CHAPTER - I

INTRODUCTION

PURPOSE AND SCOPE

The Mainland Gujarat is divisible into the Gujarat alluvial plains to the west and the mountainous upland region to the east. The Gujarat alluvial plains comprise a huge thickness of unconsolidated to semiconsolidated sediments deposited during Quaternary. The sediments of varying lithologies show a vast aerial expanse and represent deposition in a single basin of phenomenal dimension. Presently, the Gujarat plains are bounded by the Aravalli ranges, a Precambrian orogenic belt in the NE, the Deccan trap in the East, the Ranns of Kachchh and the Saurashtra in the west and by the Narmada geofracture in the south.

The continental Quaternary sediments exposed in the various river valleys have been studied mainly for their archaeologic significance, lithostratigraphy, palaeoclimates, processes and agents of deposition. Majority of these studies are confined to one or more drainage basins. Regional studies wherein the alluvial plains are considered as a single geologic unit are very few. The evolutionary history of Gujarat alluvial plains is not fully understood due to lack of data on the role played by tectonism in initiating and controlling the deposition and resulting in the geomorphic evolution of the area. Several geomorphic and drainage anomalies have remained unexplained. The vast thickness of the Quaternary sediments in the reactivated tectonic basins like Cambay and Narmada have preserved several evidences which point to uplifts, subsidences and basement topographic differences.

The present study is the first attempt to investigate the role of Quaternary tectonics in the overall evolution of the Gujarat alluvial plains. The entire Quaternary basin extending across Mainland Gujarat is included in the present study to work out the Quaternary tectonic history of the area in regional context. A comprehensive field approach combined with a critical evaluation of the available subsurface geologic and geophysical data is used in carrying out the entire study.

An attempt has been made to delineate the Quaternary basin configuration. The morphostratigraphic evolution of the Gujarat alluvial plains has been worked out through detailed tectonogeomorphic studies. Field relationships of the different geomorphic features have helped in reconstruction of Quaternary tectonic events. This study throws light on the Quaternary evolution of the Cambay basin, hitherto left

uninvestigated. The present study assumes considerable significance in the light of Late Quaternary tectonic activity recorded from the Aravallis, Saurashtra, Kutch and offshore data from the western continental shelf.

STUDY AREA

Location

The Gujarat state is divided into three distinct units -Saurashtra, Kutch and Mainland Gujarat. The Mainland Gujarat forms the eastern part of the state and comprises the Gujarat alluvial plains and the eastern uplands. The entire Gujarat alluvial plains forms the area of interest for this study (Fig.1.1). The study area forms a distinct physiographic unit of Gujarat state and is bounded by the Ranns, Saurashtra and Gulf of Cambay in the west, the upland region to the east and north-east, the Narmada river in the south and the sand dunes of Rajasthan in the north.

Communication

The study area has a well developed communication and transport system (Fig.1.2). It is well connected by rail, road and air to the other parts of the country. Broad guage and narrow gauge rail lines criss- cross the entire area. The National Highway Nos. 8 and 15 pass through the area. In addition , the area has a good network of state highways and district roads. Almost all villages are connected by pucca roads. State transport buses and other private vehicles provide an effecient transport facility.

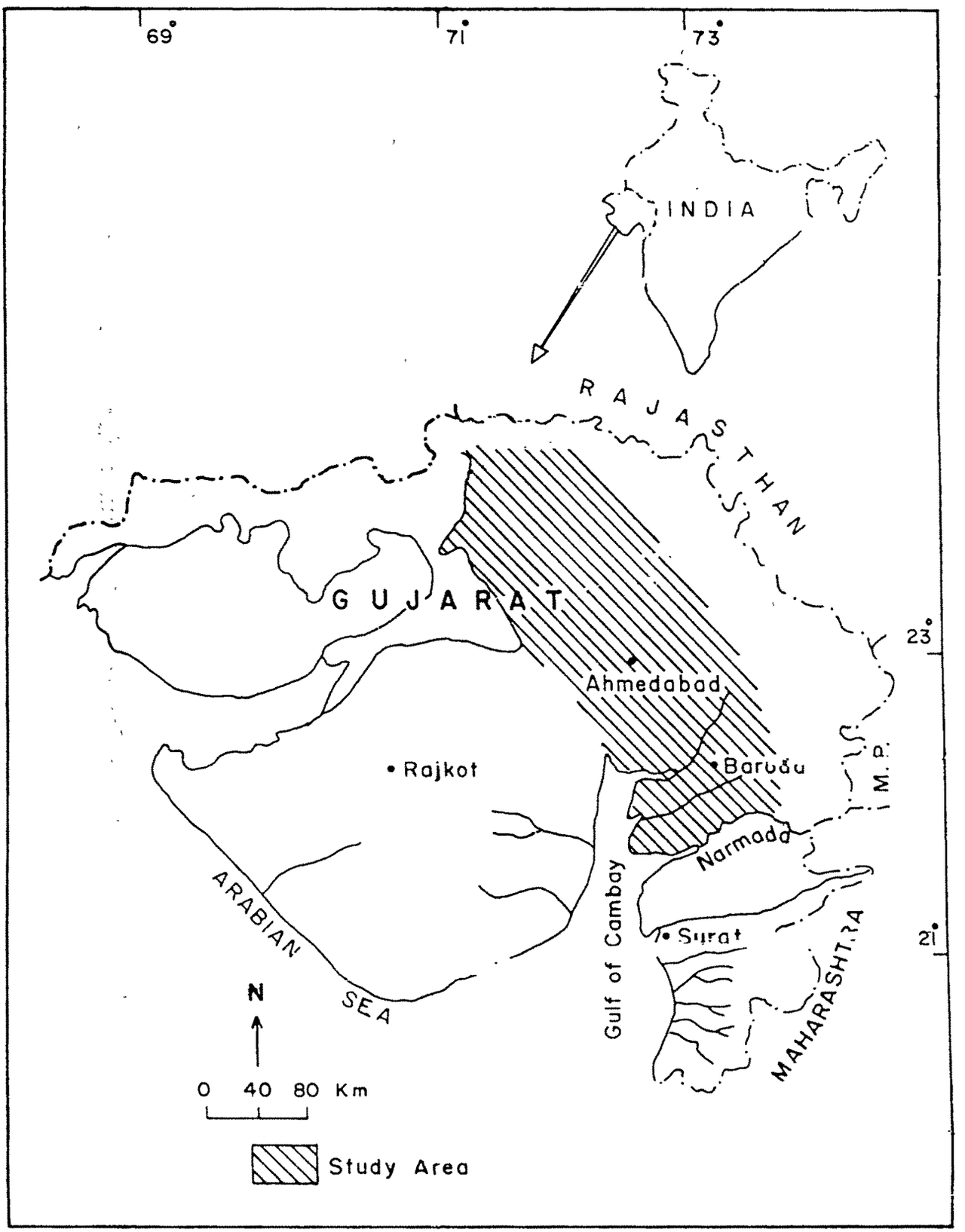

Fig. 1.1 Location map of the study area.

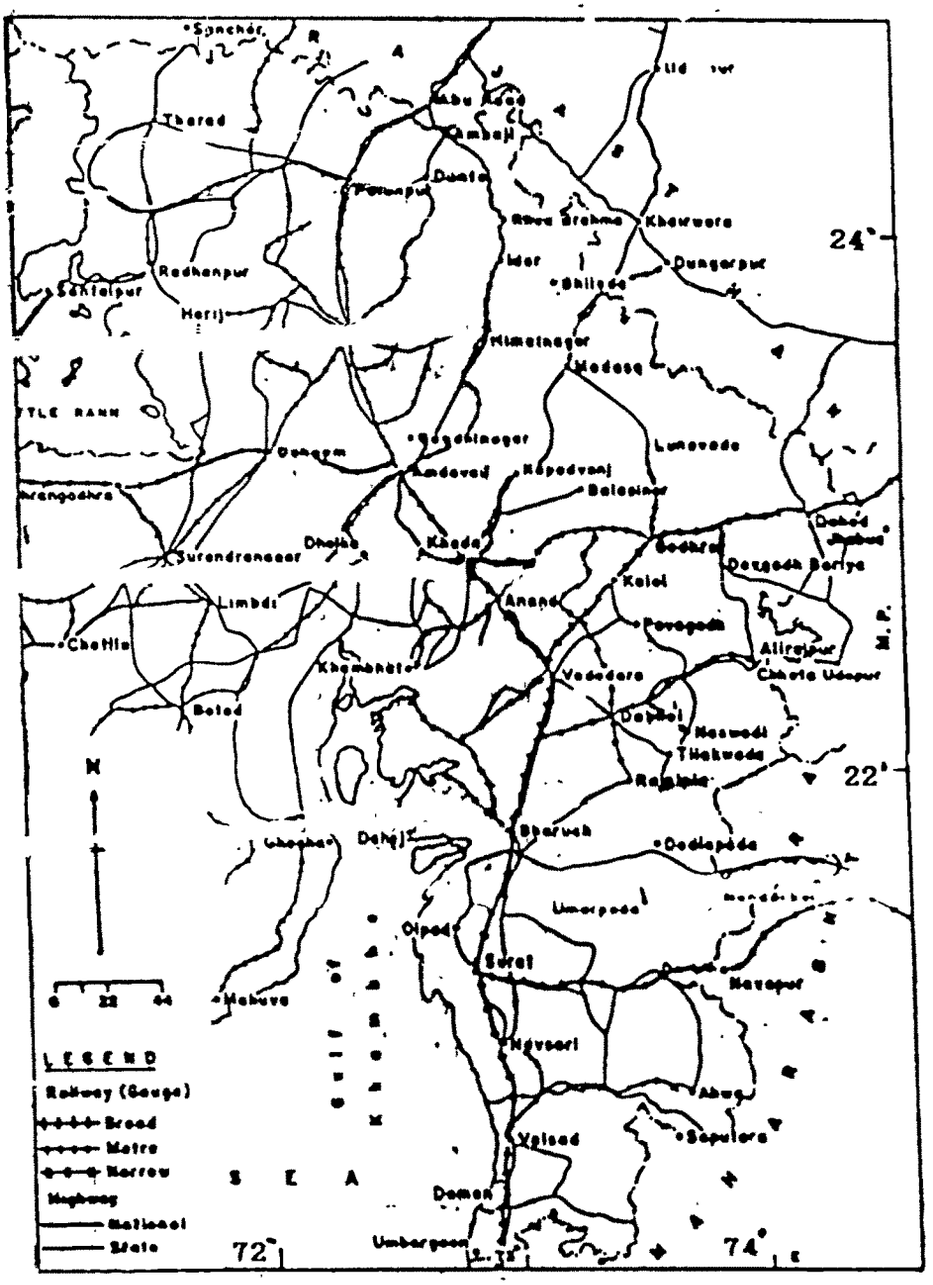

Fig. 1.2 Communication map of Mainland Gujarat.

Physiography

The alluvial plains form the western half of the Mainland Gujarat which comprise a thick pile of semi-consolidated sediments deposited during the Quaternary period. The average altitude ranges from 10 to 100 m with a gradual seaward slope (1.3). Towards the east the plains terminate against the hilly areas. The general topography is that of a flat monotonous alluvial plains . In the north and central Gujarat a gently undulating dunal topography is also observed. Towards the north the topography becomes increasingly undulating. The coastline is characterised by broad estuarine river mouths, mudbanks and mouth bars. The alluvial cliffs rise abruptly to as much as 30 m above the tidal flats.

Climate

The study area falls in the subtropical climatic zone and lies between 35° and 45°C isotherms . The area receives a major part of the rainfall from the southwest monsoon during the period of June to September. Rainfall gradually decreases towards the north merging with the arid conditions of Rajasthan (Fig.1.4). The average rainfall is between 800 mm to 1000 mm. The summers are relatively hot and dry while a generally pleasant climate prevails during the winter.

Drainage

All the rivers draining the Gujarat alluvial plains arise from the highlands in the east and flow into the Gulf of Khambhat and Ranns of Kachchh (Fig.1.3). The major rivers are the Sabarmati, the Mahi and the Narmada which are perennial. Apart from

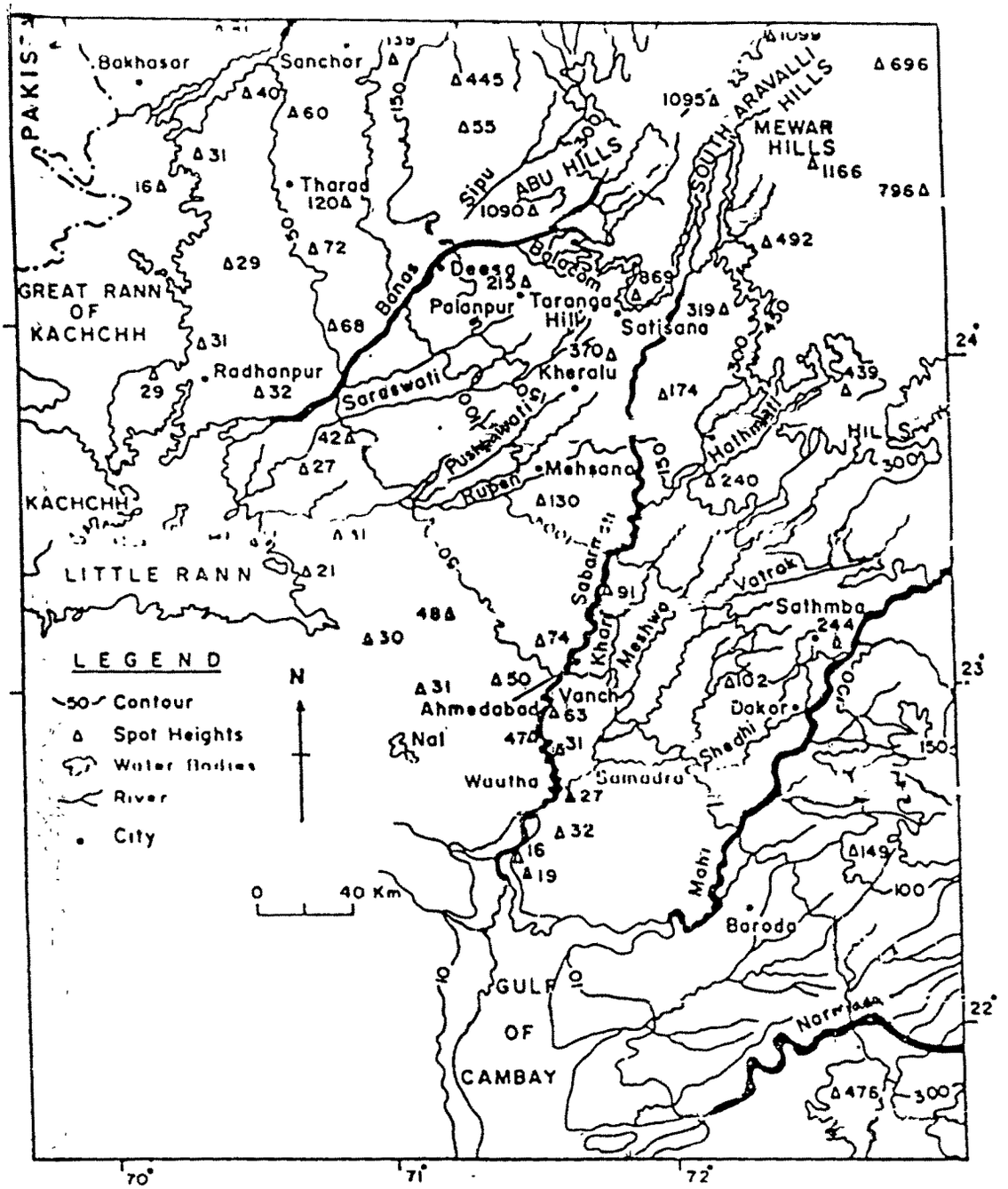

Fig. 1.3 Physiographic and drainage map

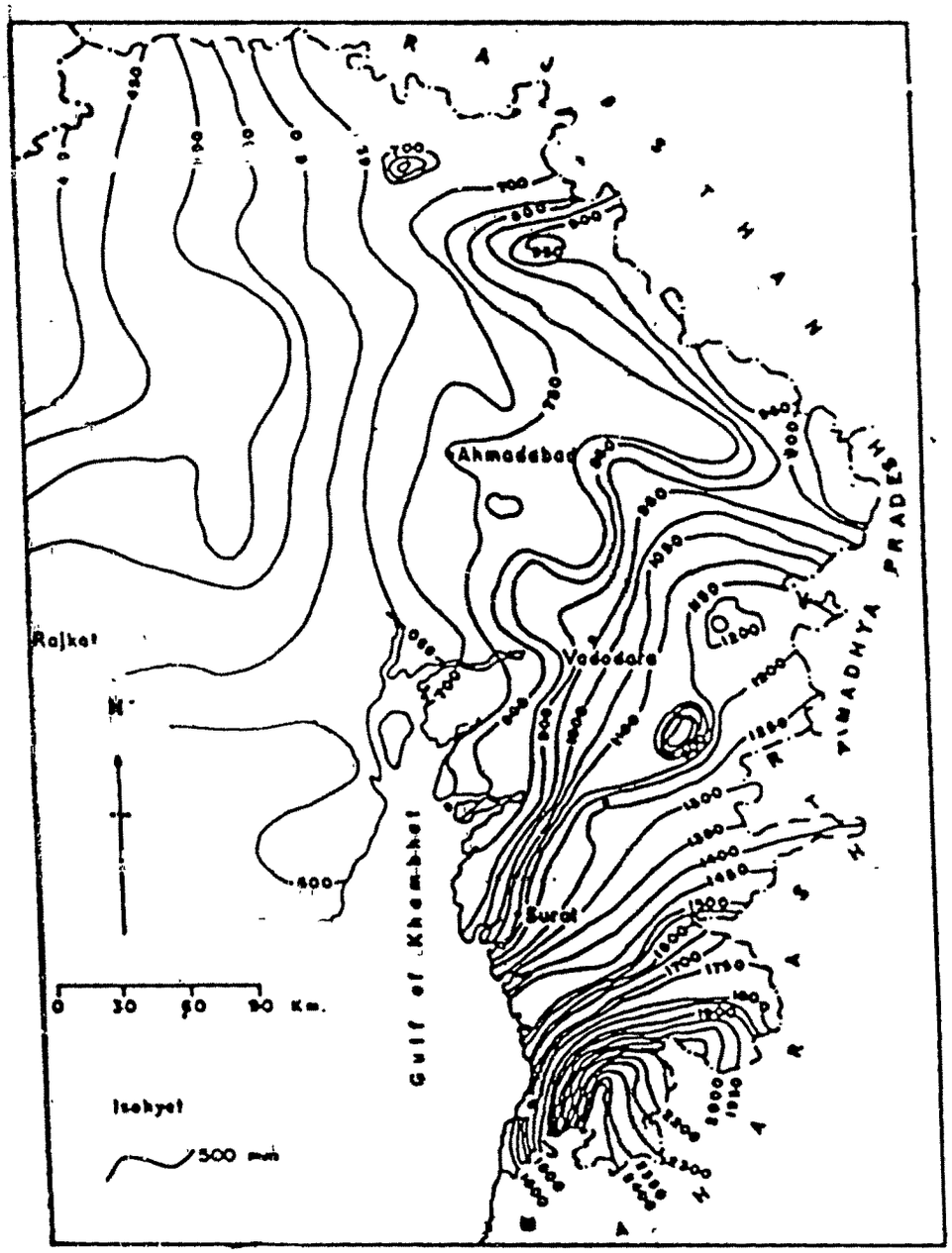

Fig. 1.4 Rainfall map of Mainland Gujarat.

this all the other rivers are more or less seasonal carrying water only during the monsoon. The overall drainage pattern indicates a strong geomorphic and structural control.

Flora and Fauna

The Gujarat alluvial plains are largely devoid of forest cover. The main plant species found in the area are Babul (Acacia arabica), Pipal (Ficus religiosa), Bordi (Zizyphus jujuba), Vad (Ficus bengalensis), Limbda (Melia azadirchta), Amli (Tarmirindus indicus) Rayan (Manilkana lexandra) and Charoli (Buchanania lanzan).Most of the land is used for agriculture, the different crops are grown according to the climatic conditions and irrigation facilities available. The main crops grown are cotton, paddy, groundnut, bajri, tobacco, maize, jowar, wheat, tur, vegetables and fruits.

The fauna is dominated by domestic animals in the absence of forest cover. The common animals include cow, Buffalo, horse, camel, dog, sheep, goat and donkeys. The wild animals frequently spotted are jackal (Canis aureus), fox (Vulpes bengalensis), monkey (Presbytis entellus), cat (Felis chaus) mongoose (Herpestes edwards) and reptiles including a variety of snakes. The common bird species comprise crow and sparrow etc.

People and Occupation

The main communities are the Hindus and Muslims alongwith their different castes and subcastes. The proportion of the urban population has increased over last

few decades has been mainly due to the impact of industrialisation. Mainland Gujarat is reputed to be the most industrialised corridor of the country. Increase in transportation and communication facilities facilitated migration from villages to cities leading to a cosmopolitan populace. Almost 60% of the population depends on agriculture for their livelihood. The rest of the population is engaged in occupations relating to craftsmen, production process workers, clerical and other related works, sales workers, transportation communication, medical, recreation and other services.

APPROACH AND METHODOLOGY

The prime objective of this study has been to collect the evidences from various geomorphic features of the area. Since the study area consists of flat monotonous topography characteristic of an alluvial terrain, the direct evidences are rare as expected. Owing to these limitations and keeping in mind the objectives of the study, the methodology was centered around collecting as many indirect evidences as possible and analyse them in the light of the available subsurface data. The study is entirely field based and the conclusions are derived solely on the nature of field relationships between the various landforms. The broad methodology followed while carrying out this study is as follows.

1. Critical analysis and evaluation of the borehole data and geophysical data obtained from various governmental and non-governmental organisations to infer pre-Quaternary tectonics and reconstructing Quaternary basement configuration.

2. In-depth study of the various lineaments mapped from satellite images followed by field checks to elucidate the nature of Quaternary tectonics on the sediments.
3. Detailed field mapping of the various Quaternary landforms and the sediments occurring in different geomorphic environs.
4. Various tectonic events have been worked out based on the field relationships and comparing the field data with the subsurface data. The roles of tectonics, base level changes and climate have been taken into account for understanding the evolution of the landscape.