used to wait for the delivery of milk from Dhule.
- The study region is located in central Tapi and her tributaries. The Tapi River basin encompasses an area of 65,145 sq.k.m, which is nearly 2 % of the total area of India. It is one of the major rivers of peninsular India with a length of around 724 K.m. The presence of Galana and Dhanora hills and Satpura ranges gave birth to variation in physiographic. All these physiographic units are the obstacles in the concentration of human being.
- Study region is mainly rural in nature, as per 2011 census, 72.09 % population of districts lives in villages. The total population of the district living in rural areas is 1,477,034 of which males and females are 759,962 and 717,072 respectively. The percentage of rural settlements to total settlements is 99.56 % and urban settlements are 0.44 %. It indicates the very less percentage of urbanization.
- In the study region out of 92 floods affected settlements, 17 settlements in Dhule tehsil on Panzara river bank, 16 in Sakari tehsil situated on Kan Burai and Panzara river bank. 31 in Shirpur tehsil situated on Aner, Arunavati, and Tapi river bank, and 28 flood affected settlements in Shindkheda tehsil situated on Burai and Tapi river bank.
- In the study region maximum flood affected settlements are situated on Tapi and Panzara river bank respectively 45 and 27. Very less number of floods
affected settlements is situated on Kan, Burai, Aner, and Arunavati River bank. Kusumbe, Mukati, Songir, Morane, Fagane, Shirud, Kapadane, Pimpalner, Sakri, Dusane, Nijampur, Dahiwel, Kasare, Mhasadi, Shindkhede, Betawad, Chimthane, Boradi, Thalner, Sangavi are very large flood affected settlement.

- Study region comes under the drought-prone region of Maharashtra State. Some time it experienced floods. Flood makes very serious problems in the study region. It is dangerous for human life as well as economic sources.

- Geologically the region is homogeneous. Deccan trap covers almost the study region. The Tapi valley proper and the valley of her tributaries are covered by the alluvium. The alluvium layers are much thicker and wider on the west while they thin out on the east. An interesting feature in the topography of the study region is the presence of dykes, which is running almost parallel to each other. The area of their dominance is Sakri and Dhule tehsils. A very large dyke about 80 km. in length runs parallel to the course of the Panjhara on its northern side and is responsible for the course of the river.

- Study region represents varied topographical features and landscape. Study region can be divided into three parts.
  i) The northern mountainous region of the Satpura.
  ii) The central fertile valley region drained by the river Tapi.
  iii) The southern hilly region.

- The soils are derived from Deccan trap rocks in the southern region whereas in the northern region it is from the sedimentary formation of the Satpura ranges. On the basis of depth, texture and colour soils of the study region can broadly be classified into three major types.
  i) Deep Black Cotton soil
  ii) Medium Black soil
  iii) Coarse Shallow soil

- The climate of the study region is generally dry except during the southwest monsoon season. In the study area year may be divided into four seasons. These are-
  i) The Cold Season (December to February)
ii) The Hot Season (March to May)

iii) Monsoon Season (June to September)

iv) Post Monsoon Season (October and November)

The distribution of the rainfall over the study region is uneven. The average annual rainfall in the study area is 58.39 cm. The rainfall distribution is uneven, it occurs heavy in hilly region. In western part of study region annual rainfall is 109 cm. 88% rainfall is during the south west monsoon period. The amount of rainfall is very high in the month of July.

In the study region the seasonal rainfall and the nature of the soils provide a variety of vegetation ranging from grasses and thorny trees to deciduous trees. In the northeastern mountainous region, extensive area is under forest. ‘Teak’ is the important commercial variety of wood. Other trees like Dhawada, Shisam, Khair, Tendu, Palas, Anjan, and Bamboo are observed in this region. The forest in the district is spread over about 2,08,890 hectare which is about 28.50% of district geographical area.

- As per the 2011 Census, the population of district is 2,048,781 of which male and female was 1,055,669 and 993,112 respectively. Dhule district population constituted 1.82% of total Maharashtra population. The sex ratio for the study region as a whole was 939 females per thousand males. According to the Census of 2011, the average density of population was 285 persons per sq. km.

- Average literacy rate of Dhule in 2011 were 74.61% compared to 71.65% of 2001. Gender wise, male and female literacy were 82.59% and 66.21% respectively. For 2001 census, same figures stood at 81.40% and 61.39% in Dhule district. Total literate in Dhule district were 1,333,571 of which male and female were 756,813 and 576,758 respectively. Dhule district is on ranks 26th in the level of literacy of Maharashtra State.

- Agriculture is the basic occupation of the people in the study region. It is the backbone of the economy of the district. In the urban area of the district 50 to 75% of the population is engaged in agriculture. Where as in the rural area more than 95% of the population comprises the same.

- In the study region large proportion of land is under cultivation. The proportion of land under cultivation to the total geographical area for the study region was 50.14% in 2009-10. It shows the dominance of agriculture in the
The study region comes under the rain shadow zone and drought prone area of Maharashtra State. The amount of average rainfall was 928.7 mm in the year 2006. The proportion of net irrigated area to net sown area was 10.48 % in the year 2000-01. The tehsilwise proportion of irrigation to net sown area was Dhule -8.15 percent, Sakri – 9.37 %, Shirpur – 19.07 % and Shindkheda – 7.34 %. The highest proportion was in the Shirpur tehsil, while it is lowest in the Shindkheda tehsil. In the study region well irrigation is important, proportion of well irrigation was 83.68 % in the year 2000-01. While the proportion of surface irrigation is 16.32 % in the year 2000-01.

In the study region 51 % area was under food crops in the year 2006-07. The main food crops in the region are rice, wheat, jowar, bajara and pulses. Area under rice was mainly confined in the Sakri tehsil. Proportion of rice in Sakri tehsil was 5.62 % in the year 2006-07. Rice is not cultivated in the Shindkheda tehsil. Wheat is the rabbi crop. It occupies 2.39 percent of the gross cropped area. It is important crop in the study region. Tehsilwise proportion of wheat was Dhule – 2.30 %, Sakri – 3.91 %, Shirpur – 1.22 % and Shindkheda – 0.99 % to gross cropped area in the year 2006-07. Jawar is the important food crop in the study region. It occupies 8.84 percent of the gross cropped area. The proportion of Dhule tehsil was the highest in the study region. It was 16.40 % in the year 2006-07. Bajara is the prominent food crop of the study region. It occupies highest proportion in all the food crops. The study region comes under the drought prone region. Farmers choose such crop because Bajara is able to face scarcity of rainfall. The area
under sugarcane in the study region is not significant. The lowest proportion of sugarcane was found to the total gross cropped area. The percentage of sugarcane was 1.08. Sugarcane is the cash crop. Cotton is not only foremost cash crop but it ranks first in all crops of the region. The highest percentage of area was in the Shindkhede tehsil having 50.67%. The proportion of Shirpur tehsil was 49.54%. In Dhule tehsil the highest percentage of cotton production having 33.33% metric tons.

- Transportation is one of the important factors influencing on the pattern, size and distribution of settlements. Study region is well linked by road transportation, railway transportation also available. Mumbai-Agra National Highway (NH-3) going through Dhule-Shindkheda-Shirpur tehsils. Surat-Nagpur National Highway (NH-6) connected to Sakri and Dhule tehsils. Almost all villages in the study region are linked by National Highway (172 K.m), State Highway (638 K.m), Majar districtway (792 K.m), other districtway (915 K.m), and Village roads (2555 K.m). In Dhule district total length of road is 5072 K.m. in March 2010. In the study region two railway routes are available. Surat-Bhusawal Western Railway route goes through the Shindkheda tehsil. It is single lane broad gauge route. The electrification of this route is completed, but work of double lane is going on. Another Dhule-Chalisgaon Central Railway route is going through Dhule tehsil. It is single lane broad guage railway route. Total length of Railways route is 81.61 Km .in Dhule district.

- Tourism in the Dhule district has a lot to offer the tourists. The prominent tourist attractions in the district can be found in the form of temples and forts. There are many beautiful and ancient temples located here which are visited by many pilgrims. These include the Gangeshvar temple at Chikse, the ancient temple at Indave, the Kapileshwer temple at Mudavad near the confluence of the Tapi and Panjhara built by Ahilyabai Holkar, the Nagal temple on the left bank of the Pajhara river in Nagpur Kokale, the Hemadpanthi temples at Nizampur and Shirud etc. Among the forts are the ones at Bhamer, Laling Songir and Thalner. Shri Samartha Vagdevta Mandir is a valuable storehouse of manuscripts, letters and chronicles of historical importance. It is visited by tourists from near, far and even outside the country.
The site, growth and development of flood affected settlements are closely influenced by the available soil, water, forest and mineral resources depending on the nature and quality of resources. Overall study shows that in every tehsil of the district, more than 50% settlements are located along the stream and river bank. The basic reason behind it is availability of water.

Dhule district reveals remarkable variability in forms and distributional patterns of flood affected settlements, which are closely related to their sitting, the later influencing there shape and size.

In the early period, flood affected settlements developed mostly by the side of water bodies such as rivers. These rivers provided natural barriers from the security point of view and served as means of transportation as well.

07 flood affected settlements are very large in size whose population is more than 5000 are located on the bank of rivers, such settlements are namely Khede, Morane, Dahivel, Kasare, Pimpalner, Sakri, Thalner,. Settlements along the banks are compact in nature. The compactness of settlements is due to the fertile soil along river banks, assured water supply throughout the year.

In the study area nearly 14% settlements are flood affected. 27 settlements are situated on Panzara river sites, out of these 16 settlements are on right bank and other 11 settlements situated on left bank. The maximum height from M.S.L. of Panzara river sites flood affected settlement is 513 M. and minimum is 201 M.

Chhadwel (P), Sakari and Dhahiwel these flood affected Settlements situated on Kan River Sites at right bank site. The maximum height of flood affected Settlements from M.S.L. is 516 and minimum is 423 respectively Dhahiwel and Chhadwel (P). All flood affected settlement of Kan river Sites are include in Sakri tehsil.

04 flood affected Settlements are situated on Burai river bank. Out of 04 only one settlement located on left bank and other on right bank. The maximum height of flood affected Settlements from M.S.L. is 320 M. and minimum is 228 M. 45 flood affected settlements are situated on Tapi river bank. Out of these 21 flood affected settlements situated on Left bank and 24
on right bank of Tapi river. The maximum height of Tapi river sites flood affected settlement from M.S.L. is 260 M. and minimum is 130 M. 07 flood affected settlements situated on Arunavati river bank. Out of these 4 settlements on right bank sites and 3 on situated left bank sites of the river. All these settlements include in Shirpur tehsil. The height from M.S.L. between 1, 40 meter to 1, 84 meter. Table, No. 5.5 show the data of Arunavati river Sites flood affected Settlements.

- 31 flood affected settlements are including in Shirpur tehsil. Out of these 18 flood affected settlements are situated on Tapi river bank, 7 on Arunavati river bank, and 6 on Aner river bank. According to Census of India 2001 in the Shirpur tehsil 1, 23,638 populations are affected by flood.

In Shindkheda tehsil 28 settlements are flood affected. Out of these 27 flood affected settlements are situated on Tapi river bank, and one settlement on Burai river bank. According to census of India 2001 in the Shindkheda tehsil 33,1,75 populations are affected by flood. 16 flood affected settlements are include in Sakri tehsil.10 flood affected settlements are situated on Panzara river bank, 3 on Kan river bank, and 3 on Burai river bank. According to census of India 2001 in the Sakri tehsil 79,8,59 populations are affected by flood. 17 flood affected settlements are including in Dhule tehsil. In the tehsil all flood affected settlements are situated on Paza ra river bank. According to census of India 2001 in the Dhule tehsil 56,046 populations are affected by flood.

- All flood affected settlements are compact in nature, because they are situated along with the river site. Flood affected settlements are various size i.e. small size settlements, medium size settlements, large size settlements and very large size settlements are found in the study region. Out of 92 flood affected settlements 23 settlements are small size, 50 settlements are medium size, 07 are large size and 12 settlements are very large size settlements.

- Spatial patterns of small size flood affected settlements clearly show the impact of topography and soil. District as whole accounts for 25 % of the total number of flood affected settlements. At the tehsil level the contribution of flood affected settlements in Sakri tehsil is 06.25 %, by Dhule 17.64 %,
Shirpur 12.90 % and Shindkheda 53.57 %. Medium size flood affected settlements cover 54.34 % of total flood affected settlements in the district, which is relatively higher as compared to another category. At tehsil level the contribution of medium size flood affected settlements is high in each tehsil, Shirpur tehsil accounts for 67.74 % while for Dhule 47.05 %, Sakri 50 % and Shindkheda 46.42 %. Large size flood affected settlement account for 7.60 % of total flood affected settlements in the district. Large size flood affected settlements are not developed in Shindkheda tehsil. At tehsil level Shirpur tehsil have higher percentage 12.90 of large size flood affected settlements, another tehsils like Sakri 12.5 % and Dhule 5.88 % giving her contribution. Very large size flood affected settlements account for 13.04 % of total flood affected settlements in the district. Very large size flood affected settlements are also not developed in Shindkheda tehsil. Another tehsils like Shirpur is only 6.45 %, which is very less to all tehsils. Dhule 29.41 % and Sakri accounts for 31.25 %.

- The impact of topography on variation in size of flood affected settlements is clearly visible. Carrying capacity of land influences the size to which a flood affected settlements can grow. Limited cultivable land and inaccessible area put serious constraints on the growth of flood affected settlements. Extensive stretches of flat and fertile land in the Tapi and her tributaries allow flood affected settlements to grow to a much larger size. In these areas the villages are large both in size and in population.

- In the study area crude circular village with common open place at the center are found. Thalner is the best examples of circular patterns. In the area of continuous extensive fertile land and the area where water is available in specific place have circular pattern of settlements. In the study region where the agriculture is well developed, settlement pattern is radial, e.g Pimpalner. In the study area large numbers of flood affected settlements are elongated settlement e.g. - Morane and Ner. These settlements are located on the right bank of river Panjhora. In the study area some settlements are linear settlements, e.g. - Samode. These settlements are linear due to the undulating topography. The entire flood affected settlements is divided in small squares of houses occupying people of different caste. e.g. - Kusumba. The lanes of
this village meet to each other in right angle. Lanes of the village Kusumba is identified by the different caste. Another reason of such village pattern is newly rehabilitated villages due to flood. Village Manjrod is rehabilited due to flood of the river Tapi. Old village is situated on right bank of the river Tapi. New village is 1 km away from the old village. New village lanes are meet each other in right angle. ‘T’ Shaped Settlement Pattern of flood affected Settlements is found in Dhule tehsil. e.g. - ‘Akhada’

- Drought-affected districts in the State received annual rainfall in the range between 600 to 750 mm through Southwest monsoon, almost all of which is received between June to October. About 50% of the drought prone areas of Maharashtra are in the Deccan Plateau. About 90 % of the land in the state has basaltic rock, which is nonporous and prevents rainwater percolation into the ground and thus makes the area drought prone.

- Dhule district has witnessed both flood and drought conditions. Due to drought conditions of the district and absence of major industrial growth most of the agricultural labors are migrating in the nearby districts and states like Gujarat and Madhyapradesh in the month of October to March.

- Heavy incessant rainfall, spell of extremely heavy rainfall, highly meandering courses of river, large scale deforestation; increased urbanization, Faulty agricultural practices and blocking of natural flow of water are the causes responsible for flood.

- Preparedness, Mitigation, Prevention, Rescue operation, Relief work, Recovery, and Rehabilitation these steps should be taken for the reduction and management of flood hazards and disaster.

- Tapi is major rivers in the district and all other rivers are her tributaries. Also Girana and Purna are other major tributaries contributing to Tapi waters from Jalgaon district. Hatnur is medium project on Tapi upstream in Jalgaon district and Ukai dam is a major project downstream. 92 villages identified as flood prone in the district in advance as a risk assessment measure.

- In the field work Villagers are very much interested and giving fruitful information about the flood.
According to Shri Nathu Devchand Patil and Shri Mansaram Ravji Patil High flood is experience at the village ‘Balde’ in 1969, 1996 and 2006. According to Shri Sittaram Ragho Koli and Shri Vasant Onkar Patil Situation of high flood occurred in 1968 at Rudavali. Shri Tukaram Uttam Patil and Shri Bhushan Gulabrao patil says that high floods recorded in 1968 and 1977 at Vanaval. This flood called as Rail. Shri Bansilal Dodu Patil is a Citizen of village ‘Uperpind’, says that, High flood is occured in 1968, 1993 and 2006. According to him in his life of 70 years he experienced long and high flood in 2006. Village Varkhede is free from flood. In the flood of 2006 water of flood enters up to village. There is need of rehabilitation for safe from future floods. According to persons of Japi village flood are occurred on the year 1944, 1969, 1971, 1977, 1978, and 2006. Flood in 2006 is very dangers for human and animal life. Dnyhlod is located on the left bank of the river Panzara. The mark of H.F.L. is found at Mahadev temple which is situated at the bank of river. High flood is recorded on 1971. The process of rehabilitation is going on away 1.5 Km. from the present village ‘Adhe’. Flood affected settlement ‘Tonde’ is rehabilitated on new side. The distant between new and old settlement is 500 meter. For village Ranjane Land is not available for the rehabilitation because surrounding land is highly fertile black cotton soil so cost of land is very high. People are ready to rehabilitate. June Langane village is fully affected by flood water.

- In the process of rehabilitation only 05 settlements are fully rehabilitated. In such settlements some amenities are given by the governments which are very scanty. People are not happy.

- The process of rehabilitation is slowly going on only in 04 villages i.e. Aadhe, Kumbhare, Ranjane and Kalgaon. The people in these villages are not satisfied.

- Out of 92 flood affected settlements only 09 settlements are either fully rehabilitated or the process of rehabilitation is slowly going on. In the 83 flood affected settlements the process of rehabilitation is not taken by the government.
- All 83 flood affected settlement are located below H.F.L. So there is an urgent need of rehabilitation.
- The reason behind the mentality of the people don’t want to rehabilitate is the highly fertile land in the study region.
- Due to the black cotton soil in the study region, Roads and drainage system is disturbed in rainy season.
- There is a construction of safety wall to minimize the flood hazard.

7.2 SUGGESTION:

It is suggested from the above study to the planners and the government has taken immediate action to rehabilitate the settlements as early as possible. Some settlements are located exact on river bank, people in such settlements don’t want to rehabilitate. In such cases government giving all amenities to the people like mettalled road, land for houses, school building, proper water supply system, proper drainage system, panchayat building, post office, dispensaries etc. There is a need of panel of Government and the members from flood affected settlements to compensate the problem of rehabilitation.

The process of rehabilitation is either completed or going on only in the Tapi site settlements but there is also need of rehabilitation of settlements in her tributaries.

In this Research work, the researcher has tried to complete the present work systematically and created a potential base for further research work on flood affected settlement. It is hoped that the research presented in this thesis will assist in preparation of region wise action plan to reduce the flood hazard for the development of overall human life.