PART-II

ANALYSIS
CHAPTER III

PHYSICAL BASIS, SHAPE AND SIZE
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Imphal is situated in the northern part of the Valley of Manipur and almost equidistant from the main ranges on the east and the west. The part of the plain where Imphal town is situated, is well served by four major rivers, viz., the Nambul, the Imphal, the Kongba and the Iril. 'Kangla', the old kernel of Imphal town is located on a relatively higher ground just on the right bank of the Imphal river in the interfluve of it and the Nambul and its tributary, the Naga Turel.

The geographical location of the town is between longitudes 93°53'E and 93°58'E and latitudes 24°46'N and 24°51'N. It lies at an elevation of about 785 metres above the mean sea level. The location of Imphal, in relation to other towns in the valley is such that there is only one town, namely Lamlai, towards its northern side (at a distance of 16 km), while the remaining six towns, viz., Nambol (14 km), Thoubal (22 km), Bishenpur (25 km), Moirang (45 km), Kakching (45 km), and Churachandpur (61 km), are all on the southern side. Of the other important neighbouring towns just on or outside the boundary of the state of Manipur, the important ones are Silchar town about
260 km away to the west in the Barak Valley, Kohima (142 km) and Dimapur (215 km) to the north in Nagaland, and Moreh about 107 km to the south-east on the international Indo-Burma border.

3.1. PHYSIOGRAPHIC BASIS

Physiography must have been an important consideration in the selection of site for the first settlement at what is Imphal today. It is, however, not easy to identify the early physiography of Imphal, upon which the early settlers had established their first foot-hold. There is no map showing the early physiography of this town and its surroundings except disjointed descriptions and comments incorporated in the historical accounts and early literature.

The process of occupying the valley, which was once full of marshes, lakes and dense forests, must have been a gradual at the beginning. People, who first occupied the valley and the surrounding hills, were not indigenous but are said to be migrants from somewhere in the north. In-long parallel ridges, perhaps, facilitated migration of the early settlers, who did not come down to the valley immediately after their arrival in the region. They came down to spurs like the Nongmaijing Hill, projecting into the valley to the east of the present Imphal town. Once
they came in contact with the plain, it rather attracted them by its abundant biotic resources, despite its marshes and unhealthy condition. The hard life of food gathering and toilsome jhumming were replaced by the initial health hazards of the plain. However, the valley succeeded in drawing the people from the surrounding hills in groups, who occupied different localities in different periods. In course of time the settlers became adapted to the new way of life in the plain. This was the only explanation of developing different principalities in different localities of the valley in the ancient times.

The peopling of the Manipur Valley was thus a long process. Some of those who migrated at first slowly took to sedentary life in the plain. Many of the subsequent migrants, some of whom came by the Iril or 'Linwai' River, could abandon nomadic life and in course of time settled in the plain and merged with the earlier settlers. The presence of several clans in the northern part of the plain around the point of debouchment of the Iril or Linwai River gives evidence to the fact that the narrow flat valley of this river used to act as the path for waves of migration.
With the passage of time and increase in population and their understanding to conquer the forces of nature, the initial uncongenial conditions were slowly removed to make the places more habitable. The lakes and marshes of the valley which were in the process of being silted up by the depositions of the rivers, became shallow more quickly with increasing human interference. The remnants of those water bodies in the form of (seven) lakes are still to be found in and around Imphal. Geographically, it is also a rock basin with a southern plunge. The heavy siltation by the streams on the one hand and the incision of the Manipur River (Turel Achooba as the Manipuris call) on the other, made the present plain of Manipur, which is criss-crossed by many rivers and streams and spotted by the sites of ancient lakes and marshes. The most important prospect that the plain held out to the early settlers, was the regular supply of food.

Imphal is in the centre of the northern part of the restricted oval shaped Plain of Manipur, drained by Nambul, Imphal, Kongba, and Iril rivers (Fig. 7). The land is very fertile, being enriched by annual deposits of silt during each flood. Its earlier topography can be reconstructed from the present one. It is learnt that the early settlements of the Ningthouja principality were at
Kangla, a dry spot on the right bank of the Imphal river. The said spot was well defended on all sides by rivers. The Nambul and its tributary, the Naga Turel (stream) on the west were equally important as Imphal river in the east. Moreover, the upper Naga stream curved towards east completing a water barrier around the said spot. All these rivers were perennial and navigable throughout the year. Moreover, the Iril river acted as the barrier against the attack of the Angom clans. The only gap in the south was and is the narrow interfluve of the Imphal and the Nambul rivers where they came very close to each other (about 914 metres). Away from the rivers there were the marches and the depressions which were waterlogged. The first site of settlement at the middle of the valley was perhaps this spot. It later grew along the river banks on the natural levees. The principality of Ningthouja as a whole was also well fortified. The Langol hills on the west together with the Lamphel Lake on the north-west, the Takyel Pat in the south-west, the Porom Pat in the east were the natural barriers. The Kawa Pat in the south-east was also not less important from the viewpoint of defence. The natural depressions of the surroundings were later on drained and filled up with earth, and houses, buildings and parks have been constructed on them.
Many such depressions were linked by canals dug during the past. These canals not only helped drainage and irrigation but also facilitated transport and communication. Porompat, a depression to the east of Imphal, for example, lies in the middle of a dense settlement. Short streams drain it in dry period, but during the rains, water flows into it from the major rivers. One of the Ningthouja Kings dug the canal named Takhelkhong to drain the waterlogged areas. The importance of the canal was just like opening a new road to an unconnected area, for, in those days water transport was the only cheap means of transport in Manipur for moving fuel, food-stuff and people. The two main rivers, Imphal and Nambul, were also connected by a canal through Yaiskul for navigation.

Of the natural depressions in the neighbourhood of Imphal, the Lamphel Pat and Takyel Pat on the left and right sides of the Nambul river, are important. The Lamphel Pat, larger of the two, is enclosed by Langol hills and the settlements of Uripok, Naga Mapal and Thangmeiband. The Takyel is on the north of the New Cachar Road and only about three km from Imphal. Though these lakes are now dry and contain little water even in the rainy season, they used to have about waistdeep of
standing water even as late as the forties. There was a lake called Kawa Pat about three km south of Imphal. This was also silted up in the flood of 1966. There are several depressions in the eastern neighbourhood across the Imphal river. Kekrupat is one of them, which lies opposite Kangla across the river. There was a depression in between the Imphal river and its left tributary towards which the Imphal river was directed by the kings in the past to relieve the pressure of flood water in the surrounding settlements. The diversion of the Imphal has put several depression to its west now. The city, however, has extended farther east upto Ayangpalli - originally a boundary wall built up by king Ayangba (A.D. 821-910). Ayangpalli is used as a main road connecting Khurai and Kongba, in the north-south alignment. There are many lakes in the east and south of Imphal farther away.

The Nambul river enters the boundary of the present town of Imphal from the west and then flows to the east until it bends south on the western side of the Kwai-ramband market, where its tributary, the Naga Turel or Naga stream meets it from the north. The Naga stream keeps the Awa Ingkhol to its north and Nagamapal to its west. Nagamapal is, in fact, on the bank opposite to the central business district of the town. The east-west
course of the Nambul river marks the boundary of Sagolband and Uripok wards of the town. The southern bend on the west of the main market in the town again marks the boundary of the central business district and the Waheng Leikai settlement area.

The Imphal river flows north-south with a meandering course. Its course was diverted now and then in the past. The interfluves of the Imphal and the Kongba rivers are marshy tracts. The Kongba river is not a prominent one like Imphal river. Khurai and Wangkhei are the wards in the interfluves of these rivers. They are one of the oldest settlements in the principality.

The Iril is another important river east of the Kongba river. The present town (G.I.A.) extends eastwards upto the Iril. It restricted the movement of people in the past and thus protected the town and the principality. Though it had, as such, little importance to the town, it contributed much for the formation of the wide plain on which the town now stands. Thus, defence and protection from flood were the main considerations of the site of Imphal town. The raised ground on which Kangla and present Imphal is situated is about 4.8 km long and lies between Chingmeirong and Chinga hills. Within this higher tract Kangla, the royal capital, was situated at the highest
spot. In course of time silting rendered the river beds higher than the adjoining plain. The water then used to be contained by the riverside embankment. Whenever there was any breach in the embankment at the flood time, water used to spill out and inundate the flood plain including the settlements. Kangla, however, was so high that it was never submerged.

A striking change noticed in the physiography of the area now, is that several marshes and lakes have disappeared in the face of man's effort to build settlements. The original physiography has been changed not only by filling in the lakes, but also by constructing embankments and diverting rivers. The Imphal river, which was diverted by the kings in the past, abandoned its old course and now flows through Khurai. The overall change is so much that one will now be struck with wonder because of reference to Pats (lakes) with no water but thick human settlements.

The flood is a common feature of the rivers of Manipur as they spill over the flat plain surface from the steep hill slopes. The floods have three peak periods corresponding the rhythm of rainfall in the state. If the rainfall is widespread, the rivers cannot drain all the water and flood occurs. Though the floods in Manipur do
not last long, the aftermath tends to be disastrous. The water supply of the town is affected badly. The problem of drinking water becomes serious in the surrounding areas which are not linked with pipe lines. The ditches and drains become filled up with filthy water and are turned ideal breeding ground for mosquitoes and insects. Such a situation leads to the outbreak of epidemics in June and July.

The floods in the Nambul river inundates the western portion of the town. Although the drains in the Imphal municipal area are attached with sluice gates, these cannot check the high level floods and the areas between the Kangchup road and the New Cachar road, particularly Sagolband and Uripok have high frequency of submergence. During such time the residents have to transport their belongings to a safer place or to the nearby main road. The plantain trees are used for making temporary rafts for relief and short transport. With the recession of flood water, people are busy again repairing their houses and clearing the silt and debris. It generally hits the poor most. The riverine tracts of the Nambul river within Imphal town is affected every year requiring annual repair and people seem to accept this calamity as an unavoidable fate rather than making any concerted
effort to remedy it.

3.2. CLIMATIC BASIS

The tropical monsoon climatic rhythm of Imphal is not very much different from that in any other town of North-East India except that it is affected by the locational and situational factors. The average annual rainfall of the town is 1435.8 mm and the average annual temperature is 20°C. The climograph of the town shows all the characters of a monsoon climate (Fig 8). An analysis of the figures (Appendix table 1) shows that July and August have the similar temperature and humidity conditions. All the months except January and February approach the muggy condition, for, the temperature and humidity of the remaining ten months are high enough.

Thus, January and February are the only favourable months so far as the sensible temperature is concerned. The hythergraph (Fig 9) shows an elongated shape. The five months, from November to March, are relatively dry with a small amount of precipitation (113 mm). The rainfall in the remaining seven months is high and exceed 1322.0 mm with July recording the highest.

Taking the characteristic of temperature and rainfall into account a year in Imphal, and for that matter
in Manipur, can be divided into two distinct seasons (1) the winter, lasting from November to the end of February, and (2) the summer, including the rainy days, from March to October. Again, the summer can be divided into two parts, the hot weather period extending from March to early June and the wet period of four months duration, from late June to October. The time of bursting of the monsoon rains is, however, not rigid.

3.2.1. Winter Season:

The temperature falls gradually from its peak in summer and by November it is slightly above 15°C (Fig.4D). It further drops to below 15°C in December. The average mean temperature of this month is 13.5°C, though some very cold nights may record as low a temperature as 0.6°C. The fall of temperature continues up to the month of January. In January the average mean temperature is around 3°C but the absolute mean may approximate 2°C. There is again a gradual rise of temperature from February, although the nights are still cool.

The high pressure in winter in the valley is of thermal origin being the result of local low temperature. The fall in temperature from October to November increases atmospheric pressure. It is about 998 mb in October, and
997 mb in November, again 998 mb in December and 398.7 mb in January. Thus, in the four winter months the difference of pressure is within 4 mb. During these months feeble winds normally blow from the south although that from other directions are not unknown. In fact in November and December winds are southerly in the morning hours but south-westerly in the evening. The velocity of these winds are low, ranging from 3 to 8 knots, but it increases with the approach of the summer months. So the highest velocity of wind in the winter season is recorded in February with 6.8 km per hour.

The winter months in Manipur experiences little rainfall with a few number of rainy days. Rainfall is 30.1 mm in November, 4.1 mm in December, 18.3 mm in January and 28.4 mm in February, with 1.5, 0.5, 1.7, and 2.7 rainy days respectively. The minimum rainy days in a year occur in the month of December.

The formation of fog is very frequent during the winter months. It results from temperature inversion caused by rapid radiation and air-drainage into the valley. Fog generally hangs over the ground in the morning hours, but in December and January, it starts gathering even in late hours of night and lingers unto
late afternoon. Fogs, in fact, start appearing from August and remain in the horizon till February. In this season the occurrence of squalls, thunderstorms and hails is reduced to almost nil.

3.2.2. Hot Weather Season:

By the end of February temperature begins to rise. While in this month the mean temperature is 4.6°C, it rises sharply to 18.3°C in March and 22.1°C in April. After that the rise tends to be slow. In May the mean temperature stands at 239°C. The difference between the monthly maximum and minimum temperatures becomes very high during this period. It is found that the maximum temperature is 27.6°C in March, 28.9°C in April, and 28.7°C in May. April records the highest maximum temperature. The approach of the rains lowers the range of temperature but makes the atmosphere increasingly sultry.

The increased temperature of the hot weather season lowers the mean pressure gradually. In the month of March the pressure is 993 mb, in April 990 mb, and in May 987 mb, falling at the rate of 3 mb per month. The formation of the low pressure centre in the north-western part of India concides the fall of about 10 mb of atmospheric pressure in Manipur. The low pressure
attracts the winds which are again multi-directional. Yet winds come frequently from south-west, south and west (Appendix table 2). The wind velocity is not so high in these months as it ranges between 8.0 km per hour in March and 8.7 km in April. This is the time of occasional cyclonic winds. The cyclones normally arrive in the evening after the formation of lows due to day's heating. In the multidirectional winds the remarkable feature is the shift from the easterly winds in the morning to westerly winds in the evening each day.

The rainfall during this season is caused by cyclones from the Bay of Bengal. In May it occurs in short but heavy showers. The average rainfall is 32.1 mm in March, 113.3 mm in April, and 268 mm in May (Fig.11). Fog is absent in these months, but hailstorms are not infrequent. The highest frequency being 7 days in March. The development of cyclonic conditions caused by small low pressure pockets increases the number of thunderstorm, which increases from 7 days in March to 14 days in April. From April it falls again to 11.7 days in May.

3.2.3.Rainy Season:

The second half of the summer comprising the period from June, to early October is the wet period with
rainfall from the south-west monsoon being frequent and regular. It may, however, be noted that the regularity of rainfall is intervened by short spells of drought.

The rapid rise of temperature before the onset of rains was checked with the well distributed rainfall from late June. After this month the temperature increase is very little. By June the temperature stands at 25°C. After this there is only a slight rise in the monthly mean temperature in July and August (25.1°C). From August it begins to decline to 27.7°C in September and 22.4°C in October. The decline continues upto January. During these months the range of temperature is about 7°C. The range increases as the season advances reaching 8°C and 10°C in September and October respectively.

The sky generally remains cloudy during this season, the cloud cover being more than 65 per cent in the months of July and August. The period is the time of high relative humidity which reaches about 80 per cent. Rainfall is widely distributed in the valley and the hills as well. Average monthly rainfall in June is 263 mm, in July 271.1 mm, in August 175.9 mm, in September 131.2 mm and in October 98.1 mm. As much as 66.82 per cent of the annual fall occurs in this period. The high temperature
and high humidity render the atmosphere trying, and the weather is not congenial to hard work. The rains in October, at the end of the season, often causes mini-floods for the last time in the year.

As to the other climatic phenomena, hailstorm is common in these month especially in September and October. Fog is rare in the early months but it begins to appear in the distant horizon in the morning and evening from August.

### 3.3. SHAPE AND SIZE

The first estimate as to the size and extent of the town, which was apparently spread out, was made by Captain Dun in 1886, three years before the proper demarcation of the town. He estimated the area at 67.5 km$^2$.\(^1\) King Surachandra in 1889 very clearly demarcated the boundary of Imphal which put the area at

37.68 km\(^2\). + Major General Johnstone demarcated the boundary of the town again in 1896 and put its area at 38.84 km\(^2\). 2 His estimate compares favourably with that of king Sumchandra Singh. 3

+ His boundary starts from Waikhom Khongnangkhong on the south, encloses Bashikhong and runs upto Porokshoubi on the south-east. It then swings northward through Mireppung on the east and sweeps westward around Kongba Laipham and Khombidok connecting these with Mantri Pukhri on the north. It then runs upto Irioshemba hill on the west enclosing Lamphel Pat. After that it curves eastward following Moirang Hanuba Leirak in the south-west enclosing Kwakeithal and the paddy fields upto Langthabal settlement. After this it swings east to meet the starting point.

Johnstone in 1896 described the boundary as follows: On the north side it touches some low hills called Chingmei-roong. The boundary then runs westward, touches the shallow lake, Lamphel Pat, which is partly enclosed by a part of the Longol hills. It then runs south and is intersected by several roads, notably the road to Silchar. After the point of intersection the boundary goes through the rice fields and sweeps round in an easterly direction. Towards south Imphal is bounded by the plain of Langthabal, at one extremity of which lies the old capital. Here two rivers intersect the boundary which goes farther east and reaches the lower ranges of hills rising 800 m above the valley. The boundary then turns northwards accross the rivers Iriel and Imphal and comes back to the starting point.


The boundary demarcated by king Sumchandra was used for census purposes for more than five decades up to 1941. However, in 1951 the official size of the town was reduced to 5.17 km$^2$ covering only the area covered by the Town Fund Committee (Fig.12).

The urban area was, however, redefined in 1956 and the Imphal Municipal Area (IMA) was constituted with an area of 17.48 km$^2$. The I.M.A. was further expanded subsequently in 1972 to 29.57 km$^2$. The expansion can be indicated as the trend of growth, as shown in table 3:1 below:

<table>
<thead>
<tr>
<th>Line of Expansion</th>
<th>Direction</th>
<th>Distance in km from City Centre as Aerial Distance</th>
<th>Growth in 1972 over that in 1956</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimapur Road</td>
<td>N</td>
<td>2.150 2.100 4.900</td>
<td>2.800</td>
</tr>
<tr>
<td>Across Lamphel Pat</td>
<td>NW</td>
<td>0.100 1.700 4.912</td>
<td>3.212</td>
</tr>
<tr>
<td>Kangchup Road</td>
<td>W</td>
<td>0.075 2.500 3.300</td>
<td>0.500</td>
</tr>
<tr>
<td>Tiddim Road</td>
<td>SW</td>
<td>0.100 2.600 4.412</td>
<td>1.512</td>
</tr>
<tr>
<td>Burma-Sugnu Road</td>
<td>S</td>
<td>1.400 2.800 3.750</td>
<td>0.850</td>
</tr>
<tr>
<td>Yairipok Road</td>
<td>SE</td>
<td>1.300 3.250 3.250</td>
<td>Static</td>
</tr>
<tr>
<td>Irilbung Road</td>
<td>E</td>
<td>1.255 1.755 1.755</td>
<td>Static</td>
</tr>
<tr>
<td>Ukhrul Road</td>
<td>NE</td>
<td>3.200 3.400 3.400</td>
<td>Static</td>
</tr>
</tbody>
</table>

Source: Measurement by the author.
While 'Kangla' is rectangular in shape, the old Imphal looks like a mango in its rough outline. The Town Fund Area, which was taken as urban Imphal in 1951, was elongated in the north-south direction. But, the newly formed municipal or the I.M.A. area of 1956 is circular in shape with some projections along the main roads. The shape of the I.M.A. changed into that of a pistol-head in 1972 when certain additions towards the north-west, south and north, were made.

It is interesting to note that in course of development, the centre of the town moved by about 0.65 km towards west from 'Kangla' to the Khwairamband market. Since 1891 the former ceased to be the political and social centre, as it was converted into a mere cantonment. The control and political power exercised from the new palace having been meagre due to the changed administrative system of the Britishers, the Khwairamband market gained its importance gradually as commercial and geographical centre of the town in the subsequent periods.

The maximum growth of Imphal up-to-date, from the geographic centre near the Khwairamband Bazar, is about 4.912 km across Lamphel Pat (NW) which was the site of an old lake and where the new government offices have been
established. This extension from the boundary by about 3.212 km within 15 years (from 1956 to 1972) is the highest. The second highest extension is along the Dimapur Road covering a distance of about 4.9 km from the city centre and 2.8 km from the boundary as it was in 1956. The third is along the Tiddim Road covering a distance of 4.412 km from the centre and 1.812 from the boundary. Along the Burma-Sugnu Road the respective extensions are 3.750 km and 0.850 km.

The maximum stretch of the town is different in different periods, though the maximum extensions have always been in the WSW - ENE and NNW - SSE directions (Table 3:2).

Table 3:2

Maximum Expansion of Imphal Municipal Area in Different Periods.+

<table>
<thead>
<tr>
<th>Year</th>
<th>WSW - ENE</th>
<th>NNW - SSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Km</td>
<td>Net Growth (Percent)</td>
</tr>
<tr>
<td>1951</td>
<td>1.315</td>
<td>-</td>
</tr>
<tr>
<td>1956</td>
<td>5.50</td>
<td>318.25</td>
</tr>
<tr>
<td>1972</td>
<td>8.55</td>
<td>55.45</td>
</tr>
</tbody>
</table>

+ The maximum extent of about 4.00 km N - S in 1951.
The extension of Imphal town in 1951 was about 1.315 km in WSW - ENE and 3.615 in NNW - SSE. The sudden expansion of the IMA had brought about an increase of 318.25 per cent of the original length of the former and 42.46 per cent that of the latter. Recent inclusion of Lamphel Pat and the areas sprawling along the roads to the north and south of the town has increased the WSW - ENE extension of the town to 8.55 km and the NNW - SSE extension to 8.5 km. Thus, the resultant net growth is about 55.45 per cent and 65.05 per cent respectively over that of 1956. The overall areal growth in the period, 1956-1972, is more pronounced towards the south-west.

The merit of the degree of circularity of a town has come to be realised by the urban geographers now-a-days. A circular town, unlike those with any other shape has certain advantages in that it can accommodate a large population in a small area, involves less expenditure in the utility services like transportation, electricity, sewerage, water supply, telephone, etc., as the periphery is equidistant from the city centre. This shape is normally not attained because of physical and social

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4 Sinha, B.N., Sirsi: An Urban Study (in application of research models), Karnataka University, Dharwar 1970, p. 11.
hindrances, unless, of course, sustained and planned effort is made. However, urban planners today tend to stress on the circular development of the towns. It has, in fact, been found that the measure of circularity+ depicts not only the shape but also the degree of uniformity in the development of a city. The measure of circularity thus depicts the relationship between the actual area of the city and its circular area, taking the maximum stretch of the town as the diameter, which is thought as the optimum size of the city (Fig. 13). The measure of circularity of Imphal is given below in table 3:3.

Table 3:3
Imphal Town
Measure of Circularity

<table>
<thead>
<tr>
<th>Year</th>
<th>Area (Km²)</th>
<th>Distance between 2 most distant points</th>
<th>Measure of circularity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Aa</td>
<td>Dp</td>
<td>Mc</td>
</tr>
<tr>
<td>1951</td>
<td>5.17</td>
<td>4.00</td>
<td>41.14</td>
</tr>
<tr>
<td>1956</td>
<td>17.48</td>
<td>5.50</td>
<td>73.57</td>
</tr>
<tr>
<td>1972</td>
<td>29.57</td>
<td>8.55</td>
<td>51.30</td>
</tr>
</tbody>
</table>

+ Measure of circularity is calculated by the following formula:

\[
MC = \frac{100 \times AA}{(3.1416)(Dp/2)^2}
\]

Where MC = Measure of circularity
AA = Actual area of the town
Dp = Greatest distance of two points on the boundary
In the variance from 0 to 100 the higher the Me, the more is the circularity. Elongated shape of Imphal in 1951 gives the Me value of 41.14, but in the subsequent two periods the town showed a tendency towards circular shape (Me = 73.57 in 1956 and 51.50 in 1972). The decrease in circularity from 1956 to 1972 was due to reclamation and rapid expansion towards the Imphal swamps during the late fifties and sixties.