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EVOLUTION OF CITIES IN MAHARASHTRA

AN ANALYSIS OF THE PHASES OF URBANIZATION

BY

K. R. DIKSHIT

The progressive increase in the degree of urbanization and the growth of individual towns all over the world is necessarily the result of a change in the pattern of world economy. The factors that promote the growth of cities today are of very recent origin. Towns have, nevertheless, existed in history from very early times though they were not so numerous and had developed in response to social and economic conditions very different from today. An appreciation of the present arrangement of towns, therefore, needs not only an analysis of the existing social and economic conditions but also an examination of the factors that may have given rise to towns in the past. One can not ignore the fact that an explanation of many of the urban features lies in the past and it is worthwhile knowing the sequence of their development. The present trend is, however, very different and the work of the geographers and the workers from other disciplines is largely confined to the analysis of individual towns in the light of their present functional and morphological structure. An attempt is, therefore, made here to trace the evolution of towns by bringing into focus the relative importance of different factors, in a historical perspective, as they have influenced the growth of towns in Maharashtra.

City growth in Maharashtra started comparatively late. After the coming of Aryans, India was divided into two major political blocks. The Aryans held their sway over the fertile Gangetic plain and the pre-Aryans occupied the area south of Krishna. In between the two, the region between the Vindhyas and the river Godavari remained for long a buffer territory. It is quite likely that before the advent of Buddhism the Aryan civilization had not overstepped the Vindhyas. Some believe that the Aryans penetrated the Peninsular India in 7th century B.C. Believably the Aryans were not the city builders. Their virile race with an essentially pastoral occupation does not seem to have had the tradition of an organized capital from which the affairs of the state were governed. Many of the early cities of north India, none of which is traced back to earlier than 250 B.C., have, therefore, an unmistakable impact of Hellenic culture or Buddhism. In contrast to this, the Pre-Aryans had a well developed art of town-building as is attested by

the ruins of Harappa and Mohanjadaro in Indus valley. It is quite likely that the Aryans learnt the art of city-building from the Pre-Aryans, and practised it on a large scale, with the growing need of a central administration, to govern a large territory in an organised way. The advent of Brahmanism and idol worship led to the building of temples and the tradition was kept up, in the form of 'stupas' and 'viharas' even after the rise and adaption of Buddhism by the emperors of the North. In early Buddhist times north India was occupied by 4 major kingdoms viz Kosala, Magadha, Avanti and Vamsas, each of which had an important capital city. The early towns of the north were, therefore, often the imperial seats and the well known centres of Buddhism are developed around some temple the God of which may have gained eminence during the Brahmanic period. Sometimes, they were mere large settlements at some strategic locations.

The pre-Aryans, on the contrary, had a well established system of administration and the temple cult dominated their life and culture. The temples have, in fact, always been in the cities of classic antiquity a means to graft the devine power with the temporal existence of the kings. The result was that even in very early times temple cities existed in the extreme South which was ruled by a number of dynasties. The three earliest Tamil dynasties viz Pandvas, Cholas (Colas) and Cheras (Keralas) had their capital cities at Kolkai (Tambrapani), Uraipur (old Trichinapoly) and Vanji (now Tiru-Karur) respectively.

In contrast to the two regions mentioned above, Maharashtra not being the permanent home of any ruling dynasty for a long time did not have a capital town or other types of urban centres. The Aryans are believed to have crossed the Vindhyans in the 7th century B.C. but they did not establish a permanent foot-hold here.

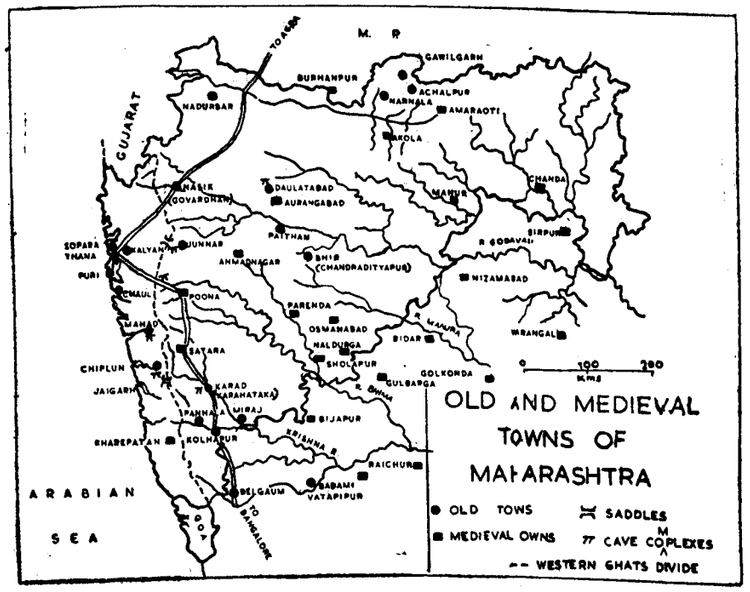
About 7th century B.C. the country being divided into 16 janpadas, 'Asmaka' was one of the janpadas which covered much of the Godavari basin. The present Konkan particularly its northern part was called the "Aparanta" whose capital was 'Surparaka', modern Sopara, a settlement now about 20 miles north of Bombay. This settlement appears to be one of the oldest in Peninsular India as it was visited by the legendary king 'Ram' and so was 'Karhataka' the modern 'Karad' which is also mentioned in Ramayan. Most of the lands mentioned in Ramayana are either confined to north of Vindhyas with the sole exception of 'Vidarbha' or are located in the extreme south suggesting that there was virtual power vacuum in this part of the country. But in the 3rd century B.C. Ashok seems to have sent ministers of religion to the Rastikas, Petenikas and Aparantakas, the last being well known of which the capital was Sopara. It is suggested by some that 'Rastikas' were in all probability the people of the present Maharashtra for a tribe named "Rattas" has from the remotest time held the political supremacy of Deccan. At the same time it is not unlikely that "Petenikas" was an early name of Paithanakas the rulers of Paithan. This provides an indirect evidence of a very early existence of Paithan. Besides, the town is also mentioned in the inscriptions of Pitalkhora near Chalisgaon. Thus the two earliest

capital cities of Maharashtra were Sopara and Paithan. In first or second century A.D. another town named Junnar appears on the scene; it was probably the capital of Satraps (Kshatrapas) who were feudatory to the Saka Kings aronnd the 1st century A.D. It is not clear why the Kshatraps should have prefered Junnar to Paithan as their capital. Proximity to coast and defence considerations may have been the important criteria. In second century A.D. the region passed into the hands of Satvahanas with their capital at Paithan. Another town that was not so important as Paithan but did exist as a large settlement was Govardhan, the present Gangapur near Nasik which was a provincial capital of a branch of Kshatrapas.

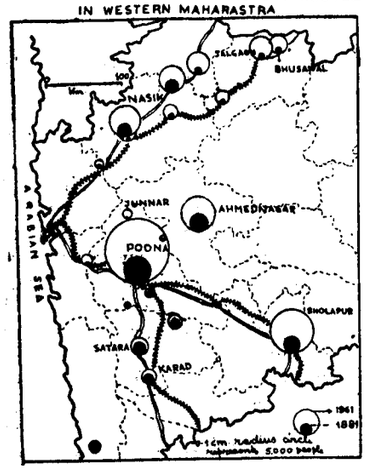
During the reign of both the Kshatraps as well as the Salvahnas Buddhism was a flourishing religion, though the kings were not badly disposed to other religions. The result was that apart from the few capital cities like Paithan, Karhatka, Junnar and Sopara, a large number of important religious places dominated by Buddhist institutions also developed. These were often the cave sites and the caves were excavated in the basa'tic escarpments overlooking the valleys attended by some large settlements in the vicinity. The Buddhist monks often travelled by sea and hence several of the creek-heads in Konkan are characterized by cave monasteries intended as rest houses where the mendicants stayed for sometime particularly during the rainy season.

The Buddhist temples, a part of the cave complexes, were thus both on the coast in Konkan and inland on the plateau. In both cases they were cut in the escarpments. While the 3000' high grand fault-escarpment of Sahyadris provided a suitable venue both from the point of architecture as well as on grounds of suitability to the itinerant mendicants, the valley escarpments, and the receding slopes of the Basaltic mesas bordering the valleys were utilized for building caves inland. The caves along the coast were associated with the landing sites while inland the cave were associated with the transport routes following the river valleys. In fact, the cave occupied the same position in the first century settlement economy of Maharashtra as temples at a later date when Brahamanism became the dominant faith of the people.

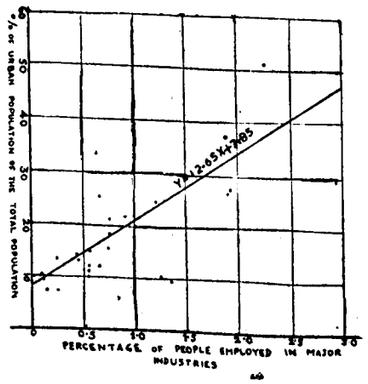
Another set of early urban settlements were those related to maritime trade and collection and dist bution economy of the land. While one comes across references of a number of port towns, there do not appear to have existed many market centres inland as exchange economy had not developed to the extent that could warrant large scale trade and consequent growth of market towns Sparse population, dearth of highway, slow and inefficient transport confined to pack animals may have been the factors that precluded the growth of many market towns. The inland trade centres, if any, coincided with the regional centres over an established transport route. The early urban centres which were more or less like a large settlement with a complex functional base, with considerable semblance to rural settlements, were thus concentrated along the coast in the valleys and a few along the important routes which generally followed the valleys.



GROWTH OF TOWNS ON TRANSPORT ROUTES IN WESTERN MAHARASTRA



RELATION BETWEEN INDUSTRIALIZATION AND URBANIZATION IN MAHARASHTRA



The early urban centres of Maharashtra thus can be grouped into 4 categories

(i) The capital cities

(ii) Port towns

(iii) Cave settlements both on the coast and inland

(iv) Important settlements on inland transport routes

The capital cities

Sopara, Paithan and Junnar have already been mentioned as the capital cities in the foregoing pages. The location of each one of these very early towns was governed by administrative and defence considerations. Sopara, which is virtually non-existent today was the provincial capital of "Aparanta" the coastal province of the Mauryan empire. It lies midway between Broach and Ratnagiri. Tht coastal "janapada" in all probability extended as far north as Tapti and a median location to administer the entire territory jestifies the choice of Sopara. Sea transport must have been another consideration for its location on a sea creek. In fact, Sopara should have had the same advantages in the first century B.C. as Bombay has today. A location inland could have created problem of effective control particularly at a time when long distance travel by land was hazardous and international contacts were most effective by sea.

Paithan, lying on Godavari, was another and perhaps the most flourishing town of peninsular India. In first and second century A.D Paithan was the primate city of Maharashtra and enjoyed the patronage of Salivahanas as their capital. Periplus speaks of Paithan as the greatest city in 'Dakhinabades (Dakshinapatha) noted for its glory. It had trade relations with the Mediterranean countries exporting onyx. The present town Paithan hardly speaks of its glorious past and it is quite possible that the town was not very big though it enjoyed the royal patronage of the Salivahanas who ruled practically the whole of present Maharashtra and the adjoining territory. To a modern mind the town does not hold any locational advantage. On the contrary, a number of geographical factors weigh against its location. The town lies in the 'dry core' of Maharashtra with hardly 15" rain, poor soil and low agricultural fertility in the hinterland. Even today the region is least populated and the least urbanized in Maharashtra. It had no specific advantage in the defence strategy of the region. Geographical centrality, however, may have been a major consideration which guided the Salivahanas to locate their capital in this semiarid region. With its arms long stretched the Salivahan empire had too much of a job to administer the empire and keep it from breaking. Perhaps the same factor of geographical centrality actuated the Bahmanis and subsequently the Moghul satraps to establish their seats of administration in this dry and hostile tract. Accessibility and speedy transport have always been the problems with the early imperialist powers, be it the Mauryas or the Moghuls. The Marathas could establish themselves in the shelter of the Sahyadris because they never controlled and administered a large, unified and compact empire effectively. and even if it were accented that they did have an empire in middle 18th century, a great deal can be attributed to the lack of accessibility and the centrality of their control system at Poona to its downfall.

The Salivahanas were of Andhra origin and it is quite natural that in the expansion of their empire they moved up along one of the

major valleys contained as they were on the other side by the Bay of Bengal. The river valley gave them the advantage of rapid movement, an assured water supply and a moderate agricultural support. To them the advantages of territorial control and running reinforcements in times of emergency must have been more important than mere economic considerations.

Other capital towns in the 1st century A.D. were of limited importance. Junnar the capital of Kshatrapas who, it appears, pitched themselves at Junnar not to lose sight of the sea, commanding at the some time the view of the plateau they were ruling. Junnar commanded a valley, a tributory of Bhima, lying at its head, and a pass that connected it with Konkan. Kalyan was another important city. Located on a creek-head it had the advantage of inland location that was an asset to the sailing vessels in the pre-steam navigation days. Later it became the regional capital of Chalukyas in the 11th century A.D. One often finds the mention of Karad and Kolhapur as important early urban centres. Karad existed in 1st century A.D. and is mentioned in an inscription at Kuden as an important town during the rule of Satvahanas. Located on the confluence of Koyna and Krishna, the place had acquired a religions significance. It was ruled by the Silharas in 11th and 12th century and was the princely seat of one branch of Silhara dynasty in the late 12th and early 13th century. Besides, it was the capital of the feudatory princes called the "Sindas" for some time in the late 12th century. Over the centuries, the town has shed away the splendour typical of a capital city that it once was. One does not even find the historic ruins. An definite size of the town with its river side location, which is none too safe from the hazards of floods and excessive erosion in the wake of a lateral swing, may have proved fatal in eliminating the traces of the city. A striking phenomenon about the location of Karad is its rich umland supported by rich soil, adequate rainfall and consequently a high agricultural productivity. It is obvious that being the capital of a second rate power and of some feudatory prince the town had to depend on its regional agricultural surplus unlike the capitals of the mighty empires which funnel into their making the resources of a vast territory.

Kolhapur, as generally believed, is an old town and support to this idea is sought from the discovery of a Buddhist Stupa in the vicinity. The town 'Hippocura' of Ptolemy is generally identified with Kolhapur, though there is no definite support for this idea. More reliable evidence of the existence of Kolhapur is available from 12th century onwards when it was the capital of a branch of Silhara dynasty, though the Kolhapur dynasty itself may have been founded as early as 10th century. That the town enjoyed the patronage of Silhara is clear from the temple of Mahalaxmi which is the nucleus of modern Kolhapur as the Silharas, thouhg possessing a fair measure of religious tolerance, were the followers of Pouranic and Vedic religion. Besides Kolhapur, another capital of Silharas and not far from Kolhapur was Panhala, and some of the Silharas called themselves 'Panthaleshwar'

Mention has to be made here of Achalpur and Deogiri (Daulatabad) both of which were the capital towns. Achalpur was the capital of Rashtrakutas though the main branch of Rashtrakutas had its seat at Malkhed, which is 60 miles east of Sholapur outside Maharashtra. Deogiri was the capital of Yadavas in 11th century and remained in

their possession till 1294 when it was captured by Alla-Uddin Khilji.

Deogiri can be considered both an old and a medieval town. The fort at a high strategic point can be compared with the Greek acropolis. More will be said about the town later on. Achalpur, for a short time the capital of Rashtrakutas, is no longer a thriving city. Chalukyas who came before the Rashtrakutas in the 6th century had their capital at Vatapipura, now identified with 'Badami' in Bijapur district. Though Badami the capital if Chalukyas and 'Malkhed' the capital of Rashtrakutas are not directly within the purview of this paper, a few words must be added about them to suggest the importance of distance as a factor in the defence and administration of a territory. A well knit administration in these remote days was far from a possibility and the administrative hierarchy often transformed into a royal hierarchy based on the sharing of power and the benefits between the central authority and the quasi independent governors ruling in distant areas. What appears quite strange in this context, is the shifting of capitals of both, the Chalukyas and the Rashtrakutas further south. One, however, wonders if it were not the conquests of Samudragupta, and subsequently of Harsha which alarmed the ruling dynasties of the South and forced the Chalukyas or even perhaps the Rashtrakutas to develop a safe base deep inside their territory with a far better chance of repelling the invaders than could be possible otherwise. Both these towns have since decayed and in case of Badami only the ruins of the the towns are to be found.

Port Towns

Urban settlements dominated the Arabian sea coast very early in history. There were not a few towns on the Konkan coast. Sopara, Kalyan, Puri, Shristhana (Thana), Chaul, Uran, Nagothana, Roha, Shrivardhana, Bankot, Jaigadh, Kharepatane and Malvan are some of the very old port towns. Inadequacy of inland transport routes often led to the development of coastal towns on the sea creeks far inland to command a larger area. Creek-heads or estuary-heads commanded the best sites for the sailing vessels which did not require a sizable draught and could easily ply a considerable distance inland giving rise to small break-of-bulk towns which absorbed a greater degree of foreign influence and developed international marts. Some of these port towns existed as early as the first century of christian era and are mentioned by the most ancient voyagers. Periplus mentiins Barigaza (Broach), calliena (Kalyan) Semulla (Chembur) Mandagara (Mandad), Palaipatmai (Pal, near Mahad) and Melizeigara (Jayagad). Irrespective of size, it appears that towns were more numerous on the coast and received the attention of foreign traders. Water transport was the most effective medium in early days of christian era and a creek head location was both a site for handling the international trade as well as a central place of collection and distribution for a small region between the Sahyadri and the coast.

Little is known about the character of these towns. One would not, however, fail to notice an ethnic composition of the population which distinguishes itself from that of the inland towns. Being in contact with East Africa and the Middle East, the region and more specifically the towns have been exposed to the influences of these foreign lands and present a variety of ethnic stock in which one finds both the semblance of Negroid traits, and the ethnographic features of the Semitic

group. Over the years these towns have not grown much and the advent of steam navigation has made them virtually defunct as international ports. They now handle small volumes of coastal trade and remain closed for three monsoon-months. These are now no more than small fishing centres with country crafts plying in and out of their creeks.

Cave settlements

Not less important in the geography of early towns are the cave settlements. Such settlements developed at the time when Buddhism had become the State religion in north India, and Buddhist medicants moved over the entire length and breadth of the country to propagate Buddhism. It may be mentioned here that 90% of the cave temples in India are in Maharashtra. They occur in the vicinity of some important urban settlements or along some well established transport routes. Thana, Nasik and Poona districts are the strongholds of Buddhist caves. The cave settlements occur in two groups.

(i) near the landing sites, and

(ii) in the valleys providing transport routes

Along the coast these caves are near the landing sites and may have encouraged the growth of small towns. This, however, is not definite and it is quite possible that these caves developed in response to certain factors incluiding a pre-existing towns in the vicinity instead of their being themselves the cause for the growth of towns. The association of these caves with the towns nevertheless is certain. On the coast the four important groups of caves are associated with 4 towns. These caves were certainly situated at landing sites on the creeks. In some cases the sea has since receded because of silting.

Name of t he creek	Dabhol	Bankot	Rajapuri	Ghodhandar
Caves and/or Towns	Chiplun	Mahad	Kudem	Kanheri & Thana

The cave temples were not confined to the coast, and have important centres even inland. Of the several groups in which they occur four are very important.

(i) Upper Indrayani group

(ii) Upper Godavari group

(iii) Middle Godavari group

(iv) Upper Krishna group

The cave temples in the upper Indrayani valley are carved in escarpments at 'Karla' and Bhaja. The nearest settlement reported was "Valuraka", though this settlement has not been identified and it is quite possible that it may have been a small settlement on the site now occupied by Lonavala. The inter relationship between the caves and the towns are more spectacular in Godavari valley. In upper Godavari valley, the Buddhist caves Popularly known as Pandu Lena and the Jain caves called Chambhar had unmistakable association with Govardhan now Gangapur near Nasik which is mentioned in the inscriptions.

Nasik has an advantageous location on the trans-country route besides commanding the upper

Gdavari valley. The strategic position of Goverdhan may have been utilized by the Buddhists in developing the caves in the transitional zone that formed the common frontiers of the Western Satraps ruling parts of western India and the Andhras ruling over the central part of the Deccan plateau. The cave at Ajanta and Vellur in the middle Godavari valley are not for away from Paithan though no important town of antiquity exists in their vicinity. The orientation of thesecaves to the lines of communication is more plausible an explanation of their sites than their identification as a sub-urban appendage to some town. The only other important cave occur in Krishna valley near Karad and it is clear that the importance of the latter in early historic times, played a very decisive role in determining these cave sites.

Early Towns on transport roures

Transport has always been an important factor in the growth of towns, and the relationship is only too clear in case of the old towns. In early days of city growth the modes of transport were very primitive and the terrain conditions presented formidable difficulties. Wheel transport was, however, employed and the chariots were an integral part of many royal armies which could move only on regular terrain. In this context, the trans-continental routes had special significance in the life of the country. These were aligned through passes, running along the valleys or penetrating the productive agricural regions. Along these routes or commanding access to them were located some towns that were important marts for collection and distribution of goods. In Maharashtra important routes followed the valleys. And the most important one that connected the Aprarnta, the north Konkan, with the Gangetic plain ran cross-country almost with the same alignment as the present Bombay—Agra road passing over the plateau of Malwa and Central India.

The three important routes joined Konkan with the upland and then descended down the valleys were each commanded by important towns. From Thana which was an important coastal town the routes diverged as follows.

1. The most important of these routes radiating from Thana traversed the Sahyadri through the saddle of Kassara Ghat and led to north India via Nasik. Nasik was an important mart, and it is certain that another route bifurcating from the main trans-continental route followed the Godavari valley connecting Paithan, the most important capital of 2nd century A.D.

2. The second route from Thana crossed the Sahadri through Nana Ghat and was controlled by Junnar on the plateau in the source region of river Ghod, a tributary of the river Bhima. The route may have descended east following the alignment of the present Central Railway east of Poona. More likely, however, is the Junnar-Paithan route which running some distance along the Mula river, a tributary of Godavari, ended at Paithan.

3. The occurrence of Karla cavse in the upper Indravani valley gives credence to the belief that Bor ghat represented by Khandala—Lonawala saddle existed quite early. Since Panvel and Pen were the two important creek-head towns, of which Panvel is quite old, there must have been a route up the plateau through

Bor ghat that passed eastward along the shallow Indrayani. There is no major settlement on this route.

4. Another route that existed further south, joined Bankot on the coast with Krishna valley passing over the 'Radtonde Ghat'. The route along the Krishna valley appears to have been one of the most important in the sense that it descended down the plateau via Karad which, as we have seen, was a small capital town. This route was commanded at the foot of the Panchaghani plateau by Wai, a town situated on the bank of the river ghani plateau by Wai, a town Krishna. Wai was both a small mart and an important religious centre.

The factors of city growth discussed above remained operative for a long time till the region south of Vindhya was disturbed by the Muslims who appeared on the scene in 12th century. From then onwards we attribute the growth of towns to altogether different factors more to do with regional administration, collection of revenue, defence of certain territory, and finally a more effective inter-regional contact. Besides all these factors the economic development of the area also played an important in promoting the growth of towns. Towns developed after the coming of Muslims in Peninsular India are classed here as 'medieval towns'.

Growth of towns during the medieval period.

Muslim influence in Maharashtra was felt for the first time in late 13th century when 'Deogiri' the capital of the Yadavas was captured by Alla-Uddin Khilji in 1294. In 1318 the town became the permanent base of Muslim operation in Peninsular India. Deigiri was a fort town and had considerable significance in the defence of the capital. From Deogiri, later named Daulatabad, Muhammad bin Tughlak directed his campaigns against Warangal. Later on the town became a temporary seat of the Bahamanis.

The expansion of the Bahmani empire witnessed the development of 2 important systems, the first being a streamlined administration for effective control and revenue collection and the second a system of defence based on fortifications.

The territory was divided into four provinces or 'tarafs' the headquarters of each one of which grew into a town. Thse 'tarafs' were Telangana, Berar, Daulatabad and Gulbarga, and Bidar, Gawilgarh, Daulatabad and Gulberga were respectively their headquarters. Further sub-division of these 'tarafs' added some more headquarters as Mahur, Junnar and Belgaum. Thus a large number of administrative towns sprang up. It must be emphasised that a 'taraf' headquarter besides being a centre of revenue collection and a nerve centre of territorial administration used to be a garrison town with a moderate force stationed for the purposes of defence, and a maintenance of law and order.

The growth of medieval towns was guided by considerations not quite similar to those that gave rise to old towns. These towns were:

(a) regional headquarters,

(b) fort towns for the purpose of defence, or

(c) small trade centres.

Regional Headquarters.

As seen earlier, during the Bahmani rule a net of regional headquarters sprang up that were both the centres of revenue collection and a defence base. Bidar, Gawilgarh, Daulatabad, Gulberga,

Mahur, Junnar and Belgaum were the provincial headquarters having strategic importance were well fortified. In fact, the first Muslim dynasty in the South, the Bahamanis, appear to have done more for military engineering than any of their contemporaries, threatened as they were constantly by powerful enemies on every side — the rajas of Vijayanagar, Telingana and Orissa, and by the Gonds and the 'sultans' of Kandesh. Daulatabad, the capital, was well fortified. The city had one of the most important fortifications known to the medieval world.[1] Besides the regional headquarters which were invariably the fort-towns, there were fort and garrison towns in the peripheral zone of the kingdom. To mention a few, Ellichpur, Narnala and Gawilgarh in the north, Mahur in the northeast, Parenda, Naldrug and Panhala in the west and Warangal and Golconda on the east were fort-towns. To the south-west were the forts of Mudgal and Raichur both of which are outside the state of Maharashtra. Many of these fort towns existed even before the coming of Muslims in Deccan. Raichur, Mudgal, Warranggal, Gulberga and Bidar existed as towns during the regime of the Hindu kings but were captured and fortified by the Muslims. Thus in Maharashtra, much of which was under the Muslim rule during the 15th century, had developed a number of fort-towns which were either regional headquarters or meant solely for defence. By the end of the 15th century the Bahmani empire disintegrated and many of the regional headquarters became the capitals of small independent dynasties. Ahmednagar and Bijapur became the capitals of two such dynasties. Ahmednagar was founded in 1490 after the breaking up of Bahmani empire and became the capital of Nizam Shahi dynasty. Bijapur, on the other hand, became the seat of Adil Shahi dynasty. In fact the disintegration of the Bahmani empire led to the growth of several small principalities and their capitals.

Another town lying at the northern limit of the peninsula was was Burhanpur, the capital of Kandesh ruled by Faruki dynasty. The town commanded a gap in the Satpuras, called the Burhanpur gap, and was standing on the most important highway between the Deccan and the north Indian plains. Besides Burhanpur, the capital, the gap was guarded by another fort-town, Asirgarh, about 15 miles north of the former and standing at a height of over 700 m. A.S.L. Burhanpur was just a gap town, it enjoyed the patronage of the Moghul kings for a long time. The city still retains some of its very important monuments which include among its several edifices a long aqueduct built by the Moghuls.

The growth of old towns and the development of new ones saw no end in the Deccan. Constant warfare prompted the establishment of a number of defence towns which were invariably walled. Change of capitals as a matter of adjustment to the rise and growth of adjacent powers and the rise of new ones with the tribuary kings and 'subedars claiming independence became a regular phenomenon. Hardly is there any town of medieval origin in Maharashtra which has not enjoyed the status of a capital or the privilege of having a fort. Aurangabad, known in the early days of its existence as 'kharki" was founded in early 17th century as a fort town by the kings of Nizam Shahi dynasty to defend the northern frontiers of the kingdom. Same was the case with Bhir, the

1. The outer wall of the fort has a perimeter of 2¾ miles and between it and the acropolis are 3 inner walls.

old Champavatinagar, occupied and fortified by Delhi kings in 14th century. Akola, a district headquarters at present, was the chief town of a rich *pargana* in the (Government) of Nornala in Berar, under the Moghul kings. The town was walled during the reign of Aurangzeb

Besides these towns in the domain of Muslim kings centred largely in Godavari and Krishna valleys, the north-east frontier of the Maharashtra was subject to periodic incursions by the Gonds. The city of Chanda originally known as Chandrapur was a walled city built by a Gond King. The Gonds had their capitals earlier at Sirpur and Balalpur. On the extreme west Chakan had become the headquarters of a Moghul governor and was developed as a garrison town.

In brief, the fort and the city walls were the essential features of the medieval towns most if which were either founded or modified from the old towns having a strategic location. The political scene in Deccan for a long time was of unrest, constant warfare, aggression and defence, disintegration of kingdoms, bifurcation of dynasties and the origin of a large number of walled towns in the process. And a period of peace for a few years meant the development of the towns and the countryside prosperity. It is during these periods of calm and comparative prosperity that many towns of Maharashtra developed.

Despite many disadvantages several towns grew in the region now lying south and southeast of Maharashtra. Gulberga and Bidar, the early capitals of Bahmanis, Bajapur the capital of Adilshahi, and Golconda, the capital of Qutb Shahi deserve special mention. The morphological character and the architectural design of these cities have much to commend. Muslims were great builders but devoted all their ingenuity in designing mosques, tomb, and forts. Town planning as something independent of the building of the monuments did not seem to have reckoned with them. It is generally observed that the works of fortifications in the Deccan were directly imitated from their European counterparts. The most significant features of all the medieval cities of Deccan, however, are the royal tombs. Most of the monuments, whether the royal tombs or the colleges are built in Persian style. The influence of Persian art persisted even after the downfall of the Bahmanis and a progressively increasing element of Indian art is discerned till it becomes all too obvious in the monuments of Bijapur. Biajapur grew out of the real need for a large town strongly fortified , essential for the permanent residence of its rulers and their retinue and from which the province could be properly administered. It consists of a wide circular area enclosed by a wall having a citadel towards the centre and the remainder of the space occupied with all the constituent buildings of a state capital, such as palaces, mosques, tombs, mint and gateways. Another city that prospered enormously in early 17th century as an equal to Bijapur in its size though not in its architectural beauty was Aurangabad which had a population of about 2 lakhs.

Besides the capital cities growing during a period of comparative calm and prosperity, there was a simultaneous developmens of small but significant trade centres, market towns and a few relgious places. Sholapur, Barsi Satara and Nandurbar were important market centres. There were no exclusive industrial cities and many of the industries were centred in larger towns enjoying the patronage of the kings. The temple towns, except a few, did not grow at all.

Pandharpur and Trimbak are perhaps the only exceptions which grew because of their religious base. The temples built by the Hindu kings and even the religious sites of the Hindus remained neglected. The religious intolerance of the Muslim rulers may have been an important factor in crippling the growth of such centres. In early 17th century Deccan suffered from a severe famine which led to the partial depopulation of many towns. The economic life of the towns was disrupted and it remained so for a long time. Added to this was the curse of high handed administration. The result was that the Deccan remained impoverished for about a generation resulting in considerable damage to the fabric of urban society.

The rise of Shivaji and subsequently of the Maratha power added a new dimension in the economic life of Maharashtra. The ravages of warfare coupled with the introduction of a fluid administration created economic instability. The system of 'chauth' and 'sardeshmukhi' weighed heavily on the peasants who were already heavily assessed by the Moghuls. No new towns, therefore, grew and even the established ones declined. Secondly, the Marathas themselves were not the town builders as the Muslims or even the early Hindu dynasties like the Rashtrakutas or Silhoras were. The most they could do was the building of some forts to suit their defence system. The conditions do not appear to have improved substantially even during the 18th century when the Maratha empire was at the apex of its glory.

It must, however, be admitted that Poona and Satara, the capital cities of Marathas grew in importance. The 'Peshwas', the hereditary Prime Ministers and the virual rulers of the Maratha empire invited artisans and craftsmen from far off cities to settle in Poona. But the growth of cities like Poona was at the expense of the empire which was never properly governed. Maratha occupation of the land hardly meant any prosperity, it was, on the contrary a curse on the poor peasantry. The glory if the Maratha empire has always been measured in terms of the territories they overran, the ruling dynasties they overthrew, the battles they won in the far flung corners of the country, the kings they subjugated, the right of tax collection they extorted and finally from the cities they plundered, but never by their economic achievement. For over a century or so, therefore, there was not much of economic development and no growth of towns.

The decline of Maratha power after the Paninat debacle coincided with the rise of the British, who overthrew the former in early 19th century. The British hold on Maharashtra led to the development and streamlining of the transport system that led to a rapid growth of many transport towns.

Transport and a new phase of urban development...

It must be admitted that the initiative taken for the development of transport in Maharashtra by the British was, to start with, a result of military necessity, and not with a view to promote trade. In due course, however, the roads also served the propose of regional trade. During the Maratha regime, the roads were generally fair weather routes. The self sufficient village communities conducted a

limited volume of internal trade during fair weather. The roads were kept in working condition by certain village groups known "Ghaut Pandays", Sir Naiques" and 'Hushu Nuwees", and often the people of the adjacent villages were called out to mend the roads. At the beginning of the British rule there were no main roads. The tracks were ill-appointed and deficient in everything. The work of road construction was taken up seriously by the British at the close of the first quarter of 19th century and Bombay-Agra road was built connecting the coast with the interior. Nasik was linked with Thana and Poona. Before this, Khandesh continued to be the main thoroughfare for cotton from Berar to Bombay and bullocks were used to transport the cotton. After the completion of Bombay-Agra road a number of roads all over he State were laid, Bor Ghat was opened and the road connecting Bombay with Poona was improved and modernised. Inland a number of roads connectng Poona, Satara, Phaltan, Sholapur and Ahmednagar were built. Several passes were opened and the Western Ghats were made passable at several points in Maharashtra. The Great India Peninsular railway, now Central Railway, was opened in 1962.

The improvement in transport routes may have been essential for military purposes, it was nonetheless, very helpful in promoting trade that was essential for the supply of raw materials particularly cotton for the overseas market The improved transport had two fold effect on the growth of towns. Firstly, there grew a large number of market centres and secondly, the settlements on the railways or the main highways grew into towns. One can notice the string development of towns along the railways. The settlements along the railways grew much faster than in the interior. Many of these settlemens became in due course a hub of transport and a regional centre for the collection of agricultural products and the distribution of finished goods. Accessibility and case of transport were important considerations in the growth of such towns. The railways provided the necessary impetus for the cultivation of cash crops as the prospect of their export improved. Even the village handicrafts were profited as their market areas expanded. The marketing of these commodities promoted small trading centres which maintained link through a hierarchy of towns with Bombay, the leading port of the country. Transport improved trade and increasing trade promoted the growth of towns. Coupled with the transport was the systematic organization of administrative centres, divisional, district and taluk headquarters. Nineteenth century is, therefore, very important in urban history of Maharashtra. Population was no longer distributed solely on the basis of agricultural productivity of small regions. Improved transport introduced a new element in exchange economy and the population could afford to cluster at any point congenial to economic growth. A comparison of a few cities on the rail route that have grown during the last sixty years with those having lower accessibility and inland location reveals an unparallelled degree of distinction in their rate of growth.

Table I

Towns on transport routes	Population in 1872	Population in 1921	Population in 1961
Bhusawal	6,804	25,557	79,121
Jalgaon	6,893	23,710	80,121
Nasik	22,436	42,756	131,103
Deolali	1,906	18,742	40,013
Sholapur	53,402	119,581	337,583
Poona	125,613	214,796	7 37,426
Lonavala	1,268	11,078	21,111
Dhulia	12,489	30,605	98,893
Igatpuri	2,407	10,639	15,003
Manmad	4,437	11,929	31,551
Chalisgaon	3,941	12,007	34,280
Malggaon	11,164	23,711	121,408

Towns away from the main trans-port lines	Population in 1881	Population in 1921	Population in 1961
Sirur	4,372	5,111	6,234
Saswad	5,684	4,019	8.498
Satara	24,484	22,454	48,709
Rajapur	5,362	6,301	33,772
Karad	11,410	11,255	
Phaltan	10.422	8,929	19,003
Junnar	10,298	7,381	12,141
Indapur	4,242	5,367	5,750
Bhor	4,572	4,008	8,627

Many of these towns located on the railways, like Bhusawal, Jalgaon, Deolali, Igatpuri, Manmad Chalisgaon, were mere village settlements in the last quarter of the XIX century.

They have since grown into large towns. The pre-existing towns on the railways on the other hand, showed a spectacular high rate of growth as illustrated by Nasik, Poona and Sholapur, Though not as effective as the railways, the road transport also helped the growth of towns to a significant extent. Dhulia and Malegaon, both located on Bombay-Agra road have shared the benefit of transport and grown into large towns. The transport

routes, particularly the railways led to the development of a belt characterized by many trade centres. In contrast to these, the towns which were still remote from the transport routes and did not share the advantages of improved accessibility remained neglected without any sizable increase in their population. Junnar, Sirur, Saswad, Indapur, and Bhor are such examples. Satara and Karad, though located on an important highway were not the centres of a prosperous region, nor did they command the nodality that is typical of many of the towns on the transport routes. They were thus not stunted in their growth and showed a moderate increase in their population. Fig two shows the increase of population in 1961 over that of 1872 of the towns referred to above. It is obvious that the transport routes particularly the railways form the axis of urban development.

Development of industries and the growth of town.

The latest phase in the urban development of Maharashtra is associated with an increasing emphasis on industrial activities. After the second world war, coinciding with the attainment of independence, industrial development is considered synonym to prosperity. Wherever industries were established they attracted people, and inflated the population of existing cities. And when set up in remote areas, or in isolation in an area of raw materials they led to the development of new towns from the pre-existing nuclei of rural settlements. Even when developed without a nucleus, the industries promoted a multifunctional settlement supported by the industrial base which was in due course transformed into a town.

The industrial towns of Maharashtra fall into several categories. (i) major industrial cities (ii) Industrial clusters (iii) New and minor industrial towns (iv) Industrial townships. The first group is constituted by big cities like Bombay, Nagpur and Poona. These town's have existed since long but recent development of industries has led to their unprecendented growth giving in the process the giant cities of the orient. The decade 1951-61 has witnessed the maximum increase in the population of Bombay. The same is true of many other cities. The development of industries have initiated the process of rural-urban migration and consequent increase in the percentage of population born outside the city. Another class of towns developed because of industrialisation consists of a loose ribbon, a linearly oriented cluster of settlements supported by industries. The Bombay-Thana-kalyan region can be cited as an example of this type of urban growth. Then, there are new towns developed as a direct result of industries, Kopargaon, Shrirampor, Ichalkaranji are such examples. Lastly there are minor townships developed around a single industry or an industrial complex. Kirloskar wadi and Ogalewadi, the former having the foundry works and the agricultural implements industry and the latter a glass factory, have developed around an individual nucleus.

Today industry is the most dominant factor of urbanization. It has accentuated the process of rural-urban migration and the creation of new and the enlargement of existing urban centres. How industrialization is related to urbanization today can be seen from a comparison of the degree of urbanization with the extent of industrialization in an area. There is a definite positive correlation between the two phenomena. (Fig. 26)

We have thus observed four phases in the urban development of Maharashtra: The earlier phase was characterized by capital towns, port towns and the towns commanding major transport routes. The towns then were far and few between. The village societies were almost self sufficient and no town developed without the patronage of a king or a ruling dynasty. A capital city was both a governmental seat and a trade centre. The port towns were of secondary importance. The second phase of the urban growth in the State begins with the coming of Muslims in Peninsular India in 12th century. Defence and revenue administration became the two important functions of the towns. Majority of the towns were, therefore, fortified and often enclosed by a wall. A fort town is the most common prototype of a medieval town. The number of towns increased because of the increasing number of ruling dynasties, each of which administered a small territory and had a capital of its own. The headquarters of the 'subedars', which were often fortified also became in due course full fledged towns.

The introduction of railways and the improvement of roads added a new dimension in the spatial arrangement of the distribution of towns. The overall increase in accessibility encouraged the cultivation of cash crops and the rise of a number of market centres. Small settlements on the railways or along the roads soon became towns of a moderate size. The economy of the land assumed a more dynamic shape and its sensitivity increased to respond to market fluctuations in the far off places and even overseas. Through improved transport the region started participating in the larger economic strategy of the country. Local agricultural productivity though still retaining its hold, became less important in the growth of towns. To this period (late 19th century) is ascribed the string development of towns enumerated earlier along the railways and the important highways. The last and the latest phase in urbanization is that of industrial development and the consequent growth of towns. During the last 40 years industries have become the most significant factor in determining the urban pattern of the State. It has led to the enlargement of existing towns, growth of new ones and the creation of an urban complex loosely diffused and creeping along the arteries of transport that threatens to devour indiscriminately the inter-urban space.

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HIERARCHY OF SETTLEMENT IN TAMILNADU
A CASE STUDY

by

Daksha C. Barai *

Rural settlements in Tamilnadu vary in size and population from small hamlets covering about 1 sq. mile with a population of a few hundred to a large village with an area greater than 10 sq. miles with a population exceeding 10,000. There are regional and local variations in the size of rural settlement Each settlement has certain service functions which cater to the needs of the population. The number and variety of services increase generally with size of the settlement and also the area and the population served. The small centres have certain minimum services located in them. For example a primary school. These settlements depend on the larger settlements for services of a higher order, such as a middle school or a High school. Thus while services of a lower order are more or less ubiquitious those of a higher order are localised at certain larger settlements. Larger settlements also have a greater variety of services, some of which are not available in the small settlements. Thus a hierarchy of rural settlements comes into being on the basis of services provided for the people. The settlements are linked together in the pattern of fundamental hierarchy. This paper analyses the pattern of distribution of services in the sample regions of Tamil Nadu with a view of finding out the hierarchy of setlements and their interactions which exist.

Certain services of a higher order such a high school or a hospital are highly localised in distribution. Small centres do not have them. Some of the medium sized centres or villages may have these services Beyond a certain population size all setlements have higher order services. A study of the distribution of each of the higher services will indicate the threshold i.e. the minimum population required to sustain that function. A knowledge of such threshold values for certain services will be helpful in planning the development of such services. This paper uses a method to fix the threshold values for certain functions.

A study of the distribution of certain services brings out the regional differences in the availability of such services. Such a study will point out areas which are not having certain services. These areas have to be provided for in planning the development of services in the region. Concrete examples of criteria to be considered in development of educational and health services are given in this paper.

As this is a case study to develop a method of analysis of data readily available in the District Census Hand book (1961), two taluks have been chosen. These taluks are Dharapuram in Coimbatore district and Sirkali in Tanjore district. Both these taluks have relatively level land without much variations in relief. Both the taluks are predominantly rural. In other respects the two taluks are different. Dharapuram taluk lies inland and is not served by a railway line. Sirkali taluk lies along the coast and is also served by a railway line. Dharapuram is a dry region without irrigation facilities while Sirkali has irrigation facilities from rivers and channels in the Cauvery delta Consequently there are differences in land use between the two regions. This is reflected in differences in dens ity of population.

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Taluk	No. of settlements	Area in sq.Miles
Dharapuram	83	853.7
Sirkali	78	170.6
Population	Density per sq. mile	Mean population per village
326,346	382	3932
185,708	1,089	2382

The data relating to the services available in each census village are taken from the village Directory. The amenities available in each village are given simple notations. The data cover different amenities such as schools, libraries, medical centres, banks and co-operatives; accessibility by road and railway, water supply and electricity. Apart from these data commercial importance of a settlement is assessed with reference to the percentage of people employed in trade and commerce to the total number of workers. All villages which have a percentage value of more than twice the average for the taluk are considered to be commercially significant as trading centres. The data relating to cinema theatres were taken from 'The Madras Filmdairy Directory, 1968' as this was not available in the census Handbook.

In each type of the function there were different grades of services. For example public library, middle school, high school and college represent different grades of educational services. Hence each grade of service was given a weight according to its importance The value of the functional index is obtained by adding the values for all services provided by the village. The following services were taken for consideration of the importance fo a place as a service centre.

Service	Score values
Educational	
High School	2
Public Library	1
Medical	
Hospital	2
Other medical facilities	1
Communications	
Telephones	3
P.T.O. or Sub office	2
Post Office	1
Banks & Cooperatives	1
Trade & Commerce	2
Administrative Centre	2
Police Station	2
Police Outpost	1
Recreation	
Cinema theatre	2
Touring cinema	1

The value of functional index for each village was calculated and the settlements were classified according to the functional index into four categories-small village large village, service centres, and small towns.

	Dharapuram	Sirkali
I Order	68	71
II Order	9	2
III Order	4	4
IV Order	2	1

Most of the villages in the taluks are I Order settlements i.e. small villages. They have a functional index of less than 5. These settlements mainly have a primary school

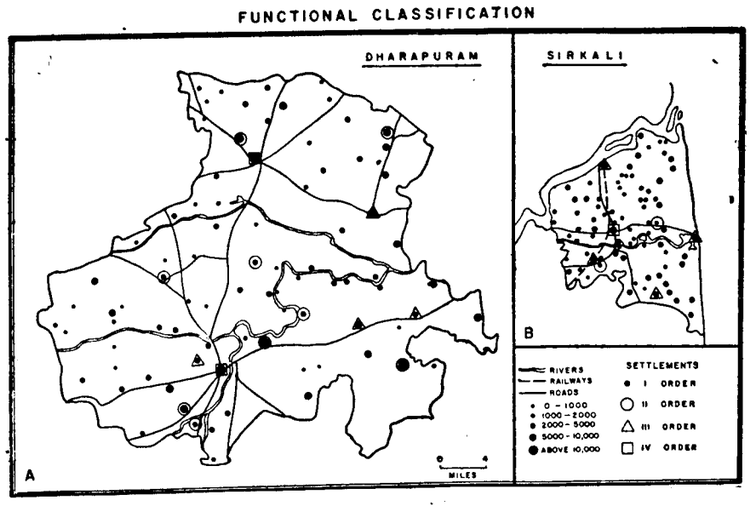


Fig. 1

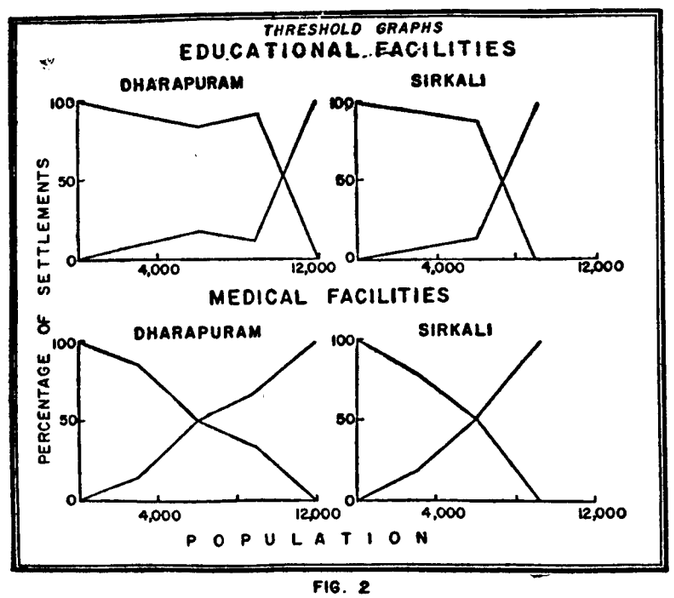
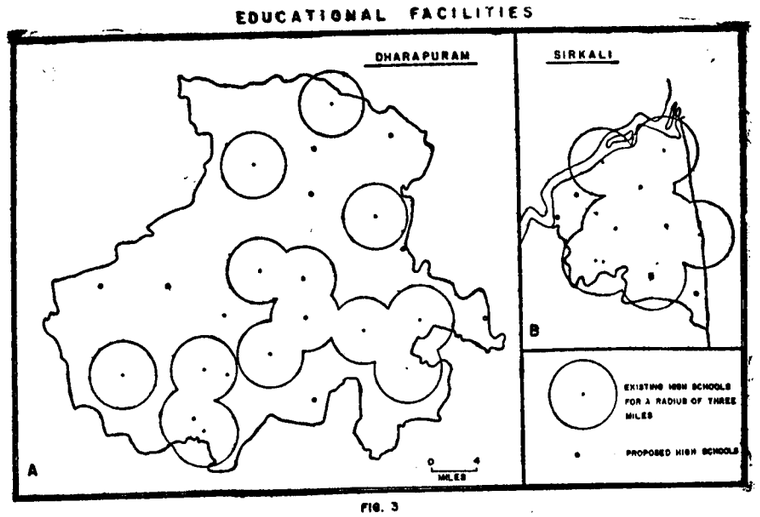


FIG. 2

Fig. 2



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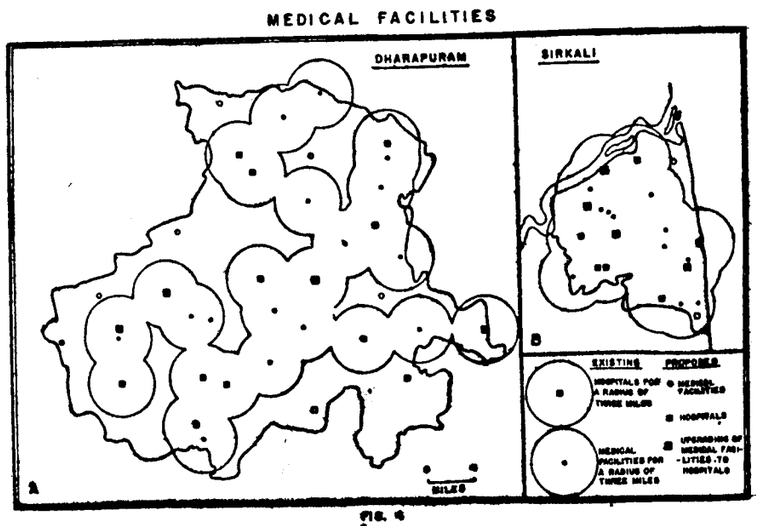

Fig. 4

post office or a cooperative society. The mean population of the I Order village of Dharapuram is 3096 and that of Sirkali is 2091. The largest village among first order settlements has a population of 4673 in Sirkali and 8407 in Dharapuram. The I order settlements have minimum essential catering to the needs of the population. These do not usually serve the other adjoining settlements in respect of any service.

The II Order settlements are generally larger than I order settlements. Their functional index varies between five and nine. These settlements have a high school, public library, post office, medical facilities, banks and cooperatives, and may be significant in trade and commerce. There are 9 II Order settlements in Dharapuram and 2 in Sirkali. The mean population in II Order settlements in Dharapuram is 5459 and in Sirkali 1873. The population in II order settlements in Dharapuram ranges from 2798 to 11,270 while in Sirkali from 1648 to 2098.

The III Order settlements have a functional index between 10 and 19. There are 4 III Order settlements in Dharapuram and 4 in Sirkali. These settlements have a greater number of services than the III Order settlements. They have administrative (Panchayat Union Headquarters) or commercial importance. They also have telegraph facilities and may have a telephone also. Some of the villages have Police Stations and touring cinemas. The mean population of the III Order settlements in Dharapuram is 6,801 and that of Sirkali is 5,912. The population of the III Order settlements ranges from 2,004 to 10,369 in Dharapuram and 4,396 to 7,326 in Sirkali.

Settlement of IV Order are usually small towns. There are two settlements in Dharapuram and one in Sirkali of this order. These have permanent cinema theatres, telephones, police stations, and administrative offices. Both Dharapuram and Sirkali are taluk headquarters and have a number of Government Offices of various departments. They serve the needs of the whole taluk. In view of the large size of Dharapuram Taluk Kangayam has developed as IV Order settlement serves an area of 426·9 sq. miles and 163,173 people. In Sirkali I fourth Order settlement serves an area of 170·6 sq. miles and a population of 185,778. Mean population of IV Order settlement of Dharapuram is 19,732 and that of Sirkali is 9,887.

The distribution of various functions among the villages in Dharapuram and Sirkali taluks shows some contrasting features. The most significant is the mean population of the villages of different orders is greater in Dharapuram than in Sirkali. This is because of differences in the composition of villages in the two taluks according to their size. In Sirkali taluk 47.4% of the total number of villages are having a total population between 1000 and 2000, and if we include villages of less than population the percentage is 60. In Dharapuram taluk only 30% of the villages have a population of less than 2000. In Sirkali taluk only 5% of the villages have a population exceeding 5000. Whereas in Dharapuram 25% of the villages come under this category. The largest settlement in Sirkali has a population of 9,887 whereas in Dharapuram it is 26,490. These figures show that Sirkali taluk is predominantly an area of small villages of nearly uniform size while Dharapuram taluk has large villages with a high range of population. Similar contrasts are noticed in terms of areas of villages. In Sirkali taluk the average area of the village is 2.2 sq. miles while in Dharapuram the average is 10.29 sq. miles. While

Sirkali taluk has villages of uniform size Dharapuram taluk has a large range of villages from 5 sq. miles to over 20 sq. miles. This contrast in size means that villages are closely spaced in Sirkali taluk more than in Dharapuram taluk.

The following table gives the distribution of certain services in the two taluks.

Function	DHARAPURAM			SIRKALI		
	No. of villages	Av. area in sq. miles served	Av.population served.	No. of villages	Av. area in sq. miles served	Av.population served
High school	14	61.0	23,310	9	18.9	19.570
Libraries	35	24.4	9,324	11	15.5	16,010
Hospitals	10	85.3	32,634	5	34.1	35.227
Other Medical facilities	26	32.8	12,552	18	9 4	9.785
Post Office	35	15.5	5,933	43	3.9	4,096
Police Station	6	442.8	54,391	4	44.1	44,034
Banks and Cooperatives	46	18.6	7,094	35	4.6	5,032
Cinemas	4	213.4	81,586	2	85.3	88,067

The table shows the number of villages having each function and the average area and population served. The number of villages having each one of these functions is greater in Dharapuram taluk than in Sirkali taluk. This is not primarily due to distribution in the number of villages in the two taluks. This is because Dharapuram taluk has a large area and a larger population than Sirkali. It is seen that the average area served by each function is greater in Dharapuram taluk than in Sirkali taluk. In terms of population the average population served by the several functions in Dharapuram is greater than in Sirkali for some functions and less than Sirkali for other functions. This means that the larger area served by each function is mainly because of the low density of population.

Both the taluks have post offices as the most widespread function among the villages excluding the primary schools. 55% of the villages in Sirkali and 66% of the villages in Dharapuram have post offices. Though the percent of villages having post office in Sirkali is low the taluk is better served if we take into account the average area or population, served by a post office. Cooperative societies and banks take the second place in terms of their frequency of occurance among the villages. In their function also Sirkali is better served than Dharapuram taluk. The distribution of high schools in terms of population shows Sirkali taluk has better facilities while Dharapuram has better library facilities in terms of population. As regards medical facilities Dharapuram taluk has one hospital for 32,634 persons while Sirkali has one hospital for 35,217. To compensate for lack of hospitals Sirkali has examined and the threshold population value for both taluks is 6,000. The threshold values were used as a basis for suggesting the location of new services for each function.

The distribution of the high schools in the two taluks was represented on the map by dots corresponding to the location of villages having them. It is assumed that a distance of 3 miles may be taken as the unit of accessibility of the high school. Therefore circles of 3 miles radius were drawn with each villages having a high school as their centre. The areas covered by the circles are served by high schools. Parts of the taluks which lie outside the circles are not within easy reach of a high school. Pupils may have to cover a distance of more than three miles to reach a high school. These areas have to be given a priority in planning the location of new high schools. Among the villages in these areas those which have a population near the threshold value and which are easily accessible may be given priority. On this basis the location suggested for new high schools are also marked on the map. If these high schools are set up both the taluks will be less than 3 miles from a high school.

The distribution of medical facilities was also examined by preparing a map showing the location of hospitals and other medical facilities. Circles of 3 miles radius were drawn around each centre and areas which are outside these circles are more than 3 miles away, from a hospital or other medical facilities. The map shows that all the villages in Sirkali taluk are having medical facilities with a distance of 3 miles. In parts of Dharapuram taluk villages are more than 3 miles from the nearest centre having medical facilities. An examination of such villages with referenee to their population and accessibility provided the basis for selecting villages which have to be provided with medical facilities. Hospitals provided not only beds for treating in-patient but also provide a wider range of facilities for the public. Hence some of the larger villages with better accessibility may be provided with hospitals by up-grading the existing facilities. Such a study has indicated suitable locations for hospitals in both the taluks. These are also indicated in the map. When these proposals regarding the setting up of new medical facilities are implemented there will be one hospital of other medical centre for 8,631 population in Dharapuram and 87 9 population in Sirkali. Medical services will also be more evenly distributed.

The paper has indicated a simple method for assessing the relative importance of villages in terms of the services provided by them. Data were collected from the District Census Handbook 1961 which is available for all the districts of India. The usefulness of the data available in these handbooks was examined in reference to the two taluks as a preliminary investigation. The study has brought out clearly the stratification of villages on the basis of the services available and a number of villages with other medical facilities, such as dispensaries, maternity and child welfare centres etc. The analysis of distribution of these functions in these two areas shows that the distribution of various functions depends primarily on population served and not on the area. This means that the villages which have their various functions are more widely spaced in Dharapuram taluk than in Sirkali primarily due to the lower density of population.

The pattern of distribution of certain services at any given time

indicates areas which are better served and those which are not so well served. This pattern will form the basis not only delimiting the region into areas according to the availability or otherwise of a particular function or service but also form the basis of planning the development of services in the region. It will be possible to point out areas which have to be provided with certain services on a priority basis because they are not well served at present. The study of distribution of present services may thus form the basis for planning the future. The first step in this process of planning the provision of services in certain villages is to find out the minimum population required to sustain a given function. This is known as the threshold of a function and its value may be ascertained by a simple graphical method. The villages are classified into certain categories of population and the percentage of villages in each category which have a given function is calculated. The details are plotted on a graph with X axis showing population categories and Y axis showing percentage values. The percentage of villages in each size category having a given function is plotted on the graph as points and they are joined by a smooth curve. It is seen that the curve rises from left to right and beyond a particular population size it flattens out at 100% level. On the same graph percentage of villages not having the particular function is plotted. These points are joined by a smooth curve. This curve starts 100% level in the left and slopes down to zero towards the right. The point of intersection of the two curves is marked and the corresponding population value represents the threshold of population for that functiohn; While villages having a populaton below the threshold may have the function in some cases villaget below the threshold populationsneed the function as they are in a position to support that function.

The distribution of high schools in the two taluks was examined in the manner suggested above and the threshold population is 10,200 for Dharapuram and 7,200 for Sirkali. This suggests that the villages in these two taluqs having a population greater than the threshold population have to tbe provided with the function, if they are not already having it, or ifge.hey are nor servedby a nearby villabas As regards medical facilities the basis is for the distribution of hospitals and other medical facilitis was popu-n lation. The relationseship betwee different villages in each taluk and the area served by villages of higher order may be determined only on the basis of field work. This study based on available data is a first step before field work is undertaken. There will be regional differences in the stratification of villages and the services provided. Such facts may be available if similar studies are done for other areas.

The second part of the paper has described a simple method for planning new service centres such as high schools and medical facilities. The method described is objective and taken into consideration the present distribution of such facilities and the need for these facilities in areas not having them.

REFERENCES: (1) J. E. Brush and H. E. Bracey, Rural Service Centres in South western Wisconsin and southern England. Geographical Review Volume XLV. (2) Steen Folke. Central Place Systems and Special Interaction in Nilgris and Coorg (South India). Collected Papers Denmark India 1968, 21st International Geographical Congress. (3) Peter Haggett. Locational Analysis in Human Geography.

Acknowledgement: I am grateful to Professor N. Ananthapadmanabhan for the valuable guidance given to me in preparing this paper.

A STUDY OF CLIMATIC FACTORS AND ELEMENTS FOR UTTAR PRADESH

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The climate of a place is defined by a number of elements or component parts, such as temperature and humidity of the air, the rainfall, the wind velocity, the duration of sunshine and host of others and less important and less significant to man. The weather varies from day to day and climate differs from place to place and the climate is thought as a generalisation of the variety of day today weather conditions. The varieties of weather and diversities in climates are due to variation in amount, intensity, and arial distribution of several weather and climatic element more particularly temperature and rainfall. One may naturally enquire as to what it is that causes the several climatic elements to vary from place to place and season to season on the earth; resulting in some places and some season being hot and other cold, some wet and other dry. The answer is to be found in the climatic controls.

These are:

a) Latitude or sun,

b) Distribution of land & water,

c) The great semipermanent high and low pressure cells,

d) Winds

e) Altitudes

f) Mountain barriers,

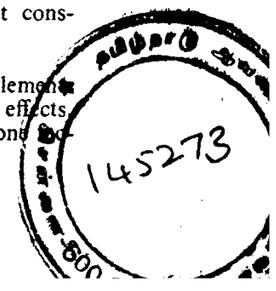
g) Ocean currents,

h) Storms of various kinds, and number or other more ones. It is this climatic controls or climatic factors acting with various intensities in different combinations that produces the change in temperature and precipitation which in turn give rise to variations of weather and climate.

The clear distinction should be made between elements and factors as defined above and use of the term is to be restricted carefully. The distinction is not always easy. eg. wind direction is a factor of great importance in determining climate, yet in some respect it is an element of climate; wind velocity is undoubtedly an element yet may also act as a factor for it may control the precipitation by the rate at which it brings surplus of moisture from the sea. The length of the day i.e. duration for which sun is above the horizon is a factor since it helps to determine the temperature but the duration of actual sunshine is an element with farreaching effect on plant and animal life.

Factors and elements of the climate are clearly of two kinds; the first mathematically determined and therefore constant and the second variable and unreliable. Among former is latitude a factor which determines the length of the day throughout the year-mathematically controlled and therefore a reliable element. Latitudes also determine the intensity of insolation and this together with the length of the day, influences the duration of sunshine and temperature — the elements which however, being also influenced by others and variable factors, such as prevailing winds, marine influences etc. which are not constant.

So factors are causes and elements are observed derivatives of effects. It is important to note that one



tor may affect the several elements and one element may be the product of several factor acting together. Moreover, several elements of weather may be controlling the one weather element i.e. a weather element may be studied and assessed through others, though the process deriving the element may be quite independent; for example evaporation from open water surfaces which is controlled by temperature, relative humidity and wind speed.

Since the air temperature is responsible to the heat transported from the soil surface to upward, for sun does not heat the atmosphere directly, soil is essentially a climatic factor; because the amount of heat transported to atmosphere will depend also upon the soil characteristics and soil moisture together with the amount of incoming solar radiation. Here soil moisture is a climatic element. Furthermore, heat receiving capacity of soil with its other characteristics determines the penetration of heat inside the soil and consequently its temperature; the soil temperature is a derivent i.e. an element. So soil temperature and soil moisture are climatic elements.

Since the plants leave and stems have to transpire the water continuously and so other weather elements are to be affected due to it. Plants or vegetations are climatic factor.

The water loss from free water surfaces to the atmosphere-called as evaporation has been taken as an element. Apart from it, a vegetation covered area continuously losses the water from soil and plants subject to availability of it and this may be called evapotranspiration. This is to be treated as a separate weather element.

On most of the occasions, the climate is termed as 'averaged weather' which is certainly a vague statement; for it is highly unclear what one means by average weather. One may say that a climate element is averaged weather element; though it is also not purely justified because the variations from the mean are as important as the mean itself. Certainly no picture of the climate is at all true unless it is painted in all colours of constant variations and the change of season which are really prominent features. But as compared to meterology which is concerned primarily with the physics of individual weather events, physical climatology deals with composite state of atmosphere for the world or for the certain parts of it. It emphasizes the characteristics and distributions of several weather elements.

Here is the description of the major climatic factors. acting, for the Uttar Pradesh-an extensive and important state of India located in the Central North.

i) It extends from 23°52′ N to 31° 18′ N, and 77° 03′ E to 84° 39′ E. In the north there are Nepal and China together with Himalayan chains. In the west it is surrounded by Punjab, Delhi and Rajasthan The eastern border consists of Bihar and southern is surrounded by M.P.

From east to west it has a length of 650 kms and from south to north 240 kms. The whole area of U.P. is 293729 sq. kms.

ii) U.P. is no way surrounded by sea and is far from sea on all the sides by 100s of kms. U.P. too lags in permanent natural lakes of major importance. However, the Ganges and Jamuna coming out from Himalayas pass through midway of state and are in possession of water throughout the year and constitute the major drainage pattern. Other rivers are Sarada, Ghaghara, Chambal, Baruna, Sarju, Gomati, Kosi and host of others. Some of them are tributaries either to Ganga or Jamuna and most of them go dry in summer.

iii) The State consists of 4 natural regions;—

a) Northern hilly area, where elevation ranges from more than 5000′ to 1000′ above mean sea-level.

b) Great Plain-built by Ganga and its tributaries, covering two-third area of the whole State and here elevation is from 0′ to 500′ above mean sea level.

c) Sub-hilly region-in between the above two, where elevation above mean sea-level ranges from more than 1000 to 500′.

d) Southern Plateau part with the elevation 1000′ to 500′ above mean sea-level.

U.P. represents the severe physiographic contrast with the result that when plain area is terifically hot in summer still the northern hilly region is cool or snow covered. The Himalayan chains in the north have an approximate direction of N.W.—S.E. and do not allow wind currents coming from south or south-east to cross away.

iv) a) In the winter season high pressure areas are present over U.P. due to coming of the province in the high pressure belt built at western India. The winds are westerlies or northerlies but since intensity of increasing pressure is not high so these winds donot have much velocities. The situation prevails from November to the beginning of March.

b) Pressure starts to go down from March onwards and by May the belt of minimum pressure passes near by U.P. Due to continuous decrement of pressure fast moving winds originate. In May and June due to high heat westerlies move very fast. The situation prevails up to middle of June.

c) In U.P. south west monsoon currents enter in third or fourth week of June. The moist easterlies coming from Bay of Bengal inform the arrival of monsoon. The situation continues upto the end of September. During this period lowest pressure area of north India is or around the U. P. October is the month of transition from low pressure to high pressure and from November onword again dry weasterlies coming from land area are felt.

5. From July to September U.P. is visited from the low pressure areas originated in the Bay of Bengal which have characters of the moderate or feeble tropical cyclones and are chiefly responsible for the major rainfall during the season in this area. Technically they are called 'Bay Depressions' and their frequency ranges from 6 to 12 for the season as a whole. In the months of January and February, cyclones which originate in the Mediteranian passing through Iran; west Pakistan and Punjab come to the western region of U.P. and they create a sudden change in the weather. They are called western distrubances and western U.P may get a little rain due to them. They may create hail or sometimes are responsible for the cold waves in the plain areas. Their frequency varies from 2 to 3 for the season.

MEAN ANNUAL TEMP IN °C FOR U.P

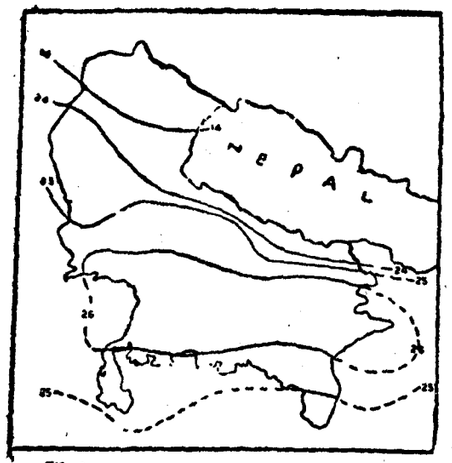


FIG. 1

MEAN ANNUAL TEMP RANGE IN °C FOR U.P
(MEAN OF HOTTEST MONTH THAT OF COLDEST MONTH)

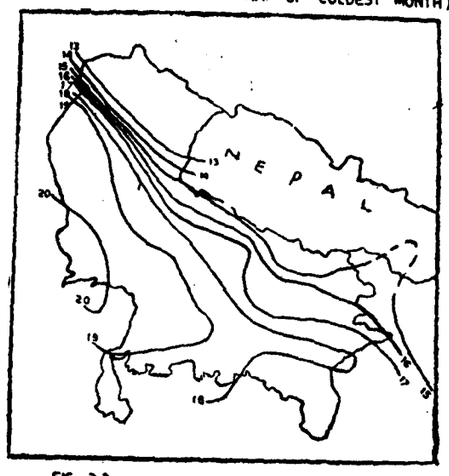


FIG 2a

MEAN ANNUAL TEMP RANGE IN °C FOR U.P
ANNUAL MEAN OF MAX ANNUAL MEAN OF MINIMUM

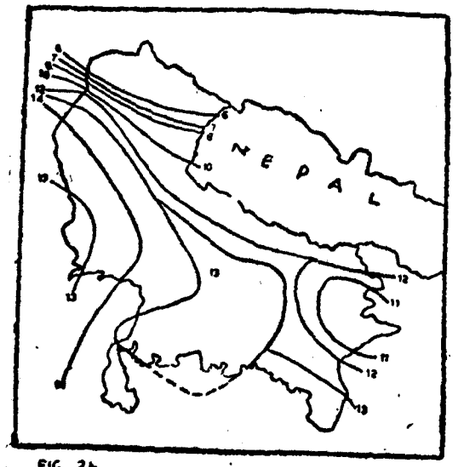


FIG. 2b

MEAN ANNUAL RAIN FALL FOR U.P IN CMS

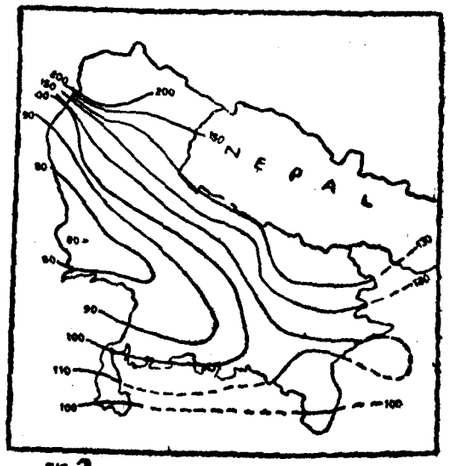


FIG. 3

RAIN FALL FOR U.P DURING HOT SEASON IN CMS
(MARCH TO MAY)

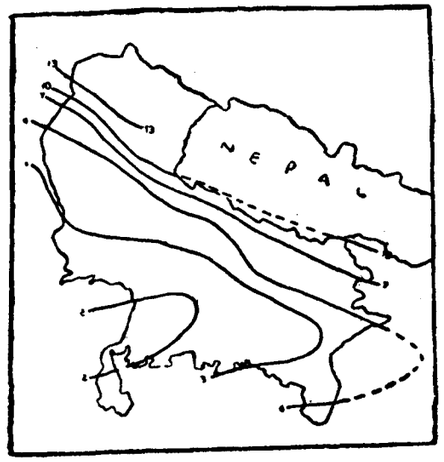


FIG. 4

RAIN FALL FOR U.P DURING MONSOON SEASON IN CMS
(JUNE TO SEPT)

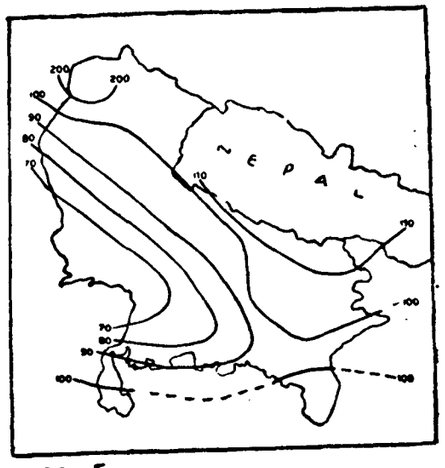


FIG 5

CLIMATIC ELEMENTS

Temperature: The distribution of surface temperature over the region is shown in Fig. 1. Highest values of the order of 26°C are found in the central region. There is gradual decrease of temperature as we move from south to north, in the northern sub-hilly and hilly region. In the northern most part of the State this value goes to 14°C or even below.

Fig. 2a shows the variation of mean annual temperature range (mean annual temperature of hottest month (minus) mean annual temperature of coldest month) and is of great interest in the connection of study of temperature regime of the region. Starting from the more than a value of 20°C in the western region the range decreases towards the north below to 13°C. Fig. 2b represents the annual temparature range in °C taken in the way as the annual mean of maximum minus annual mean of minimum. This range is 13—1°C in the plain, southern and western region and gradually decreases while moving north and in the northern-most part the range reaches below 6°C.

Rainfall: The mean annual rainfall (Fig 3) indicates a distinct zonal distribution. It decreases from east to west and it increases from centre to both ways—south and north, but with a more rapid rate towards north. The areas of maximum rainfall lie in the northern hilly region with a value of more than 200 cms and that of minimum rainfall in the western region with a value of less than 80 cms.

Fig. 4 shows the rainfall for the region in the hot season i.e. from March to May and Fig. 6 for the cold season i.e. from October to February. In both the seasons the areas of maximum rainfall are concentrated in the north hilly region.

Fig. 5 presents the distribution of rainfall increasing from west to east

and from central to both ways — south and north. The southernmost part of U.P. gets a rainfall of the order of 100 cm in this season while the northern part approximates to 200 cms. The easternmost part has a value of 100 cms of rainfall for the season while the westernmost part upto 70 cms.

Fig. 7 represents cartographically the annual number of rainy days for U.P. (A rainy day is one which gets more than 2.5 mm. of rainfall per day). The main feature is the increment of number from west to east region. The annual number of rainy days are approximately equal for eastern and southern region with the concentration of maximum in northern hilly region amounting upto 90. The lowest value are for the western U.P. and go below 40.

Furthermore, it is inferred from working at the data, that ;

1) the ratio of rainfall in wettest month to driest month for the region varies from 58 to 240 with the median value as 125,

2) the concentration of rainfall for 4 monsoon months i.e. from June to September in the region varies from 74% to 90% with the median values of 86%,

3) the concentration of number of rainy days for 4 monsoon months varies from 70% to 84% with the median value of 81%.

Variability of Rainfall - Since approximately 80% of the total annual rainfall for the region as a whole is concentrated in the 4 monsoon months the variability of rainfall during monsoon is of great importance from the viewpoint of agriculture of the state. Infact monsoon rainfall is never reliable. Floods and droughts are common fluctuations in the monsoon rainfall. The early arrival of monsoon, late arrival of monsoon, lengthy gap between two consequtive spells, all of these affect the crops adversely. So we see that amount of rainfall and time (arrival and departure both) of Monsoon are uncertain.

The variability of rainfall is the degree in which that of any year is liable to deviate from the local averages (Blandford, H. F.: Rainfall of India, Burma & Cylone, pp. 78-79). The variability for eastern part of state on annual basis is 16% to 17%. For middle part this value is 18% to 50% and for the western U. P. it is 20% to 22% and for the southern plateau part it is 23% to 24%.

According to Blandford the places having a variability more than 12% have greater chances for famine so great plain and southern plateau areas of U. P. have greater possibilities of famine.

Pressure and Winds—The important inferences drawn are as follows:

1) Variation of pressure from January to July for the region is from 4.7 mb to 18.3 mb with the median value of 18 mb ;

2) the mean annual wind speed for various stations of U. P. varies from 3.1 kms per hour with 12.2 kms per hour with median values of 5 km per hour ;

3) The variations in the wind velocity (velocity in the months of strongest winds—that in the month of the weakest wind) varies from 1.7 kms per hour to 6.7 kms per hour with the median value of 4.5 kms per hour.

Relative humidity—Fig. 8 shows the mean annual values of relative humidity in percentage. The values are lowest in western region and highest in the northern region. For the region as a whole it varies from 48% to 60% with a median value of 56%.

Evaporation and Evapotranspiration :

On the basis of available data on evaporation for 6 stations of U.P. for a period of 6 years the following conclusions are drawn :

1) The highest values are seen in the plain areas with annual values as high as 270 cms and

RAIN FALL FOR U P DURING COOL SEASON IN CMS
(OCT TO FEB)

FIG 6

MEAN ANNUAL NUMBER OF RAINY DAYS FOR U.P

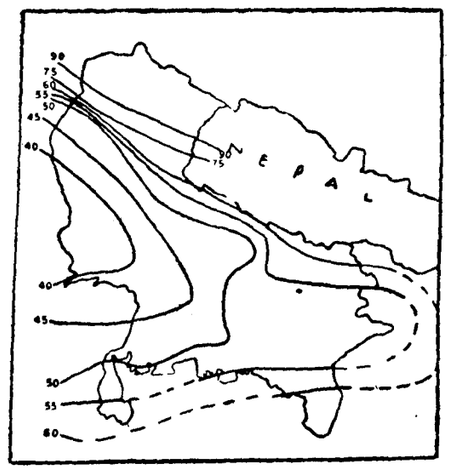


FIG 7

MEAN R H FOR U P IN PERCENT (ANNUAL)

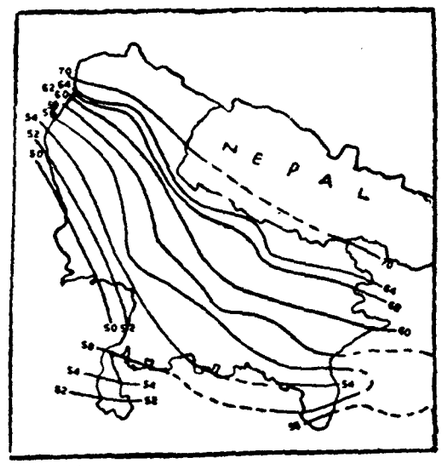


FIG 8

lowest values are seen in the northern hilly region with annual values as below as 125 cms or even lower :

2) The evaporation is highest in the summer months, i.e. from April to June and designating it as summer concentration of evaporation for 3 summer conventional months the value for it varies from 41% to 47%. So it may be stated that the average water loss for 24 hours for a summer day is more than twice than the average water loss for 24 hours for a day in other season.

Evapotranspirational values for the region have been calculated from other climatic data with the help of emperical formula and method of computations as suggested by Thornthwaite (1948). However, it is not easy to compute actual evapotranspiration for it depends upon the host of factors like temperature, soil characteristics, soil moisture storage, etc. On the other hand, it is easy to know the potential evapotranspiration defined as the maximum water loss by soil and vegetations in a vegetation-covered area if it were available for the use. This is of great significance because it represents the water needs of a place. Its values have been computed from other climatic data for in our country observations on this very weather elements have not yet been started to be taken. Conclusions on the basis of the computed values of potential evapotranspiration are given as follows :

1) The annual values of potential evapotranspiration for most of the stations of U. P. ranges between 140 to 150 cms and same for the north hilly region where it decreases rapidly from south to north and goes as below as 70 cms.

2) The water need is maximum in three conventional summer months and it varies from 39% to 45% for these 3 months out of the annual need.

Comparing the evaporation and evapotranspiration for the region we conclude that;

i) The values of evaporation are higher for every station studied than those of potential evapotranspiration. At station of plain area this difference is more but as we go towards higher altitude i.e. in northern hilly region, this difference is reduced too much for example evaporation values is 144 cms. while those for Dehra Dun are 125 cms respectively.

ii) There can be no mathematical relationship between the two for they are based on separate considerations. One depends upon temperature relative humidity and wind velocity and is direct water loss from water surfaces to the atmosphere, while the other depending upon the temperature, soils and vegetations and is water loss from water surfaces to the atmosphere, while the other depending upon the temperature, soils and vegetations and is water loss from subsurface of soils & leaves and stems of the plants.

Soil temperature and soil moisture. — As mentioned earlier soil temperature and soil moisture are climatic elements of great importance for they play a major role in the energy exchange between the earth and the atmosphere which is the ultimate cause of the origin of the climate However, no weather service in the world has yet started to take observations on these elements but attempts are being made to assess the soil moisture data from other indirect sources. One among those is the water balance technique as developed by Thornthwaite and his associates at laboratory of Climatology. Centertion, New Jersy, U.S.A. by which daily or seasonal estimate of soil moisture variations may be had. It is not difficult to record the soil temperature at different depths and specifically at the depth of the root zones of various crops, due to its importance in the field of agriculture. Let us hope that all the weather services in the world will start to take the regular records of soil temperature and soil moisture as they do for temperature precipitation winds and insolation. These data will be of great practical values and will help to have a more clear climatic picture of any region of the world.

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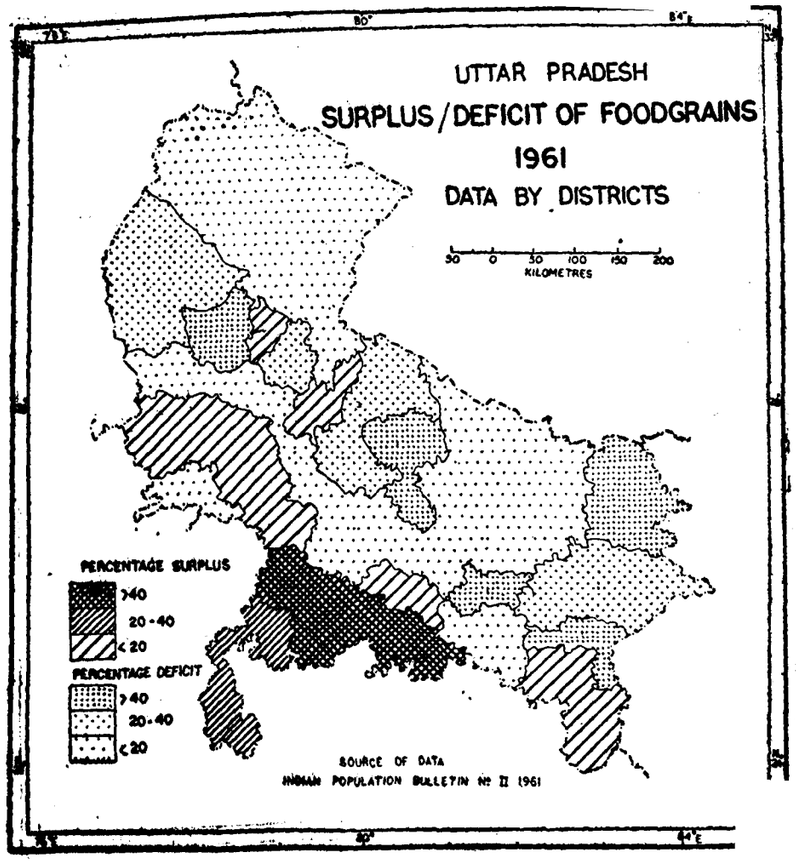
REGIONAL PATTERN OF SURPLUS/DEFICIT FOOD PRODUCTION IN UTTER PRADESH

By

Dr. GOPAL KRISHAN*

Despite a widespread awareness of continuing food problem in India[1], there is a general lack of studies on the extent of surplus or deficit of food in different parts of the country[2]. Part of the reason for this lies in the non-availability of requisite data. The present study is one of the attempts towards filling up of this lacuna. This analysis is, however, confined to Uttar Pradesh (the most populous state of India with a population of 73.7 million and an area of 294, 948 km² in 1961), for which alone the detailed published data on surplus/deficit of food could be obtained[3]. The purpose of the present paper is to identify and to analyse the areas of surplus or of deficit in food in this state[4].

Uttar Pradesh, like Kerala, Jammu & Kashmir, West Bengal, etc. is one of the food-deficit states of India. Its production of foodgrains falls short by 10 per cent of its total needs. The total consumption of food grains in the state during 1960-61 has been of the order of 13.95 million tons as against the net production estimate of 12-56 million tons, resulting in a deficit of 1-39 million tons.[5] It is so despite 75.2 per cent of the



MAP 1

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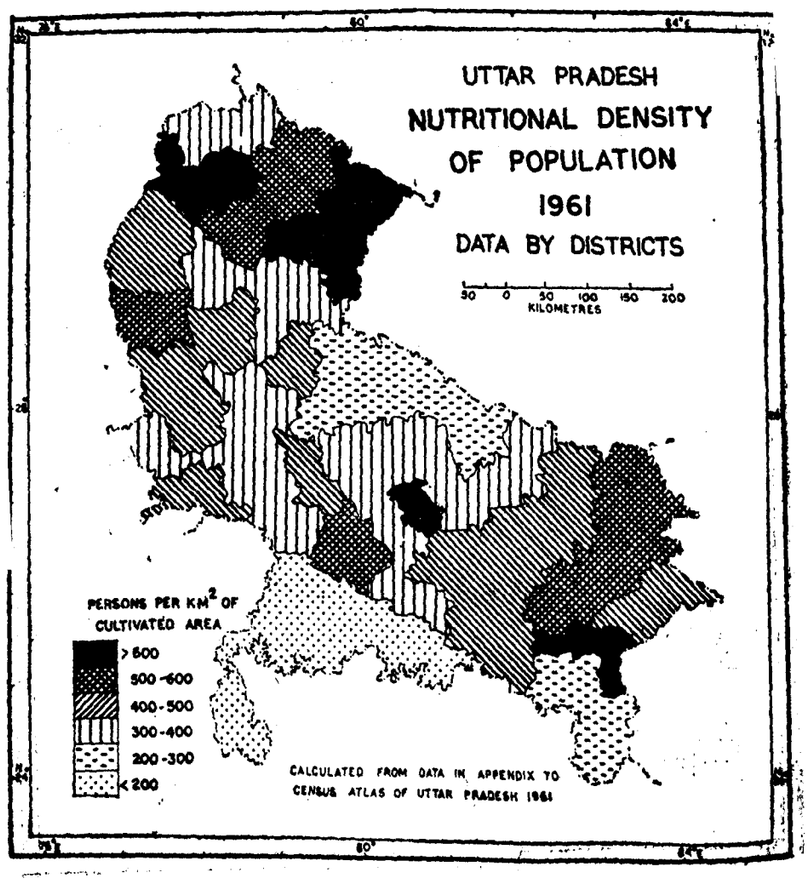
1. For a sitmulating, geographic analysis of problems of food in India see George Kurian's article on Food Problem in India A continuing Crisis" published in *Indian Geographical Journal.* Vol. XL, 1965, pp. 51-71.

2. Some of the important geographic studies on food problem in various regions in India have been carried on by B. N. Chaturvedi "Andhra Pradesh : a Surplus State in a Deficit Country" *Deccon* Geographer, Vol. 1, 1962; G. K. Chori, "Food and Man in Vishala Mysore, 1956-57", *Geographer*, Vol. 8 & 9, 1956-57; M. Yunus, "A Survey of Food Resources and Cash Crops of United Provinces", *Calcutta Geographical Review*, Vol. 7, 1945; and V. Krishnan, "Self Sufficiency of Tamilnad in Food grains", *Indian Geographical Journal*, Vol. 35, 1960.

3. The present study is based on the data given in the Appendices II and III of the Indian Population Bulletin, No- 11 1961, published by the Office of the Registrar General, India

4. The surplus/deficit of food in various districts of the state has been studied in relation to net production of foodgrains in each district. For example, a surplus of ten per cent signifies a production of 100 tons for every 90 tons of consumption. By the same token, a deficit of 10 per cent stands for a production of 100 tons for every 110 tons of consumption.

5. P. S. Sharma: "Pattern of Consumption of foodgrains in Uttar Pradesh in 1960-61", in *Population Bulletin of India*, No. 11, Office of the Registrar General, India, 1961, p 351.



MAP 2

working force of the state is directly engaged in agriculture, about two-thirds of its total area is under cultivation, about 30 per cent of its net sown area receives irrigation, about per cent 85 of its cropped area is devoted to food crops, and only about one-eighth of its total population is urban[6]. Two main reasons for the deficit food production in Uttar Pradesh are: (i) its excessively high density of 250 persons per km². as compared with 143 in India[7]. and (ii) its relatively low yield per hectare of food crops in comparison with that in India as a whole[8].

Though the state of Uttar Pradesh suffers from a deficit of food, yet some of its parts do produce a surplus. Morcover, there are significant intra-state spatial variations in the extent of surplus/deficit of food. Keeping these facts in view, two types of areas have been identified in Map:

a. Areas of Surplus in Food Production.

b. Areas of Deficit in Food Production.

a. Areas of Surplus in Food Production

Only 13 out of 54 districts in Uttar Pradesh are surplus in production of food. These districts account for only one-fourth of the total area and contain hardly one-sixth of the total population of the state. It it observed that most of the districts with surplus in food form contiguous tracts while some of these are, of course, sporadically distributed over the different parts of state.

The most extensive tract producing a large surplus of food is Bundel - khand which includes the districts of Jhansi, Jalaun, Hamirpur and Banda (Map). The surplus of food in these districts ranges between 28 and 48 per cent of the net production. The Bundelkhand is, however, inferior to many parts of Uttar Pradesh in terms of agricultural productivity[9]. A large part of it is a dissected upland with low round hills, plateaus, and escarpments. It receives a variable annual rain fall of 75 to 100 cms. Its mixed red and black soils are overdrained and eroded at places. Still this tract raises a surplus of food as it is characterized by (i) a relatively low density of 100 to 150 persons per km². (ii) relatively large per capita cultivated area of 0.55 to 0.73 hectares, and (iii) relatively big size of agricultural holding per cultivating household of 4.4 to 5.6 hectares.

6. The corresponding 1961 figures for India as a whole are: Agricultural workers, 69·5 per cent; cultivated area 52·8 per cent; irrigated land 18 per cent; area under food crops 75 per cent; and urban population, 17·8 percent.

7. Even If the population density is computed in relation to cultivated area only the respective figures for Uttar Pradesh and India are 378 and 271 persons per km.

8. The yields per hectare of rice and wheat, which are the staple cereals of most of the people in Uttar Pradesh, were 7·4 and 8·0 quintals respectively in this state. The comparable figures for India are 9·2 and 8·3 See *Statistical Abstract of the Indian Union,1963, & 64,* Government of India Press: New Delhi pp. 61-62.

9. S. S. Bhatia: "Spatial Variations, Changes and Trends in Agricultural Efficiency in Uttar Pradesh, 1953-63" *Indian Journal of Agricultura Economics*, Vol. XXII, 1967, pp. pp. 70-71.