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# India

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NATIONAL INTELLIGENCE SURVEY

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Military Geography

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# INDIA

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*This chapter supersedes the geographic coverage in the General Survey dated February 1970.*

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# Military Geography

## A. Location and description (U/OU)

India has an area of approximately 1,211,000 square miles (including the Indian-held portion of Jammu and Kashmir,<sup>1</sup> Sikkim, Goa, and Daman), one-third of the conterminous United States. The population was estimated at about 578 million in July 1973. The mainland is triangularly shaped, with the base in the north along the Indian-Chinese border and the apex in the south in close proximity to the major sea route between western Europe and the Far East. Maximum north-south extent is about 1,900 miles,<sup>2</sup> and the maximum east-west distance is about 1,800 miles.

### 1. Topography

Peninsular India is characterized largely by upland plains, scattered hills, and some mountains; to the north are the Great Indian Desert and the broad plains of the Ganges and Brahmaputra which in turn, are bordered in the north and east by high mountains (Figure 1). The Laccadive Islands in the Arabian Sea are mainly flat coral atolls; the Andaman and Nicobar Islands in the Bay of Bengal are composed of plains and hills covered by dense forest.

The upland plains (Figure 2) of the peninsula lie at elevations between 1,000 and 3,000 feet. The coastal plains, narrow on the west and up to 120 miles wide on the east, are flat, low, and less than 500 feet in elevation. Most hills are rounded to flat topped; slopes are between 10% and 40%. Local relief (differences in elevation between tops and bottoms of adjacent topographic features) generally is between 500 and

<sup>1</sup>For diacritics on place names see the list of names on the apron of the Military Geographic Factors Map, the map itself, and maps in the text.

<sup>2</sup>Distances are in statute miles unless nautical miles are specifically stated.

1,000 feet, but it reaches 2,000 feet in places. The hills are less than 4,000 feet above sea level. The mountainous areas are moderately dissected, with steep slopes between 30% and 50%; local relief ranges from 2,000 to 4,000 feet. The highest elevation in peninsular India is 8,841 feet, a mountain peak in the south. The principal drainage is eastward to the Bay of Bengal. Most streams have winding courses and are narrow in upper reaches and more than 250 feet wide in lower reaches. Banks are high and steep, and rapids and waterfalls are common in upper reaches. The main streams are more than 3.5 feet deep the year round. Smaller streams are more than 3.5 feet deep only during the high water period, usually May through November. Flash floods are common after heavy rains, particularly in June through September. Numerous reservoirs (tanks) to store rainfall and runoff for irrigation purposes have been developed in this part of India, especially near the east coast. Most of peninsular India is cultivated in dryland crops (Figure 2), although in the northeastern plains and along the coasts, wetland rice is grown. The rice paddies are flooded during the growing season, sometime between early May and late January. Dense broadleaf evergreen forest covers most of the seaward-facing lower slopes of the western mountains and hills. Deciduous forest covers the northeast and the eastern slopes of mountains and hills along the west coast; these trees are leafless sometime between early February and mid-May. Open scrub (Figure 3) covers many areas in the northwest and south. Settlement is dense in the south and along the coasts where some of the country's largest cities are located; the interior generally has a sparse settlement pattern. The villages and older sections of larger towns contain multistory brick or mudbrick buildings built along narrow, winding streets. The newer parts of the larger towns contain multistory, Western-style brick or concrete buildings on wide streets laid out in a grid pattern. A

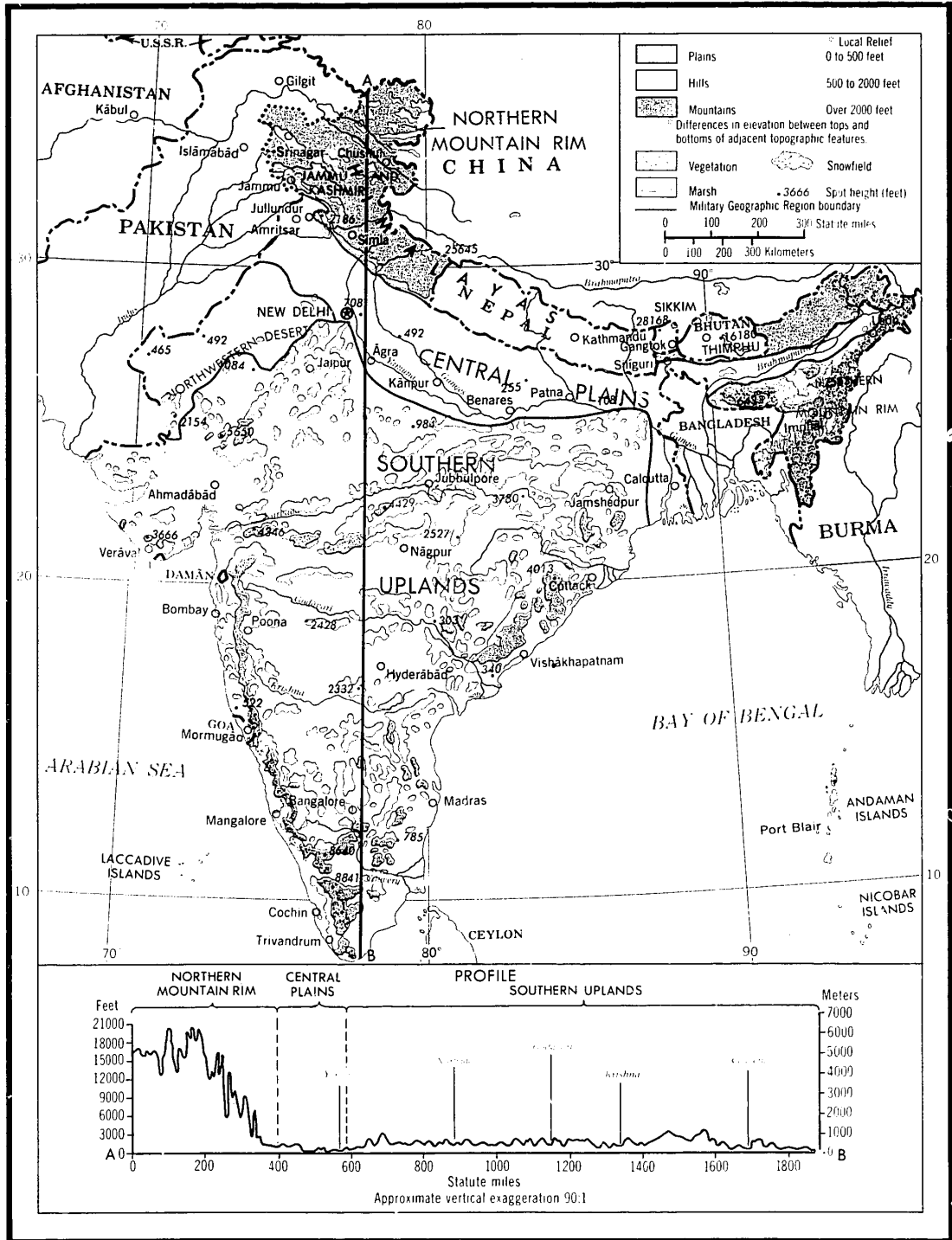


FIGURE 1. Military geographic regions and terrain (U/OU)

FIGURE 2. The southern upland plains in peninsular India are flat to rolling and cultivated in dryland crops such as wheat, sorghum, barley, and corn (U/OU)



sparse network of railroads (mostly single track and 3'6" gage) and surfaced roads extend across the peninsula and along the east coast. It connects the major coastal and inland centers.

Northwestern India is covered by the sandy, stony plains of the Great Indian Desert. Elevations generally are less than 1,200 feet, sand dunes (Figure 1) and ridges are mostly 10 to 25 feet high, but some reach 200 feet. Hills are usually less than 2,000 feet above sea level (the highest point is an isolated hill, 2,154 feet above sea level), local relief in the hills is between 500 and 1,000 feet. Streams are small and intermittent and terminate in salt lakes or percolate into the ground. The coastal part of the northwest is made up of saltflats and mudflats. High tides seasonally flood the coastal area. The only vegetation is sparse desert scrub in the interior plains and mangrove swamp along the coast. There are few settlements, and transportation facilities are limited to some single-track meter-gauge railroads, a short segment of a two-lane bituminous-surfaced road in the southwest, and a few sand tracks and trails.

The plains along the Ganges in the north and the Brahmaputra in the northeast vary from low and flat

(Figure 3) to gently rolling and are crossed by dense networks of streams. Elevations are less than 700 feet. There are many irrigated areas and mangrove swamps are found along the coast. Irrigation tanks are common in the Calcutta area. The two main streams have meandering and braided courses, others have straight courses. Most streams are more than 500 feet wide and more than 15 feet deep. During the high water period, June through September or October, all streams are much wider and deeper, and flooding is common. Streambanks are high and steep. The plains are mainly cultivated—wetland rice and, west of 82°E, dryland crops. The rice paddies are flooded during the growing season, sometime between early May and late January. Deciduous forest occurs in the east; most of the forest is leafless sometime between early February and mid-May. The settlement pattern is dense. Building types and materials in the cities and villages are similar to those in peninsular India. The predominant culture features on the plains are the canals, ditches, and embankments. The network of railroads, mostly double track and 3'6" gage, and surfaced highways is also dense.

The remainder of India consists of high mountains, some flanking hills, and small plains areas. The

FIGURE 3. Scattered thorny shrubs, 3 to 10 feet high, typical of the vegetation on the dry interior plains (U/OU)







FIGURE 4. Sharp-crested sand dunes are very common throughout the Great Indian Desert (U/OU)

Himalayas make up most of the mountain areas and are rugged and steep (Figure 6). Peaks are mostly between 12,000 and 20,000 feet above sea level, and many are permanently snow covered. The other mountains, south of the Brahmaputra, are lower, averaging up to about 6,000 feet in elevation, the highest point, 12,533 feet above sea level, is northeast of Imphal. Local relief is more than 5,000 feet in most of the Himalayas and more than 2,000 feet in the mountains south of the Brahmaputra. Local relief in the hills ranges from 1,500 to 2,000 feet. The plains north of Chushul and the many small basins and valley plains in the mountains are flat to rolling. In the mountains, vegetation is lacking at elevations above about 10,000 feet, mixed forest, predominantly evergreen, occurs on lower slopes (Figure 7) and on the hills. Some valleys are terraced and cultivated in



FIGURE 5. The flat Gangetic Plain is a patchwork of irrigated fields in northern India (U/OU)



FIGURE 6. High peaks in the central Himalayas are rugged, steep, and partially snow covered (U/OU)

wheat or rice. The dense network of streams in deep rocky gorges or Y-shaped valleys are fed by glaciers (Figure 8) and snowmelt. Stream flow is small November through May, but becomes torrential (flash floods are common) June through September. There are few settlements in the highlands; buildings are of brick or stone. The transportation routes are mostly tracks or trails, there are a few surfaced roads, and along and south of the Brahmaputra, some single-track meter-gauge railroads.

## 2. Climate

India is mostly tropical or subtropical, although in the mountainous north arctic conditions prevail.



FIGURE 7. A mixed forest of predominantly needleleaf evergreen trees and some deciduous trees is typical of the vegetation at elevations below 11,500 feet (U/OU)



FIGURE B. Glaciers in the Himalayas are the principal sources of stream in northern India (U/OU)

There are pronounced wet and dry seasons and significant seasonal and areal variations in temperature throughout the country (Figure 0). Winter (December through February) is generally clear, cool, and dry except in the Himalayas, where winter is very cold and snowy. The hot weather season (March through May) is sunny, dry, and very hot. The southwest monsoon is a rainy season that extends from May or June through September except in north-central portions, where it is limited to July and August. This season is uncomfortably hot and humid with frequent showers and rainstorms. The season of the retreating southwest monsoon (October and November) is characterized by decreasing cloudiness, rainfall, and temperature.

Temperatures in India during the hot weather season are among the highest recorded anywhere in the world. Afternoon averages reach 100°F or more over much of the interior. In contrast, the winters are pleasantly warm in the south and cool in the north, with early morning averages ranging from 75°F in the south to 45°F in the north. Winters in the Himalayas are, of course, much colder. Mean annual precipitation ranges from less than 5 inches in the extreme north to well over 100 inches along the seaward-facing mountain slopes in the southwest and northeast (Cherrapunji, located on an exposed slope near Shillong in the northeast, receives 450 inches annually, the second highest world average. Average monthly amounts during the southwest monsoon range from 2 inches in the north and west to about 25 inches or more on windward mountain slopes. Snow

occurs above 3,000 feet in the Himalayas in October through March.

Maximum cloudiness occurs during the southwest monsoon, when the average cloud cover ranges from 70% to 90% except in the extreme northwest, where averages are appreciably lower. Minimum cloudiness occurs during the winter and averages mostly between 20% and 50%.

Thunderstorm activity reaches a maximum in March through October. The average number of thunderstorm days annually ranges from 70 or more in sections of the extreme south, east, and north to 10 days or less in some coastal and interior sections. Visibility, although generally good, is limited at times by dust or haze in the desert sections during the hot weather season. In winter, the chief restrictions are valley fog in the north, smoke near the industrial districts, and low clouds and snow in the Himalayas. During the southwest monsoon, heavy showers and low clouds are the limiting factors.

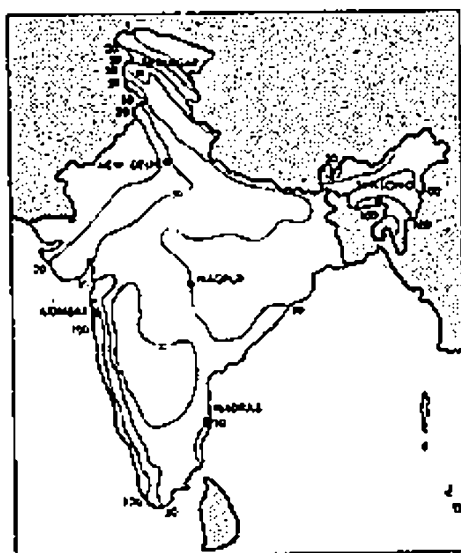
Relative humidity is usually highest during the southwest monsoon, when average values are 80% or more throughout the day in many sections. Lowest humidities occur during the hot weather season, and averages are less than 50% in central portions. Surface winds are generally weak except during the southwest monsoon, when speeds over 18 knots are occasionally experienced at a number of locations. Tropical storms reach the mainland from the Bay of Bengal and Arabian Sea, principally in May through November, accompanied by heavy rainshowers and occasionally by destructive winds and high tides.

## B. Military geographic regions (C)

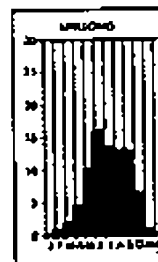
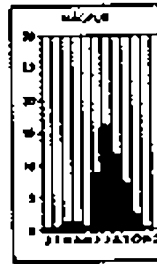
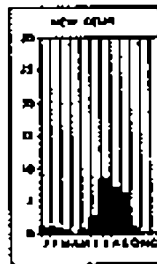
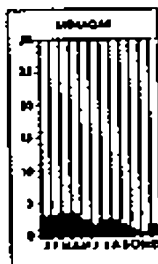
India has been divided into four military geographic regions—the Southern Uplands, the Northwestern Desert, the Central Plain, and the Northern Mountain Rim (Figure 1). The combination of environmental conditions within each region would have a relatively uniform effect on military operations, but there would be marked differences between adjacent regions.

### 1. Southern Uplands

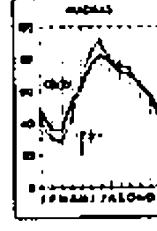
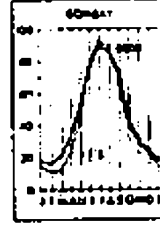
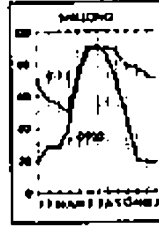
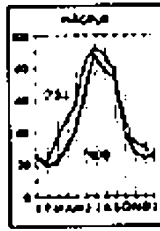
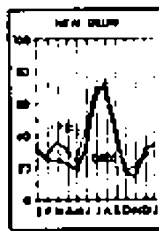
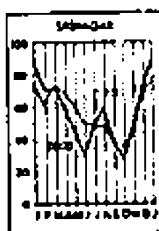
This region generally is well suited for ground operations. Annual movement would be feasible, but roads would need considerable maintenance to support sustained heavy military traffic. Construction of roads having long, straight alignments would be easy nearly everywhere, and construction would constitute major engineering problems only in the mountains and some hill areas. Offroad dispersal and



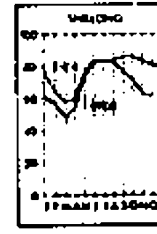
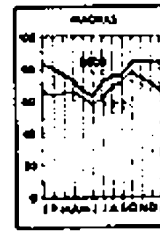
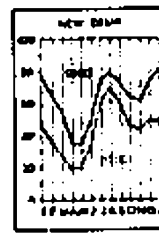
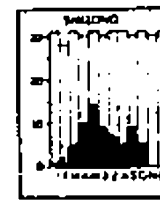
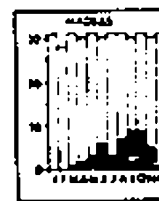
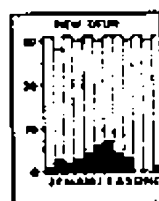
MEAN ANNUAL PRECIPITATION (INCHES)



MEAN MONTHLY PRECIPITATION (INCHES)

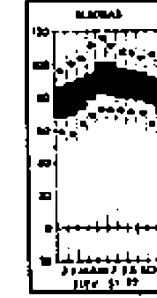
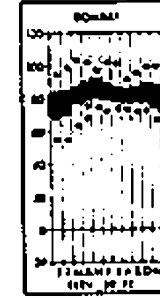
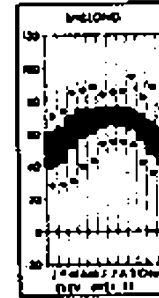
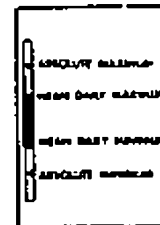
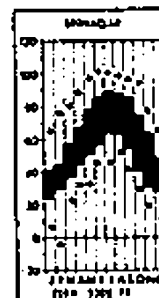


MEAN CLOUDINESS (%) AT SPECIFIED HOURS (15Z)



MEAN THUNDERSTORM DAYS

MEAN RELATIVE HUMIDITY (%) AT SPECIFIED HOURS (15Z)



TEMPERATURES (°F)

FIGURE 9. Precipitation, cloudiness, thunder-storm days, relative humidity, and temperatures (U/OU)

cross-country movement conditions for vehicles are good most of the year on the rolling, cultivated, or scrub-covered plains in most of the interior of the region. Hindrances to movement are stream depths during the high water period, high, steep streambanks, and irrigation tanks near the coast. Conditions become only fair at times after heavy rains, especially during June through September, when the soils become miry. On the coastal plains cultivated in wetland rice, movement would be feasible only from February through April, when the ricefields are drained. In the hills and mountains in the remainder of peninsular India, steep slopes preclude offroad dispersal and cross-country movement. Concealment from air and ground observation is available in the areas of evergreen forest along the west-facing slopes of the western mountains and hills and in structures in the towns and villages. It is available in the other forested areas (in the east and northeast and on the east-facing slopes of the western mountains and hills) except from sometime between early February and mid-May when the trees are leafless. Cover from flat-trajectory fire is afforded by the newer structures in the large urban centers and by surface irregularities in the mountains and some hills. The construction of bunker-type installations is feasible in the areas of thick, well-drained soils in most of the interior plains. The construction of tunnel-type installations is feasible only in the few areas of sufficient relief and hard stable rock in the mountains and some hills.

The Southern Uplands region is well suited for airborne and airmobile operations. There are numerous sites on cultivated or scrub-covered plains for parachute or helicopter landings. The region has 14 airfields suitable for landings of assault-type aircraft, and most of the region is well suited for the construction of large airfields with unrestricted runway orientations and air approaches.

Clear sea approaches, available transportation routes, and relatively favorable terrain for cross-country movement except for delta areas, permit amphibious operations. During the southwest monsoon, however, tide and surf conditions would be unfavorable for amphibious landings.

Generally unfavorable conditions exist for irregular force operations. Movement on the plains would be possible almost everywhere, but they would be slowed when rice paddies are flooded from sometime between early May and late January. Small units could move on foot in the hill and mountain areas, but slowly and with great difficulty because of steep slopes and dense forests. Cover from flat-trajectory fire and concealment from ground observation are provided in the

rugged highlands by surface irregularities; on the plains, fair to good cover is afforded by manmade features, chiefly masonry buildings, railroad and road embankments, dikes, and irrigation ditches. In the hills and mountains, concealment from air and ground observation is available in the densely forested areas, but only sometime between early February and mid-May in the areas of deciduous forests. Water is generally plentiful except between January and March, although most sources are biologically contaminated, especially near populated places. Small to moderate amounts of natural food are available in the hills and mountains; small quantities of cultivated plant food also are available. Wildlife such as antelope, deer, and bear provide additional food sources. On the plains, rice, wheat, corn, and other crops are available at harvesttime. Fuel for fires is limited to the forested areas. The flat to rolling plains in most of the region afford many sites for helicopter landings and parachute operations to supply food and firearms. When the rice paddies are flooded, however, recovery of airdropped heavy supplies would be difficult. Principal endemic diseases are: enteric infections (cholera, smallpox, typhoid fever, and hepatitis); respiratory infections (influenza, pneumonia, and tuberculosis); and insect-borne diseases (malaria, filariasis, typhus, plague, and encephalitis). Many species of insects (such as flies) and pests (such as scorpions and spiders) affect health conditions. Among the poisonous snakes in the region, the most dangerous are vipers, kraits, and cobras. Dangerous animals include tigers, leopards, wild elephants, and rabid animals. Some plants and trees contain poisonous or allergenic properties.

## 2. Northwestern Desert

This region is very poorly suited for ground operations. Water is scarce, and there are no roads; cross-country movement would be slow in loose sand and dune areas and would be precluded in the saltflats, mudflats, and flooded areas in the southwest. Concealment from air observation is lacking and concealment from ground observation and cover from flat-trajectory fire are available only in the dune areas. Additional cover could be obtained by the construction of bunker-type installations in the many areas of thick soils and a low water table. None of the region is suited for the construction of tunnel-type installations. Roads with long, straight alignments could be constructed easily in most of the region; construction would present major engineering problems in the southwest, where natural foundations and drainage are poor.

The region is well suited for airborne and airmobile operations. There are many sites for parachute and helicopter landings except in the areas of high dunes and, in the southwest, of poor drainage. There are no airfields suitable for landings of assault-type aircraft. Large airfields could be constructed in most of the region; such construction, however, would entail a major engineering effort in the dune areas and the poorly drained areas.

The Northwestern Desert region is largely unsuited for amphibious operations because most of the coast is fringed by saltflats and mudflats. The Rann of Kutch is inundated by high tides during June through September.

Conditions are unfavorable for irregular force operations. Movement of foot troops would be slowed or precluded by soft soil and loose sand. Movement in the Rann of Kutch would be feasible only from November through May but extremely hazardous even then because of the varied thickness of salt crust. Cover from flat-trajectory fire and concealment from ground observation would generally be poor except in the sand dune and isolated hill areas, where surface irregularities provide some cover and concealment. Concealment from air observation is limited largely to manmade features. Water, shelter, and fuel are scarce throughout the year. Food is also scarce in most of the region except in the southwest, where dryland crops are available at harvesttime. The few settlements in this least populated part of India represent the best available food sources. Duststorms and the intense heat between April and mid-June would make operations extremely difficult. Food supply and firearms could be provided relatively easily by airdrops or helicopter landings. Endemic diseases are the same as those cited for the Southern Uplands region; there is little wildlife.

### 3. Central Plain

The region is relatively well suited for ground operations. Onroad movement would be unimpeded in most of the region. Offroad dispersal and cross-country vehicular movement would be fairly easy in the west in the cultivated areas, but would be slowed by the irrigation ditches and canals; movement would be easy in most of the remainder of the region from February through April when the rice paddies are drained. Hindrances to cross-country movement are: high, steep streambanks; areas of mangrove swamp; the many streams too deep to ford; the extensive flooded areas from June through September or October; and, near Calcutta, the irrigation tanks.

Concealment from air and ground observation is available in structures in the towns and villages throughout the region and in the forests of the east except from sometime between early February and mid-May, when the trees are leafless. Cover from flat-trajectory fire is available in the newer structures in the large urban centers. The construction of bunker-type installations for additional cover would be easy in the areas of low relief and thick soils in most of the region, but it would not be feasible in the perennially wet areas and near streams because of the high water table and flooding during June through September or October. Low relief and deeply buried bedrock prohibit the construction of tunnel-type installations. Construction of roads with long, straight alignments would be easy nearly everywhere; the requirements for bridging, fill, and drainage provisions, however, would constitute major engineering problems in parts of the region.

The Central Plain region is fairly well suited for airborne and airmobile operations. Sites for parachute and helicopter landings are numerous in the cultivated areas in the west and in most of the remainder of the region from February through April when the rice paddies are drained. Sites generally are lacking in the east because of forest. There are 11 airfields in the region suitable for landings of assault-type aircraft. In spite of its flatness, the region is only fairly well suited for the construction of airfields; foundations and drainage are poor in much of the region and pose engineering problems. Furthermore, air approaches would be severely restricted by the surrounding high mountains.

Amphibious operations would be impractical. The coast is part of the Ganges Delta and is a morass of swamps traversed by innumerable sloughs and distributaries. Large areas of the coast are subject to inundation from stream runoff and by high tides. The sea approaches are obstructed by extensive shifting shoals, and shallow water extends several nautical miles off the muddy shores.

Conditions in the region are mostly unfavorable for irregular force operations. Movement would be possible everywhere but would be slowed when the rice paddies are flooded, sometime between early May and late January, and when the drycrop fields are irrigated, generally sometime between May and November. In places, movement would be precluded by soft soil or steep-banked streams and canals too deep to ford. Cover from flat-trajectory fire is provided by manmade features such as masonry buildings, walls, railroad and road embankments, dikes, irrigation ditches, and streambanks. Concealment

from air observation is limited largely to manmade features such as buildings and from ground observation to railroad and road embankments, dikes, and irrigation ditches. Water is plentiful, and livestock and (seasonally) rice, wheat, and corn are adequate sources of food. Most sources of water are biologically contaminated, especially near populated places. Wood for fuel is scarce. The flat to rolling plains afford many sites for helicopter landings and parachute operations to supply food and firearms. When rice paddies are flooded, however, the recovery of airdropped heavy supplies would be difficult. Endemic diseases are the same as those listed for the Southern Uplands region; there is little wildlife.

#### 4. Northern Mountain Rim

Most ground operations would be precluded in the region. Vehicular movement on the few roads would be restricted by poor surfaces and steep grades, and impossible on the tracks and trails. Road construction would entail nearly insuperable problems of grading, blasting, tunneling, and bridging. Offroad dispersal and cross-country movement of vehicles would be precluded because of steep slopes. Cover from flat-trajectory fire and concealment from ground observation would be afforded by surface irregularities. Concealment from ground and air observation would be provided by forests in the eastern mountains and at lower elevations of other mountains; no concealment from air observation is available at higher elevations in the Himalayas. The mountains are well suited for the construction of tunnel-type installations that would furnish ample cover by means of short entries. Except locally in valleys and basins with thick soils, the region is unsuited for the construction of bunker-type installations.

The Northern Mountain Rim region is also virtually unsuited for airborne and airmobile operations. Sites for helicopter and parachute operations and the construction of airfields are available only in a few of the wider basins, but even here the surrounding high peaks severely restrict approaches. There are four airfields in the region suitable for use by assault-type aircraft.

Conditions in the region favor irregular force operations. Small units could move on foot in most of the region, but only with great difficulty because of rugged terrain and dense forests. Movement would be slowed or precluded at times by deep snow and, from April through November, by flash floods. Dense forests provide excellent concealment from air and ground observation on lower slopes; above 11,500 feet

concealment from air observation is generally lacking. The numerous surface irregularities and buildings in the few towns provide additional concealment from ground observation, and cover from flat-trajectory fire. Water is plentiful in most of the region except in the northwest; as elsewhere, most sources are biologically contaminated. Food is scarce except for the crops and some livestock in the settlements in the mountains, and the forests provide wood for fuel. Airdropping supplies would be restricted to a few sites in the wide basins. The physiological and psychological factors affecting irregular force operations are similar to those cited for the Southern Uplands region.

### C. Strategic areas (C)

India has numerous large cities which are important industrial, commercial, and transportation centers. Four—Calcutta, Bombay, Delhi, and Madras—are most significant as strategic areas (Military Geographic Factors map at the end of the chapter, Figure 22).

#### 1. Calcutta

Located in the Ganges Delta area near the Bangladesh boundary, Calcutta (Figures 10 and 11) is the largest urban area in India, one of the most important commercial and transportation centers in Asia, and the major industrial center and second largest port in India. The 1971 population of the strategic area, which includes the city and its environs, was 7,005,000. Production here accounts for more than half of the goods manufactured in India and includes railroad cars, motor vehicles, and many military items, such as weapons and munitions. The Calcutta strategic area contains the largest concentration of jute mills in the world. The airfield east of the city is an international airport; a smaller field is located to the north. The total storage capacity in the strategic area for refined petroleum products is 2,913,000 barrels.

#### 2. Bombay

Located on a peninsula on the west coast, Bombay (Figures 12 and 13) is the second largest urban area, largest port, a headquarters of the Indian Navy, and a major transportation, commercial, industrial, and telecommunication center. The 1971 population of the strategic area was 5,969,000. The port, with an excellent deepwater harbor and extensive storage facilities, handles 40% of the tonnage of imports and

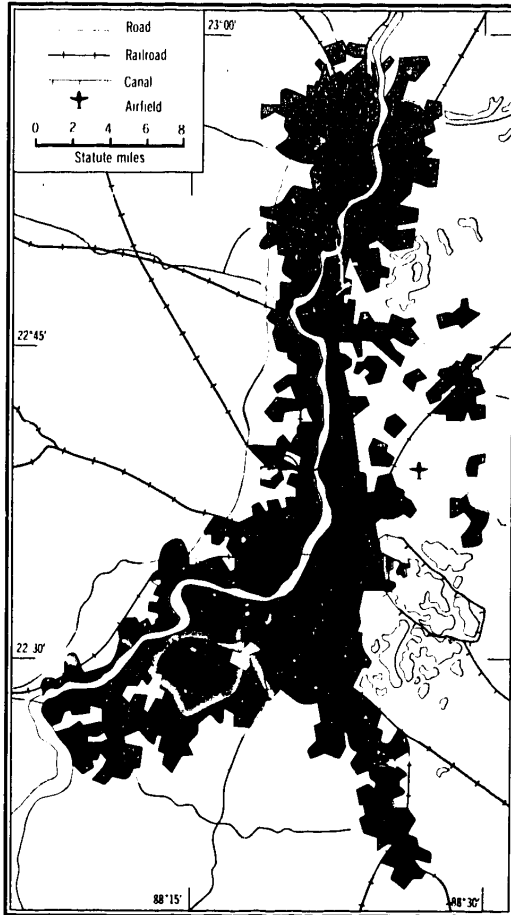


FIGURE 10. Calcutta strategic area (C)



FIGURE 11. Calcutta's Chowringhee Street is the center of one of Asia's greatest commercial districts (C)

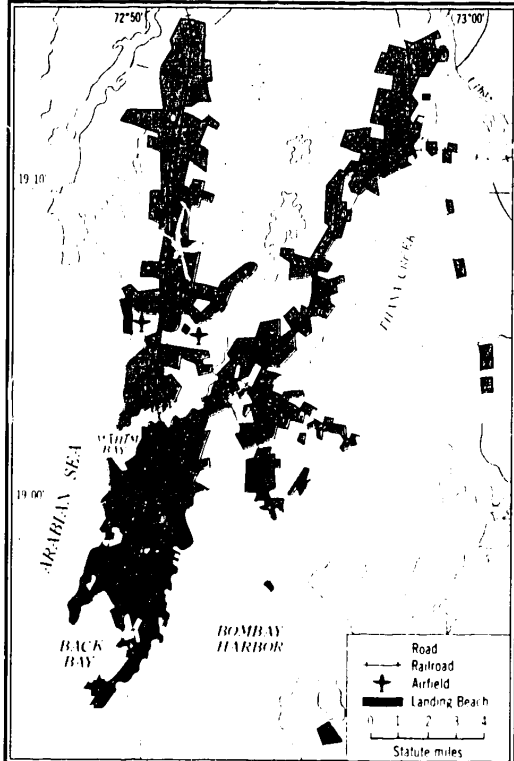


FIGURE 12. Bombay strategic area (C)

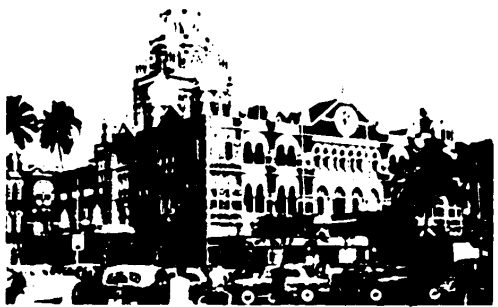


FIGURE 13. The Western Railroad Office in Bombay reflects the combination of Western and Indian architecture typical of older buildings (C)

exports of the country. The naval base, in the southeast, has extensive storage facilities for guns, gun mounts, and other naval equipment; the main ammunition depot is on an island about 4 miles to the east. An international airport is located in the north-

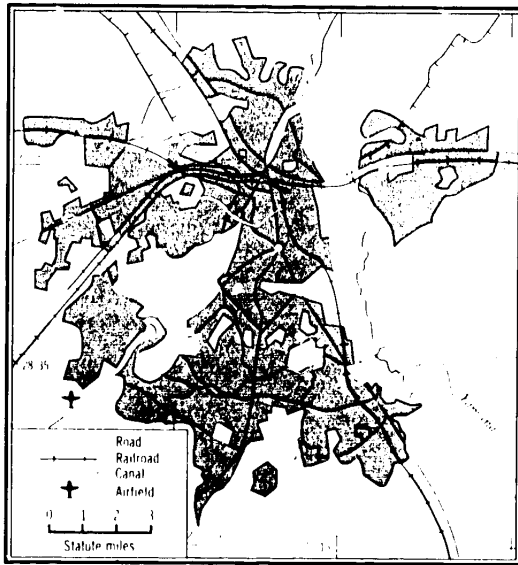


FIGURE 14. Delhi strategic area (C)

central part of the strategic area; another smaller field is located in the northwest. Bombay contains the most important concentration of textile mills in India and has many light engineering, motor vehicle, and consumer goods factories. The city also is the center for India's atomic energy research, and the country's largest petroleum refinery as well as several chemical plants are located here. The total storage capacity in Bombay for refined petroleum products is 15,302,000 barrels, crude oil storage is 5,705,000 barrels.



FIGURE 15. New Delhi, in the southern part of the strategic area, contains large, multistory government buildings with spacious, landscaped grounds (C)

### 3. Delhi

Located in northern India, the national capital (Figures 14 and 15) is also the principal telecommunication center and a leading transportation, financial, educational, and cultural center. The 1971 population of the strategic area was 3,630,000. Most of the people live in the older, congested northern part of the city (Figure 16). The southern part consists of New Delhi, location of government buildings, diplomatic establishments, and a large military reservation. The city's only airfield, located in the southwest, is an international airport. The total storage capacity in the strategic area for refined petroleum products is 225,000 barrels.

### 4. Madras

The fourth largest city (Figures 17 and 18) has a population 2,170,000, and is the third largest port in

FIGURE 16. Substandard living conditions in dilapidated structures are commonplace in the older northern sections of Delhi (C)





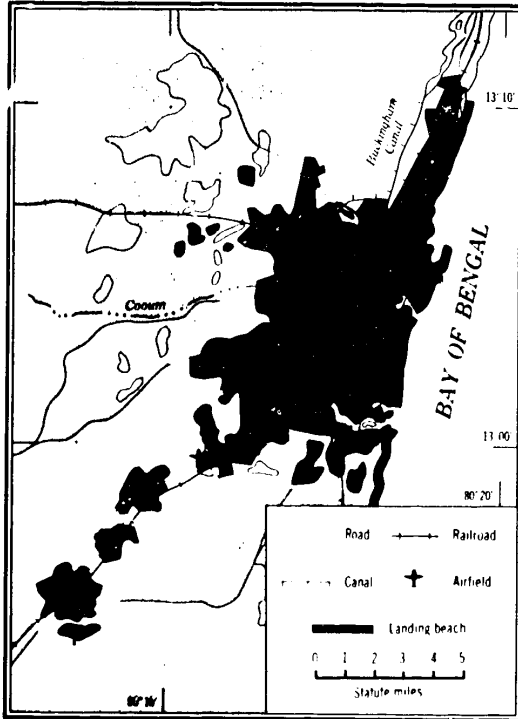


FIGURE 17. Madras strategic area (C)

terms of cargo handled. The commercial, telecommunication, educational, and cultural center of South India and a growing industrial center. Madras manufactures railroad cars and motor vehicles. The airfield immediately southwest of the built-up area is an international airport, a smaller airfield is located farther south. The strategic area has a refined

petroleum products storage capacity of 1,284,000 barrels.

5. Other important areas

NAME AND POPULATION	SIGNIFICANCE
Agra 638,000	Major transportation center; railroad transshipment point and important joint civil-military airfield; significant commercially; administrative seat of Agra district.
Ahmadabad 1,588,000	One of leading industrial (cotton textiles), transportation, and commercial cities; large civil airfield; religious and cultural center.
Allahabad 514,000	Important agricultural trading and communications center; important civil-military airfield; main Hindu pilgrimage place; seat of large university; district headquarters.
Asansol-Durgapur complex 560,000	Important heavy industry (steel, aluminum, railroad cars and locomotives, mining machinery) and marketing center; rail junction with large yards.
Bangalore 1,648,000	Major industry (aircraft and aircraft engines, machine tools, communications), transportation (large civil airfield), and commercial center; capital of Mysore State.
Cochin 438,000	Important west coast port (second to Bombay) and commercial center, naval training and operating base, military airfield.



FIGURE 18. Madras harbor, on the Bay of Bengal, is a principal port of call for vessels proceeding to and from Calcutta (U O U)

Hyderabad-Secunderabad 1,799,000	Important transportation (railroad, workshops), light industry, cultural, and commercial center; capital of Andhra Pradesh State; large military base; a military airfield and a large joint civil-military airfield.
Jamshedpur ..... 465,000	A principal iron and steel manufacturing center; major industrial city.
Kanpur ..... 1,271,000	Major industrial (textiles, leather goods; jute mills), commercial, and transportation center; largest city in Uttar Pradesh State; major ordnance plants, large fertilizer plant.
Nagpur ..... 866,000	Principal transportation and commercial center of central India, growing industrial center (textiles, ordnance); administrative seat of Nagpur district; large joint civil-military airfield.
Vishakhapatnam ..... 362,000	Important east coast port and commercial and transportation center; site of large shipyard, naval training base, and petroleum refinery; storage capacity for refined petroleum products 925,000 barrels, crude capacity 645,000 barrels.

**D. Internal routes (C)**

The internal routes, the easiest avenues of movement between strategic areas, between land approaches and strategic areas, and between amphibious landing areas and strategic areas (see map at the end of the chapter), are described in Figure 19.

**E. Approaches**

The perimeter of India is 14,480 miles (excluding Sikkim), of which about 7,880 miles are land boundaries and the remainder is seacoast. The coastline of the mainland is about 3,600 miles long and is about equally divided between the Bay of Bengal and the Arabian Sea. About one-half of the shores are sandy, the remaining shores are mostly formed by mudflats. The coastline of the island groups in the Bay of Bengal and the Arabian Sea totals about 700 miles. The islands are predominantly fringed by coral reefs. India claims 12 nautical miles of territorial waters. The land boundaries are discussed in Figure 20 (U/OU).

**1. Land (C)**

Land approaches to India are greatly restricted by difficult terrain and poorly developed transportation facilities. The seven selected approaches are the best means of access from adjacent countries (see map at the end of the chapter). Of these, only two, the approaches from Pakistan and Bangladesh, are across plains. The approaches are described in Figure 21.

**2. Sea (U/OU)**

The east, south, and west coasts of India border the Bay of Bengal, Laccadive Sea, and Arabian Sea, respectively. Offshore approaches are generally clear except for a few shoal areas several nautical miles offshore, and widely scattered islets, rocks, and wrecks off the central and southern parts of the west coast. Nearshore approaches are partly obstructed by scattered islets, rocks, mudflats, shoals, and fishing stakes. Surf 4 feet or higher is common on all coasts May through October. During the remaining months surf is light along the west coast, along the northern part of the east coast, and moderate elsewhere. Along the west coast tides are largely mixed and range from about 2 feet in the south to about 15 feet in the north. The amphibious landing areas shown on the map at the end of the chapter provide access to strategic areas or to routes leading to them.

The amphibious landing area at Madras consists of three beaches totaling 26 miles. They are sandy and flanked by lagoons (Figure 17). This stretch is separated by a harbor and interrupted by several streams but has a usable length of 24 miles. Sea approaches are clear, but nearshore bottom slopes are too flat off most of the beach for dry-ramp LST landings. The spring tidal range is 3.2 feet. Surf 4 feet or higher occurs frequently. The beaches front a partly cultivated plain extending several miles inland to low hills. The center part is immediately backed by a seawall and the city of Madras. The remainder of the beach is backed by low sandy ground that is partly covered by casuarina and palm trees, and which extends to a canal 1,200 yards to 1.6 miles inland. The canal roughly parallels the coastline. Exit is by tracks and trails to a surfaced coastal road and the streets of Madras.

The amphibious landing area at Puri is a sandy beach 4.9 miles long. Offshore approaches are clear, but the nearshore zone is partly obstructed by bars. Nearshore bottom slopes are such that an LST would

FIGURE 19. Internal routes (C)

ROUTE	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
Between Delhi and Calcutta; across densely populated and intensively cultivated lowland plains drained by the Ganges.	One to four lanes wide; mostly bituminous surfaced and in poor to good condition. Many narrow, low-capacity bridges are major bottlenecks.	Double track, 5'6" gage; electrified between Allahabad and Calcutta.	Restricted by narrow, congested streets in numerous towns and villages, irrigation ditches, canals, miry soils in cultivated areas, and many streams. Movement precluded at times by flooding during high water period, June through September or October, and in ricefields between early May and late June.
Links Calcutta to Madras; through poorly drained eastern coastal lowlands with numerous streams and ricefields.	One to two lanes wide; bituminous surfaced and in fair to good condition.	Mostly single track, 5'6" gage.	Restricted by irrigation tanks, ditches, canals, miry soils, and narrow, congested streets in towns and villages. Movement precluded by flooding during high water period, and in rice paddies during growing season.
From Madras to Bombay; across mostly plains and some hills and mountains.	One to two lanes wide; concrete and bituminous surfaces in fair to good condition. Bottlenecks include narrow bridges, tunnels, and sharp curves.	Predominantly single track, meter gage. Madras-Bangalore and Pune-Bombay lines 5'6" gage, double track. Pune-Bombay line also electrified.	Generally easy, but hindered in places by narrow, congested streets in towns and villages, and by irrigation tanks and canals. Restricted by miry soils for short periods between May and November. Precluded by steep slopes in hills and mountains near Bombay.
Connects Bombay with the Delhi-Calcutta route at Agra; across rugged hills and mountains near west coast, and rolling upland plains elsewhere.	One to two lanes wide; concrete and bituminous surface in fair to good condition. Bottlenecks include numerous narrow bridges and sharp curves.	.....	Restricted near coast by steep slopes; elsewhere by streams and irrigation tanks locally. Movement difficult in some plains areas because of miry soils June through October.
Links southern approach from Pakistan to Delhi across predominantly cultivated, flat to rolling plains.	Two to four lanes wide; mostly bituminous surfaced in fair to good condition. Bottlenecks are narrow, low-capacity bridges.	5'6" gage, double track in north and single track in south.	Fairly easy but slowed by numerous irrigation ditches and canals, hindered by flooding and miry ground after heavy rains between June and September.
Connects northern approach from Pakistan with internal route at Jullundur.	One to two lanes wide; bituminous and bituminous-surface treated, in poor to fair condition. Bottlenecks include many narrow, low-capacity bridges, sharp curves, steep grades, and tunnels.	.....	Precluded along most of route by steep slopes and by extensive flooding during April through November.
From western approach in China to internal route at Srinagar; across rugged mountains with narrow valleys and passes.	One to two lanes wide; gravel and bituminous-treated surfaces in poor to good condition. Sharp curves and steep grades most common bottlenecks.	.....	Precluded by steep slopes.
Links approach from Nepal with internal route at Barhi, mainly across low plains of Ganges.	One to two lanes wide; bituminous and bituminous-treated surfaces in fair to good condition. Many narrow, low-capacity bridges and sharp curves.	Single-track, meter-gage line in northern part of route.	Greatly restricted by numerous irrigation ditches, canals, and streams. Precluded seasonally by extensive flooding.

FIGURE 19. Internal routes (C) (Continued)

ROUTE	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
From eastern approach from China through Sikkim, connecting with internal route at Baruni; northern third in steep, rugged mountains, remainder traverses plains of Ganges.	Single lane; bituminous-surface treated in poor to good condition in mountains; many sharp curves. Two lanes wide, with bituminous surface in good condition across plains; many narrow, low-capacity bridges and sharp curves.	Predominantly single track, meter gage; between Siliguri and Mukuria, 5'6" gage.	Precluded by steep slopes in mountains. Elsewhere, movement hindered by numerous irrigation ditches, canals, and streams; precluded by extensive flooding during period June through October.
Approach from Burma joins internal route at Siliguri; southern third across steep, rugged hills and mountains; remainder traverses Brahmaputra plains and some hills.	One to two lanes wide; bituminous, bituminous-treated, and gravel surfaces in poor to good condition. Sharp curves, steep grades, narrow bridges, and ferries are principal bottlenecks.	Single track, meter gage in plains.	Precluded by steep slopes in hills and mountains. Movement restricted by numerous irrigation ditches, canals, and streams; precluded by extensive flooding seasonally.
Between approach from Bangladesh and Calcutta; across flat low-lying plains with many streams.	One lane wide, bituminous-treated surface, in fair condition.	Double track, 5'6" gage line roughly parallels road.	Difficult to get, poorly drained lowlands; precluded by flooding during period June through October.
Connects amphibious landing area near Puri with internal route at Cuttack; across poorly drained plain.	Single lane with bituminous surface; in fair condition.	.....	Restricted by numerous irrigation ditches and canals. Movement precluded by flooding June through November, and in rice paddies during growing season.

FIGURE 20. Boundaries (U/OU)

BOUNDARY	LENGTH	STATUS	TERRAIN
	<i>Miles</i>		
Pakistan.....	1,380	Demarcated.....	From the coast inland, across flooded lowland plains, saltflats, or mudflats for about 200 mi.; flat to rolling, sandy, or stony desert plains for about 700 mi.; flat to rolling alluvial plains for about 200 mi.; and very rugged, predominantly barren mountains in the remainder.
China.....	1,640	Mostly undefined or in dispute. Only 140-mile China Sikkim border demarcated.	Small area of plains in northwest; remainder high, barren, rugged mountains.
Nepal.....	1,050	Demarcated.....	Short eastern and western segments in rugged mountains that are barren in north and forested in south, western part mainly along stream. Main segment of boundary across flat, cultivated plains.
Burma.....	880	Demarcated most of its length, remainder accepted and being demarcated.	High, rugged, and forested mountains.
Bangladesh.....	2,500	Demarcated except for several segments	Mostly flat, poorly drained alluvial plains
Bhutan.....	370	Demarcated.....	Forested hills and mountains in east
Sikkim.....	60	do.....	High, rugged, forested mountains

FIGURE 21. Land approaches (C)

APPROACH	ROAD	RAILROAD	OFFROAD DISPERSAL AND CROSS-COUNTRY MOVEMENT
From Lahore, Pakistan, across flat to rolling, intensively cultivated plain cut by numerous irrigation canals.	Two to three lanes wide; bituminous surfaced; in good condition. Bottlenecks include narrow bridges.	Double track, 5'6" gage...	Hindered by irrigation canals.
From Rawalpindi, Pakistan, through wide valley plain in hills and in narrow, steep-sided valley in mountains.	One lane wide, with bituminous-treated surface in poor to fair condition. Steep grades, sharp curves, and narrow bridges are major bottlenecks.	.....	Feasible on plains except in July and August when ground generally wet. Movement cross country precluded in mountains because of steep slopes.
From Cha-hsi-kang, China, along narrow valley in hills area.	One lane, improved earth; in fair condition. Bottlenecks include sharp curves and steep grades.	.....	Precluded in most of approach by steep slopes.
From Kathmandu, Nepal, through rugged, steep mountains in the northern segment, and across forested or cultivated plains in the south.	One to two lanes wide; bituminous and bituminous-treated surface, in fair to good condition. Bottlenecks include steep grades, sharp curves, and narrow, low-capacity bridges.	Single track, 2'6" gage near border.	Precluded by steep slopes in mountains, difficult in forested areas of plains, but generally easy in cultivated areas.
From Lhasa, through Sikkim, across rugged hills and mountains.	One lane; improved earth surface in fair condition.	.....	Precluded by steep slopes.
From Shwebo, Burma, through hills and mountains.	One lane wide, earth or gravel surface in poor to good condition. Bottlenecks include ferries, numerous fords, narrow bridges, and steep slopes.	.....	Infeasible, because of steep slopes.
From Jessore, Bangladesh, across poorly drained, cultivated plains cut by numerous streams.	One lane wide, bituminous-treated surface in poor condition.	Double track, 5'6" gage, and electrified.	Infeasible because of numerous streams, nearly perennially soft soils, low dikes, and flooding.

ground several yards off the beach. The spring tidal range is 6 feet. Surf 4 feet or higher occurs frequently. The beach is immediately backed by Puri and its suburbs, which extend about 1.5 miles inland on a flat sandy lowland. The lowland extends several miles inland behind Puri, is traversed by streams and dikes, and is covered by grass, scattered casuarina trees, cultivated fields, and wooded areas. The streams empty into a lake about 2 miles inland. Numerous villages dot the lowland. Exit from the beach is by a track or cross country to the streets of Puri and to a surfaced road leading inland.

The amphibious landing area at Bombay consists of 3 beaches (Figure 12) with a total usable length of 5.2 miles. They are sandy and have fair trafficability. Offshore approaches are partly obstructed by fishing stakes 1.5 to several nautical miles off the beaches. Nearshore approaches to the 2 southern beaches are restricted to rock- and reef-fringed bays and are partly obstructed by shoals, rocks, reefs, and scattered fishing stakes. The nearshore approach to the northern beach

is partly obstructed by shoals, rocks, reefs, and scattered fishing stakes. Flat nearshore bottom slopes preclude LST dry-ramp landings at low tide, but because the spring tidal range is 12 feet, an LST will ground only several yards off the beaches during high tide. Surf 4 feet or higher reaches a maximum during May through October, when it is estimated to occur 5% to 35% of the time on the northern beach but is infrequent during all months on the remaining beaches. The northern beach is backed by discontinuous seawalls, a grass-covered embankment 3 to 16 feet high, a sandy area, and a reclaimed swamp. Exits from the 2 southern beaches are directly to the street of Bombay. Egress from the northern beach is by trails and tracks to a surfaced coastal road.

3. Air (U/OU)

Air approaches<sup>3</sup> to India from the north are over southern U.S.S.R., southwestern China, Nepal,

<sup>3</sup>The discussion zone for air approaches extends approximately 200 nautical miles beyond the borders of India

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Sikkim, and Blutan; from the east over south-central China and Burma; from the south over Bangladesh, the Bay of Bengal, Sri Lanka (formerly Ceylon), the Indian Ocean, and the Arabian Sea; and from the northwest over Pakistan and northeastern Afghanistan. Mountains in all the overland approaches present terrain obstructions. The highest peaks (elevations in feet) and locations are:

ELEVATION	LOCATION
24,550	Southern U.S.S.R.
23,028	Nepal
23,433	Southwestern China
21,000	South-central China
19,200	Burma
3,291	Bangladesh
6,281	Sri Lanka
28,250	Pakistan
22,609	Northeastern Afghanistan

Upper winds are predominantly westerly all year except in the eastern and southern approaches, where easterly winds prevail in June through August about 20,000 feet. These easterly winds are strongest near 35,000 feet, averaging about 70 knots. The westerly winds reach maximum speeds of 60 to 80 knots between 30,000 feet and 35,000 feet in December through March along the 28th parallel. Average speeds decrease on either side of this parallel, dropping to 20 knots in the southernmost and to 50 knots in the northernmost parts of the approaches. The average height of the freezing level is close to 18,000 feet over all approaches from mid-May through September. From late November through March the average height ranges from 16,000 feet in the southernmost to the surface in the northernmost parts of the approaches.

In the northern approaches weather conditions are unfavorable at times in all seasons and probably poorest in May through September, when thunderstorms usually occur on 5 to 15 days per month and the risk of severe turbulence and icing is greatest. In addition, the western part of the northern approach is adversely affected by extensive cloud systems in which the icing hazard is frequently present; maximum cloudiness occurs in January through April when monthly averages are 50% to 70%. The eastern part of the northern approach has its maximum cloudiness in June through September when 60% to 90% cloud cover is normal.

Weather conditions in the eastern approaches are generally favorable in December through March,

when skies are frequently clear or partly cloudy and thunderstorms occur on less than 5 days per month. Unfavorable weather conditions begin in April and extend through October, especially June through September during the southwest monsoon when numerous thunderstorms (mostly 5 to 15 per month) and showers, moderate to severe turbulence, and hazardous icing conditions usually accompany the extensive cloudiness (70% to 95%). Tropical disturbances occasionally affect the coastal sections of Burma in April through December.

Weather conditions in the southern approaches are best from mid-December through March when cloudiness and thunderstorm activity are at a minimum. The least favorable weather occurs in June through September when the southwest monsoon is fully developed. During this period, average cloudiness ranges from 30% to 80% and is attended by frequent showers and hazardous icing conditions. Thunderstorms and severe turbulence are most prominent during two periods, March or April through May or June and September or October through November or December, except over Bangladesh where they are at a maximum during the southwest monsoon. During these periods of maximum activity thunderstorms occur normally on 2 to 7 days per month over the water and 3 to 15 days monthly over Sri Lanka and Bangladesh. Tropical disturbances, occurring principally in May through November, often become extremely dangerous storms and should be avoided.

In the northwestern approaches the weather is favorable for flight much of the time, although periods of inclement weather occasionally occur in December through March over the Hindu Kush mountains. Here, migratory lows are often attended by hazardous icing conditions and by snow and low clouds that obscure the peaks and ridges. Maximum cloudiness, 30% to 60%, occurs in January through March, except near the Arabian Sea coast where cloud cover reaches a maximum, 70% to 80%, in July and August. Poor weather conditions also occur at times in April through September during the height of thunderstorm and turbulence activity; the thunderstorms normally occur on 3 to 10 days monthly at most places, with the greater number generally on the southward-facing slopes of the Hindu Kush. Tropical disturbances only rarely affect the coastal sections.

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17

Places and Features referred to in this General Survey

	COORDINATES			COORDINATES			COORDINATES	
	° N.	' E.		° N.	' E.		° N.	' E.
Agra	27 11	78 01	Haryana (state)	29 00	76 00	Nicaragua Islands (isls)		
Agra (dist)	27 05	77 25	Himachal Pradesh (union territory)	31 00	75 00	Orissa (state)		
Ahmedabad	23 03	72 37	Himalayas (mts)	26 00	84 00	Ostrovskoye		
Ahmednagar	18 05	74 44	Illinois (stn)	38 27	91 28	Peshawar		
Aizawl	23 44	92 43	Illinois (mts)	35 00	91 00	Pondicherry		
Ajaccio	30 23	74 43	Hooghly River (strm)	21 45	88 05	Panaji		
Ajmer	26 27	74 23	Hyderabad (state)	17 23	78 28	Panaji		
Akasa CMO (region)	33 05	79 30	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Albany	18 29	73 54	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Aligarh	27 43	78 03	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Alhambra	23 27	81 51	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Ambala	30 31	76 50	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Amalivoli Islands (isls)	13 23	72 23	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Amritsar	31 33	74 43	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Andaman Islands (isls)	12 30	92 43	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Andhra Pradesh (state)	16 00	78 00	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Andhra Pradesh (union territory)	16 00	78 00	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Arvi	21 24	73 00	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Assam	25 00	91 30	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Assam	18 22	73 49	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Assam	23 41	90 49	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Assam (state)	24 00	93 00	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Avdi	13 07	80 07	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Badajoz	11 36	74 33	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	29 47	76 18	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	22 44	75 23	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	13 39	77 33	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 53	83 15	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 41	78 28	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	28 21	79 25	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	24 19	83 23	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	24 29	83 59	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	31 45	75 12	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	13 00	80 00	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	17 25	78 19	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 20	83 00	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 23	84 23	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	31 25	76 26	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	31 20	72 14	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	31 13	81 28	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	32 14	77 24	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	29 14	83 20	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	21 03	73 48	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	17 54	77 33	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 11	83 31	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 00	80 00	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	27 30	90 30	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 49	86 00	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 40	83 53	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	18 34	73 59	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	31 03	80 59	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	15 29	80 13	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	32 27	84 10	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 03	82 23	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	22 53	85 27	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	8 04	77 51	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	9 10	93 47	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	27 29	84 31	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 32	79 41	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 36	89 31	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 27	78 49	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	30 44	78 53	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	30 46	78 43	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 46	86 07	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	25 19	91 42	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	31 03	73 58	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 30	81 30	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	29 43	84 33	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	34 34	78 39	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	23 21	83 28	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	9 24	78 14	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	10 25	78 30	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	31 00	76 44	Jammu and Kashmir (state)	33 00	75 00	Panaji		
Bahadurgarh	18 44	73 49	Jammu and Kashmir (state)	33 00	75 00	Panaji		

in this General Survey

COORDINATES			COORDINATES			COORDINATES	
° N	' E		° N	' E		° N	' E
27 11	76 01	Haryana (state)	29 00	76 00	Narbas Islands (isls)	8 00	83 30
27 03	77 08	Himachal Pradesh (union territory)	31 00	76 00	Nepal (state)	21 00	81 04
25 02	78 37	Himalayas (mts)	24 00	84 00	Nizams	11 24	78 47
19 05	74 44	Hindus (river)	26 27	77 28	Odisha	22 28	78 28
23 44	82 43	Hindus Kush (mts)	23 00	71 00	Pakistan	26 10	81 40
20 22	78 43	Hongkang River (river)	31 53	88 05	Pandya	20 17	86 42
26 27	74 35	Hyderabad (state)	19 23	78 29	Paradip	20 19	86 27
23 04	78 30	Hyderabad (state)	18 00	78 00	Paradip Gach (port)	23 17	78 36
18 28	73 54	Imphal	24 48	93 37	Pathankot	21 28	75 53
27 53	76 03	Indo-Gangetic Plain (plains)	27 00	80 00	Patna	25 37	85 09
23 27	81 61	Indraprastha	28 29	77 18	Patna	24 04	77 00
20 21	76 30	Indus River (river)	25 20	67 47	Peche	13 06	80 14
11 23	72 33	Indus Valley (valley)	29 00	71 00	Pondicherry (union territory)	11 34	78 49
31 33	74 33	Islamabad, Pakistan	33 42	73 10	Port Blair	11 40	82 43
12 30	92 43	Jaisalmer	28 23	78 25	Port	27 21	93 26
16 00	79 00	Jabalpur	23 19	79 37	Pradhana, Bhutan	27 37	89 57
31 34	73 02	Jaduguda (new mine)	27 39	83 20	Pune (Poona)	18 32	73 57
24 00	84 30	Jalpur	26 53	73 49	Punjab (state)	31 00	76 00
18 22	73 48	Jalimere	26 33	70 54	Puri	18 40	73 53
23 41	84 59	Jalshahi	13 03	77 33	Quilon	6 33	76 28
26 00	83 00	Jamkpur	23 12	86 30	Rajasthan (state)	26 00	74 00
12 07	80 07	Jammu	32 41	74 53	Rajkot	23 16	70 47
11 34	73 33	Jammu and Kashmir (state)	33 00	77 00	Rajmahal Hills (hills)	24 40	87 25
26 42	84 19	Jamnagar	22 29	70 04	Rana Pratap Sagar Dam (dam)	24 36	73 39
22 44	88 27	Jamshedpur	22 48	86 31	Rana Pratap Sagar (powerplant)	24 37	73 33
12 58	77 34	Jamshere, Bangladesh	23 10	89 13	Ranchi	23 21	85 20
23 22	81 13	Jodhpur	26 17	73 07	Rangpuram	13 23	76 08
23 41	78 23	Jogbhopa	26 18	90 23	Ranipore	13 58	79 20
28 21	79 23	Jorhat	26 41	94 17	Rann of Kutch (marsh)	24 03	70 10
24 18	83 28	Jullundur	31 18	73 34	Raurkela	22 10	86 53
25 28	85 59	Kabul, Afghanistan	34 31	69 12	Rawalpindi, Pakistan	33 26	73 04
31 48	75 17	Kabul	16 56	83 18	Riband (river)	24 23	87 36
18 00	90 00	Kalpi	23 18	73 29	Rochester	29 52	77 53
17 28	78 28	Kalpattham	12 24	80 10	Rohatgi (hydro power plant)	9 21	77 08
23 20	82 00	Kandla	23 02	70 13	Sabarnati (river)	23 03	72 40
24 35	86 23	Kandla Creek (river)	22 58	70 13	Sagar	23 50	78 43
31 35	78 23	Kanpur	20 25	85 10	Saha	30 19	76 58
34 30	79 14	Kanpur	26 28	80 21	Sambalpur	19 33	74 37
31 13	81 26	Karachi, Pakistan	24 52	67 03	Sanchi, Bihar	26 18	80 37
23 14	77 21	Karakoram Range (mts)	10 04	78 47	Sankosh (river)	26 23	89 41
20 14	83 50	Karakoram Range (mts)	34 00	78 00	Saradwathi	17 27	78 30
21 03	78 46	Karachi	10 45	79 00	Sarawati (river)	14 18	74 53
17 51	77 33	Karnataka (region)	16 00	78 00	Satpura	23 31	81 53
23 11	83 31	Kashmir	30 55	78 57	Saurashtra	21 49	78 43
25 00	76 00	Kashmir	21 28	84 07	Saurashtra	16 59	74 08
21 03	73 46	Kashmir (union territory)	21 38	70 30	Saurashtra	17 41	73 33
27 30	80 30	Kashmir (union territory)	27 43	83 19	Sawabe, Burma	23 54	83 42
22 44	86 00	Kashmir (union territory)	16 40	70 16	Sikkim (protonomote)	27 48	89 30
22 44	86 00	Kashmir (union territory)	16 44	72 53	Sikhar	24 49	82 46
18 56	79 50	Kashmir (union territory)	22 20	87 30	Singur	31 08	77 10
24 00	80 00	Kashmir (union territory)	18 20	73 46	Sindi	20 48	78 52
18 28	73 54	Kashmir (union territory)	25 33	91 36	Singur Peak (peak)	24 34	87 24
22 27	85 10	Kashmir (union territory)	22 43	89 33	Sriharikota Island (island)	13 43	80 10
23 03	92 25	Kashmir (union territory)	18 34	73 53	Srinagar	31 03	74 49
23 22	88 22	Kashmir (union territory)	10 14	17 28	Sylhet, Bangladesh	24 54	91 33
8 04	77 34	Kashmir (union territory)	23 40	94 07	Talcher	20 57	85 13
9 10	92 47	Kashmir (union territory)	16 49	82 43	Tambaram	12 53	80 07
22 22	79 11	Kashmir (union territory)	22 31	83 41	Tamil Nadu (state) (formerly Madras)	11 00	78 03
22 34	89 31	Kashmir (union territory)	23 11	78 50	Tirapur	19 51	72 42
28 27	78 48	Kashmir (union territory)	18 04	80 24	Tirunelveli	27 25	91 52
30 44	76 33	Kashmir (union territory)	9 35	74 31	Tirunelveli	18 00	79 20
30 28	78 43	Kashmir (union territory)	22 22	73 17	Tirunelveli	27 00	71 00
23 48	84 07	Kashmir (union territory)	17 18	79 10	Tirunelveli	8 32	76 51
35 18	81 43	Kashmir (union territory)	11 13	71 74	Tirunelveli	27 30	81 22
31 05	73 54	Kashmir (union territory)	13 31	80 59	Tirunelveli	26 00	82 00
22 30	91 50	Kashmir (union territory)	13 00	73 00	Tirunelveli	8 29	76 33
23 23	84 82	Kashmir (union territory)	34 20	77 23	Tirunelveli	19 02	72 55
27 39	87 53	Kashmir (union territory)	31 33	74 13	Tirunelveli	8 47	78 08
33 26	78 30	Kashmir (union territory)	29 28	91 04	Tirunelveli	33 34	73 08
23 31	83 33	Kashmir (union territory)	18 43	73 22	Tirunelveli	23 30	82 00
9 58	76 10	Kashmir (union territory)	28 38	83 33	Tirunelveli	21 15	72 82
10 25	76 20	Kashmir (union territory)	24 51	80 35	Tirunelveli	28 00	80 00
					Tirunelveli	22 18	73 13



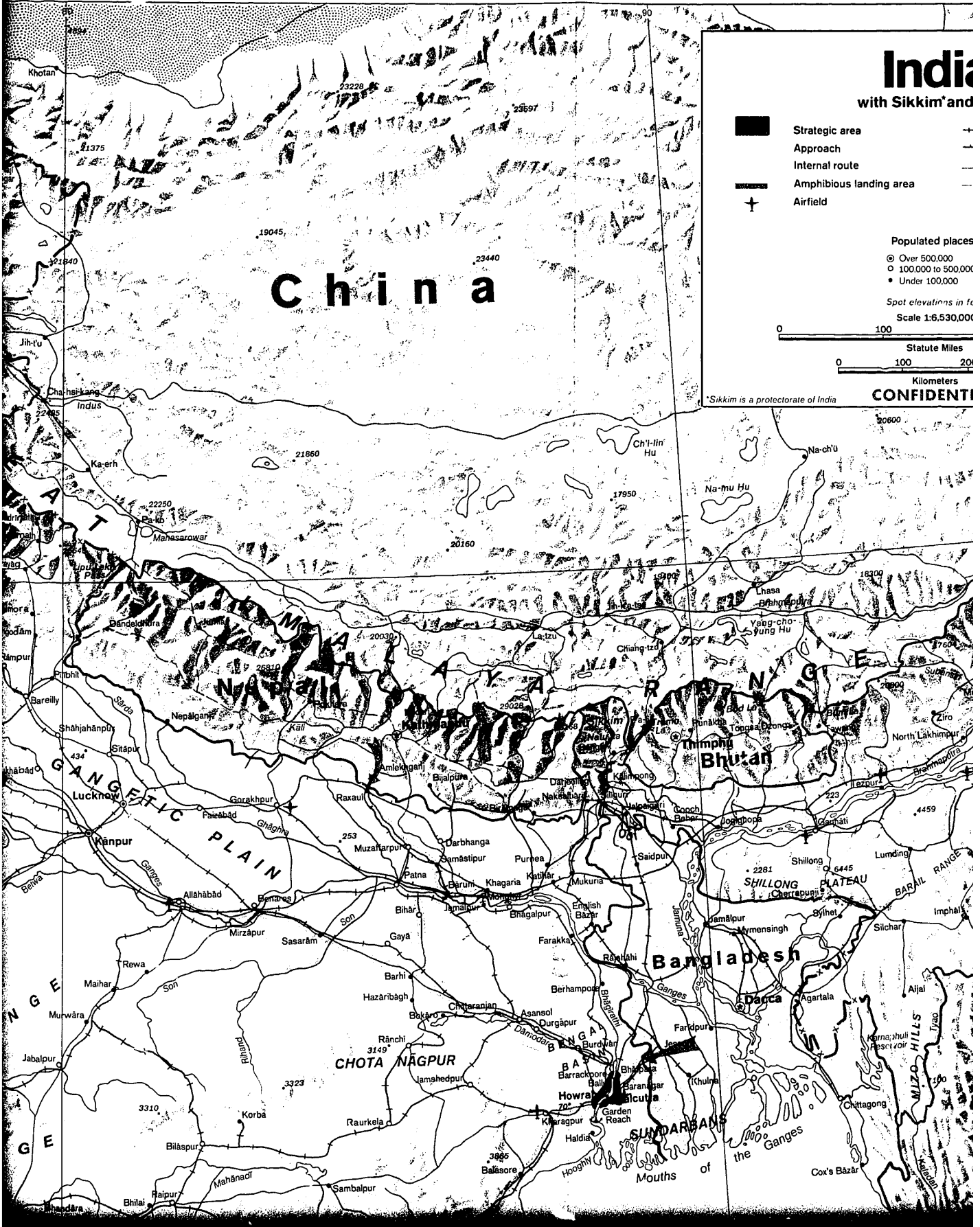
Bhopal	28 19	77 24	Washukh	10 04	73 47	Sashukh (strm)	
Bhubaneswar	20 16	85 50	Karakoram Range (mts)	24 08	73 00	Secunderabad	
Bhubair	21 03	75 46	Kashmir	18 33	79 46	Sharavati (strm)	
Bidar	17 54	77 31	Karnataka (region)	16 00	73 00	Sikong	
Bihar (state)	25 11	85 21	Karnal	20 55	76 57	Shiphai La (pass)	
Bikaner (strm)	23 00	84 00	Katnagha	21 23	84 07	Shikha	
Bikrjal	21 03	75 46	Kashikar (region)	21 22	70 20	Shikhar	
Britain, Kingdom of	27 30	90 20	Kathmandu, Nepal	27 42	85 19	Shimsha, Burma	
B-400 Coalfield (coalfield)	23 49	38 00	Kavala (state)	10 00	79 13	Shikha (princedom)	
Bukhro Nadi (strm)	23 44	83 58	Khadi	18 24	73 43	Shikhar	
Bombay	18 53	72 53	Khatkhata (Cambay)	22 20	79 27	Shikhar	
Brahmaputra (strm)	24 22	90 38	Khatkhata	19 29	73 46	Shikha	
Buckingham Canal	18 28	80 13	Xharokhata	23 35	91 38	Sikong Peak (peak)	
Budko Budge	23 27	85 10	Khatir Hills (mts)	22 44	89 23	Siharikota Island (is)	
Cachar (dist)	23 05	92 55	Khulna, Bangladesh	18 24	73 52	Siraganj	
Calcutta	23 32	88 22	Khulna (see Khadi)	10 14	77 29	Sylhet, Bangladesh	
Cape Comoria (rept)	8 04	77 24	Kudakamal	23 40	94 07	Tachar	
Cer Nicobar (is)	9 10	83 47	Kohima	18 49	82 43	Tacharum	
Chabra (r dist)	27 29	83 11	Koraput	22 21	82 41	Tamil Nadu (state) (formerly Ma)	
Chahabkanz, China	32 32	79 41	Korba	23 11	73 50	Tatapur	
Chalga, Bangladesh	23 38	89 31	Kota	18 24	80 29	Tawang	
Chandigarh	28 27	75 48	Kottagidore	9 33	78 31	Tawang	
Chandigarh (r str)	20 41	76 55	Kottayam	22 22	73 07	Tawang	
Chandigarh (union territory)	26 43	76 43	Koyah	17 16	74 10	Tawang	
Chandrapur (r str)	23 48	86 07	Koyah (strm)	13 15	73 28	Tawang	
Chattarpur	25 18	91 42	Koshikote (Cokeit)	13 37	80 39	Tawang	
Chhaling Bhang, Pakistan	31 03	73 54	Krishna (strm)	11 00	72 00	Tawang	
Chittagong, Bangladesh	22 20	91 50	Lacrosse Islands (is)	34 20	77 23	Tawang	
Chittaranjan	23 52	86 02	Ladakh (dist)	31 33	74 13	Tawang	
Ch'ang-sung Shan-lu, China (mtly)	27 29	87 03	Lahore, Pakistan	24 10	77 33	Tawang	
Chenail	23 38	18 38	Leh	29 29	81 06	Tawang	
Chitpale	23 34	83 32	Lhasa, China	18 43	73 25	Tawang	
Cochin	8 59	76 14	Lombok	28 35	83 23	Tawang	
Cochin (former native state)	10 25	76 30	Lough	26 51	80 53	Tawang	
Colombate	12 00	78 38	Lucknow	30 54	75 51	Tawang	
Colaba (section of Bombay)	18 43	72 49	Ludhiana	23 23	92 44	Tawang	
Colombia, Sri Lanka	6 44	78 21	Lungsh	23 00	79 00	Tawang	
Coimbatore (r str)	27 32	83 22	Madhya Pradesh (state)	13 03	80 17	Tawang	
Cox's Bazar, Bangladesh	21 28	91 59	Madrara	9 56	74 07	Tawang	
Cuttack	20 30	83 50	Madrara	20 19	85 45	Tawang	
Dabhoi	18 24	73 42	Maharadi (strm)	19 30	73 00	Tawang	
Dacca, Bangladesh	23 43	90 35	Maharashtra (state)	11 43	75 32	Tawang	
Dumkin (dist)	20 23	72 43	Mahe	11 13	76 00	Tawang	
Dacca (photos)	14 00	77 00	Malabar (dist)	24 00	76 00	Tawang	
Dahms Dao	30 12	78 02	Malay Peninsula (photos)	17 52	74 33	Tawang	
Delhi	28 45	77 13	Mangalore	33 07	73 39	Tawang	
Delhi (union territory)	19 29	74 37	Mangla, Pakistan	23 50	91 00	Tawang	
Delhi	23 14	73 48	Manipur (state)	13 35	73 44	Tawang	
Dharmam	27 29	84 34	Marmaga	27 30	77 51	Tawang	
Dibrugarh	27 23	85 38	Mathura	25 20	81 29	Tawang	
Digbol	23 44	83 00	Meghalaya (state)	26 29	77 43	Tawang	
Dighwara	27 04	94 23	Meerut	11 46	77 48	Tawang	
Dindigul	20 47	70 33	Mettur Tunnel (hydro power sta)	32 33	73 46	Tawang	
Diu (dist)	20 47	70 33	Mhow			Tawang	
Durgapur	20 60	78 18	Mikha and North Cachhar Hills, United Dis-			Tawang	
Durgapur	24 32	84 08	trict of	25 30	83 00	Tawang	
Durgapur	22 29	87 19	Mikha Hills (hills)	24 10	82 30	Tawang	
Eastern Chhota (mts)	14 00	76 50	Mincopy Island (is)	8 17	73 07	Tawang	
Falakhid	26 47	82 08	Mizor Hills (hills)	23 10	89 40	Tawang	
Farakka	24 49	87 34	Mizoram (union territory)	23 00	83 00	Tawang	
Ganga River (strm)	22 23	80 27	Monda	27 11	91 56	Tawang	
Gangotri Plains (plate)	28 00	84 00	Mukteswar	29 29	79 39	Tawang	
Gangtok	27 20	88 37	Mukunda	23 37	87 53	Tawang	
Garo Hills (dist)	25 50	80 30	Mussoorie	30 27	78 03	Tawang	
Garo Hills (mts)	25 30	80 29	Mysore	12 13	76 38	Tawang	
Gaulia	26 11	91 44	Mysore (state)	13 30	78 00	Tawang	
Ghatala	22 36	88 29	Naga Hills (mts)	28 00	85 08	Tawang	
Goa (dist)	15 35	74 00	Nagaland (state)	20 00	84 13	Tawang	
Godavari (strm)	17 00	81 43	Nagpur	21 09	79 08	Tawang	
Gondharpur	28 45	83 27	Nagpur (dist)	21 07	79 08	Tawang	
Great Indian Desert (desert)	27 00	71 00	Nabokhallya	27 17	85 30	Tawang	
Gujarat (state)	23 08	79 00	Nampur	27 11	85 30	Tawang	
Gulf of Kutch (gul)	22 26	68 20	Nand TAI	29 23	79 27	Tawang	
Gulf of Khatkhata (gul)	31 00	73 20	Nand TAI (dist)	28 12	79 23	Tawang	
Gulmarg	34 82	74 23	Nankhallya	26 41	86 13	Tawang	
Guntur	14 18	80 27	Nanpa	27 23	76 13	Tawang	
Hakimpur	17 33	78 31	Nank	19 29	73 45	Tawang	
Haldia	23 01	83 04	Nank La (pass)	27 24	86 49	Tawang	
Haldwar	20 43	78 39	New Delhi	28 28	77 12	Tawang	
Haldwar	28 55	78 10	Neyveli	13 32	78 29	Tawang	

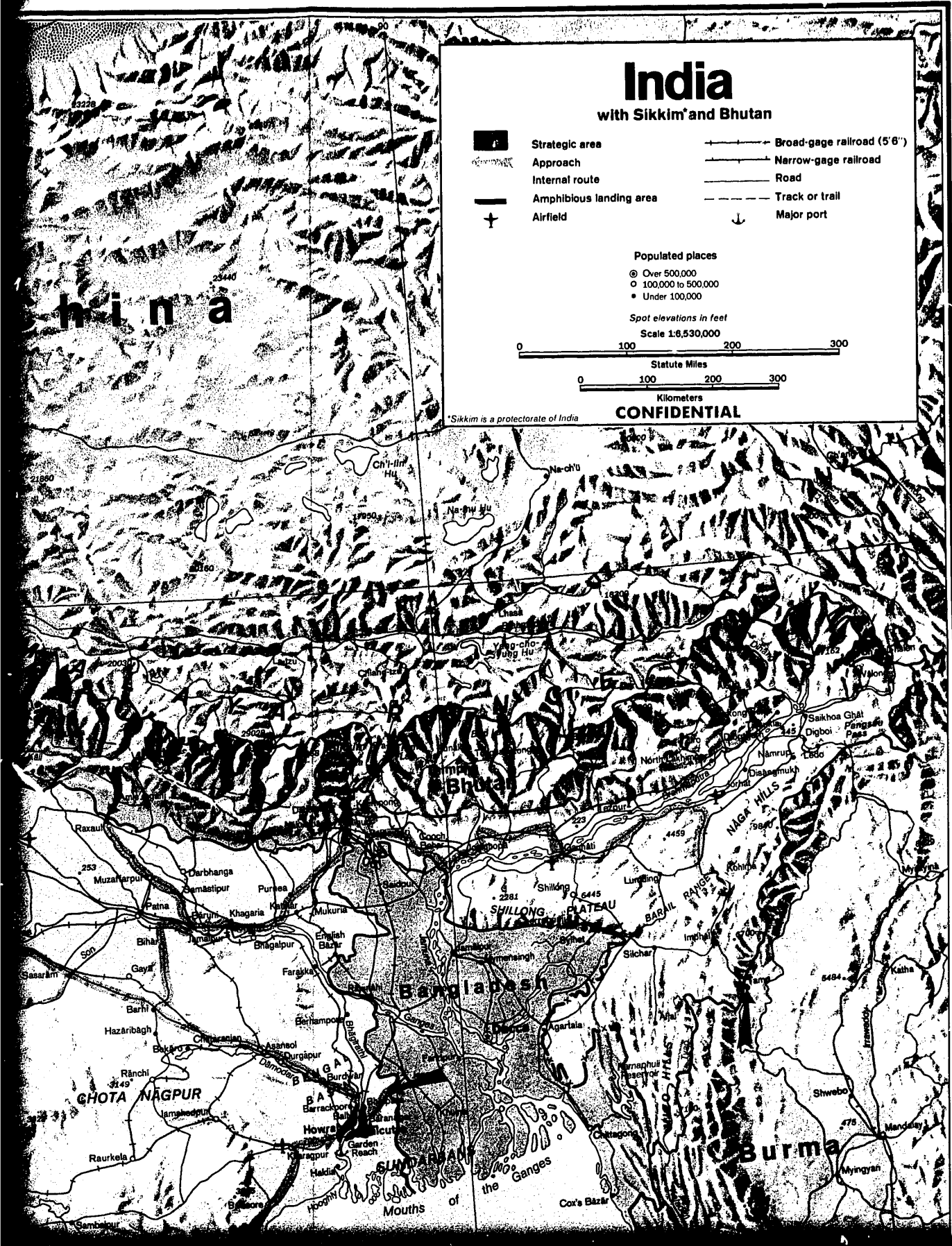
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# India

with Sikkim and Bhutan

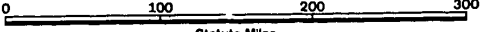
- Strategic area
- Approach
- Internal route
- Amphibious landing area
- Airfield
- Broad-gage railroad (5'6")
- Narrow-gage railroad
- Road
- Track or trail
- Major port

### Populated places

- Over 500,000
- 100,000 to 500,000
- Under 100,000

Spot elevations in feet

Scale 1:6,530,000



Statute Miles



Kilometers

**CONFIDENTIAL**

\*Sikkim is a protectorate of India

h i n d i a

CHOTA NAGPUR

Bangladesh

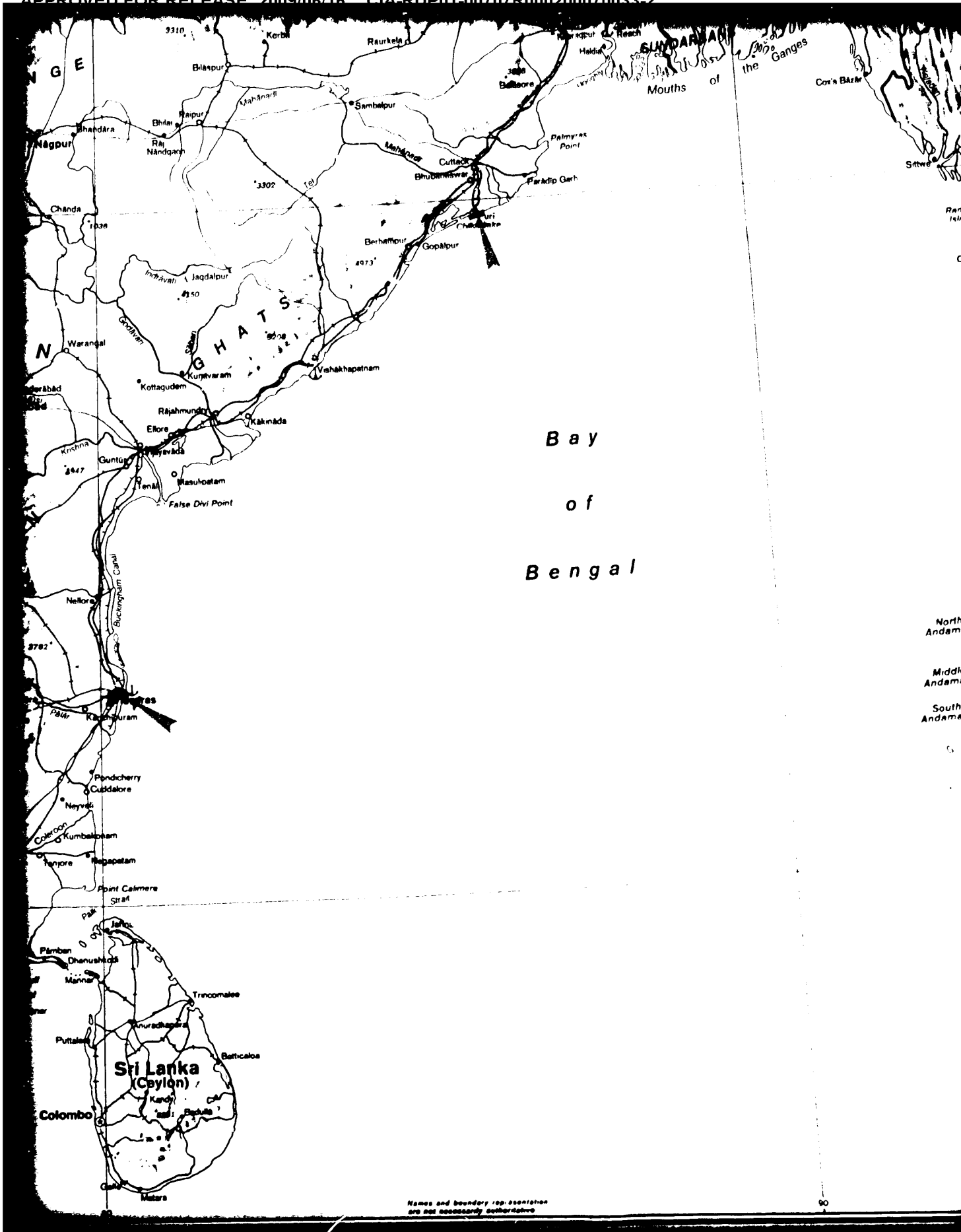
SUNDARBANS

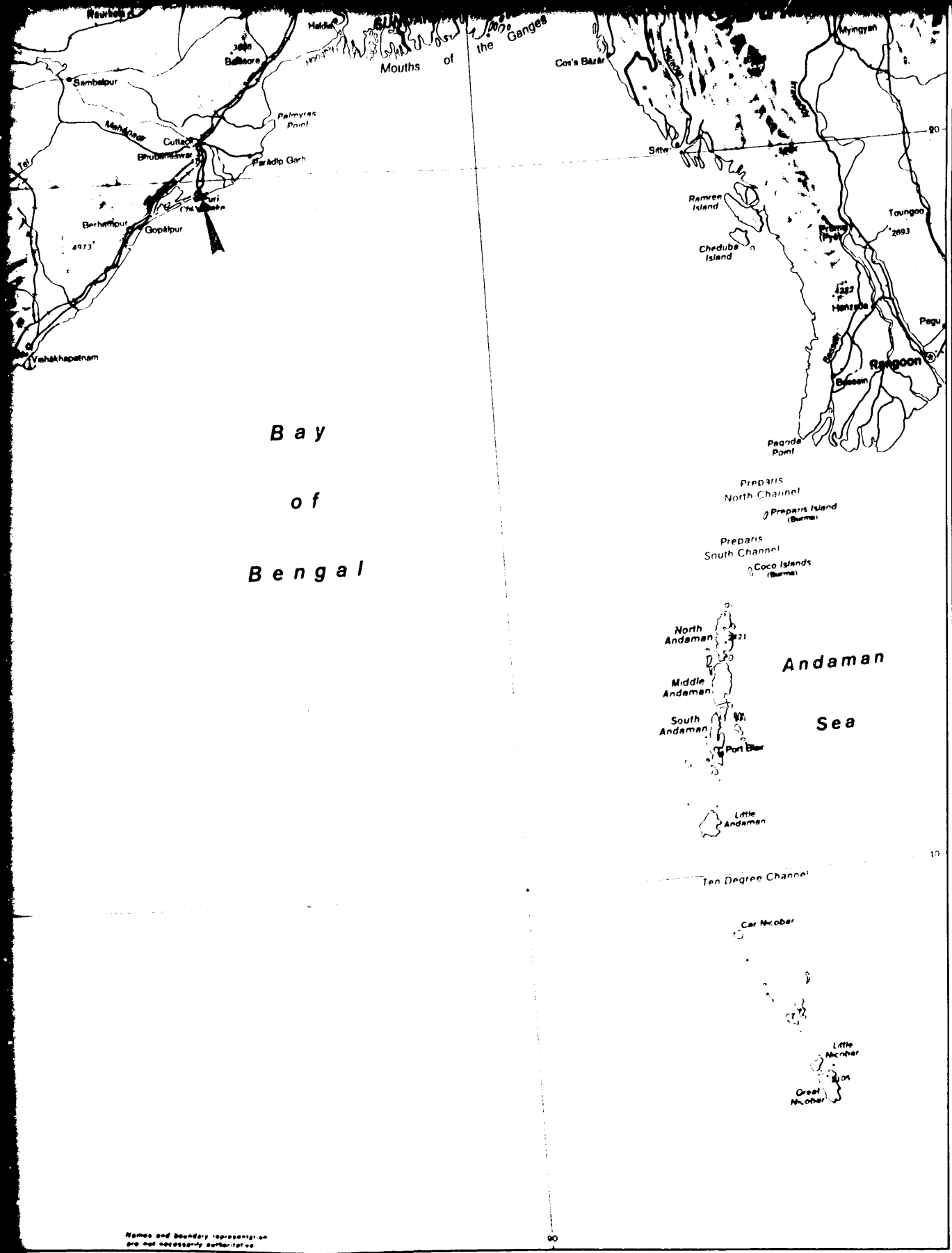
Burma



\*\* Chandigarh is also the capital of Punjab and Haryana







Names and boundary representations are not necessarily authoritative