A review of existing literature pertaining to the line of research followed in this study is being presented here. Fluvial Geomorphology, the documentation of which is already very bulky, is still in a process of being enriched rapidly with newer and newer literature carrying better ideas and more sophisticated techniques. Thus, the range of available literature in this area is considerably wide. However, only the portion of literature considered relevant to this study is reviewed here and the summary is presented in the following few pages.

Rivers represent one of the most dynamic and effective agents of land sculpture. They are responsible for draining landmasses and carrying the water-sediment load to oceans. In fact, the very question as to how landscapes evolve can satisfactorily be answered through our understanding of the activities of rivers. Rivers carry back to the ocean the excess water that falls as rain or snow on the landscape and does not evaporate during the hydrologic cycle. Hence, fluvial system is powered by the conversion
of the potential energy of solar distillation and gravity to the kinetic energy of motion and heat (Bloom, 1978). Most of the energy is lost to friction of internal turbulence in flowing water, with perhaps 2-4 per cent of the total potential energy of water flowing downhill converted to the mechanical work of erosion (Rubey, 1938). Fluvial processes, in turn, obviously vary in intensity among climatic regions and along gradients of temperature, precipitation, altitude and seasonality.

Geomorphology has been keeping pace with the changes in other earth sciences in terms of techniques, concepts and aims. The most significant change has been the input of quantitative methods, especially in the field of fluvial geomorphology. The classic paper of Horton (1945) surely constitutes a breakthrough in fluvial geomorphology. Following the modification of Horton's morphometric analysis, the geomorphic relations among different landscapes and the functional behaviour of the geomorphic variables of drainage basins are well documented in the works of Strahler (1957, 1969), Schumm (1956), Chorley (1957), Fairbridge (1968), Doorancam and King (1971).

The preponderance of published works on fluvial geomorphology in recent years points to the growing interest in varied themes of the subject. The classic
treatise on the subject by Leopold et al. (1964) provides a striking milestone in the development of the subject. Much significant work on channel geometry is summarised in this text. Leopold and Wolman (1960) draw attention to the commonly observed ratio between channel curvature and channel width which, as they observe, relates to the dynamics of flow rather than load. Brush (1961) has identified a close relationship between drainage area and mean annual flood; Morisawa (1967) has studied the relation of discharge to stream length and Lustig (1965) deals with geomorphic parameters most closely related to sediment yield. Moreover, works on the interior geometry of channels include the study of stream meanders by Matthes (1941), Friedkin (1945), and Leliavsky (1955). Fahnestock (1963) uses field results to conclude that both meandering and braiding can occur regardless of fill, cut or poise, but that braiding always requires a mobile bed load. Langbein and Leopold (1968) show that channel bars and dunes constitute kinematic waves that involve random perturbations. Morisawa (1968) concludes that rivers, in their lower reaches, attain the significant physical characteristics of braiding which can be attributed to both incompetency and incapacity of the rivers. As shown by Leopold and Wolman (1957), at least nine variables interact to determine the nature of the resulting stream channel. These include volume and variability of discharge, amount and grain size.
of the sediment load, width, depth, velocity, slope and bed roughness.

The orientation of much fluvial research towards studies of sediment transport and water discharge has been stressed in several reviews such as those by Sundborg (1967), Ljunggren and Sundbong (1968) which defined the interrelationships of flow velocity, grain size, state of sediment movement, and varying particle density. In alluvial rivers, channel form adjusts to maintain hydraulic relationships between the channel boundary and the water and sediment discharge through the channel reach (Dury, 1970a). The magnitude of peak flow and frequency characteristics of discharge have been shown to condition the overall channel size by Leopold and Maddock (1953). Harvey (1969) has demonstrated the significance of hydraulic regime to channel cross-sectional form adjustment. Both channel-perimeter sediments and sediment transport through the reach influence channel form, the perimeter sediments directly controlling channel shape and also reflecting sediment transport (Schumm, 1960). Besides, suspended sediment (Leopold and Maddock, op. cit, 1953; Ferguson, 1984) and bedload (Gilbert, 1914; Wilcock, 1971) influence channel form via their effects on channel roughness and hydraulics.

The review of world-wide rates of sediment yield by Holeman (1968) can be read in conjunction with the specific
studies such as that of Lustig (op.cit, 1965), who has distinguished various geomorphic parameters that correlate well with sediment yield. Moreover, works related to varied themes in fluvial studies especially in the flow aspects of rivers include those of Dury (1961), Woodyer (1968), Gregory (1977), and Smith and Stopp (1978). Garde and Ranga Raju (1977) attempt to summarise and synthesize the vast amount of information on sediment transport and problems related to alluvial streams scattered in numerous journals, monographs and other research publications. Richards (1982) and Petts (1983) have described rivers in terms of their form and process in detail.

In view of existing and impending threats of flooding, sedimentation or erosion as a result of natural or man-induced changes in channel morphology, some studies related to these aspects are worth reviewing. Miller and Leopold (1963) demonstrated simple methods of field measurement of changes in river channel and hill slopes.

Channel stabilization schemes involving upper bank paving, subaqueous mattressing, dikes, and jetties (Stanton and McCarlile, 1962; Task Committee, 1965) directly modify the stream channel in cross-section, profile and possibly also planform. Such schemes are
often essential for the provision of maintained or increased channel capacities and the prevention of bed or bank erosion (Task Committee, 1972). Channel improvement schemes also assist in the stabilization of stream banks and removal of excessive sedimentation (Erichsen, 1971). Any unplanned upstream activity may result in subsequent channel changes in downstream reaches causing sedimentation and increased flooding (Emerson, 1971). Under certain circumstances channel realignment schemes are necessary which often result in channel degradation upstream and sedimentation downstream (Yearke, 1971).

Sediments, as an independent variable in the study of landforms, can lead to a more comprehensive understanding of geomorphic processes and land surface response (Stephenson, 1970). Although grain-size analysis has been employed extensively in sedimentary petrology, its use in geomorphological studies is still very limited (King, 1966). Both hydraulic and physiographic studies of rivers often require an adequate description of bank and bed materials (Wolman, 1954). Twenhofel and Tyler (1941) opine that the most widely used statistical devices for comparing and describing sediments are quartile measures, median, sorting co-efficient, quartile skewness and quartile kurtosis. Granulometry and grain-size analysis receive attention in the works of Dury (1970b). Wentworth (1922, 1926) proposes a scale of grade and methods for mechanical
analysis of sediments, while Krumbein (1934) relies heavily on statistical analysis in treating sediments. Udden (1914) lays stress on empirical approach in studying grading characteristics of sediments from various natural environments to see what relation, if any, exists between them. Such an approach is subsequently expanded by Wentworth (1931) and in recent years by Pettijohn (1975) and others. However, some sedimentological studies attempt at classifying sediments texturally, the notable one among them being the work of Folk (1980). The systematic studies of alluvial deposits on the Mississippi River (Fisk, 1947) and the geological investigation of the alluvial valley of the Lower Mississippi River (Fisk, 1944) deal with fine-grained sediments with reference to the environment and geology of the alluvial plain in which they accumulated.

A large number of fluvio-geomorphological studies have been carried out so far on different river basins in India. These include the works of Chatterjee, Singh and Quereshi (1978), Kumar and Pandey (1981), Gupta and Chakrabarty (1983), Pal and Bagchi (1983), Dikshit (1983), Mukhopadhyay (1980, 1982), Rai (1980) and Goswami (1982). Some of the Indian references on river hydrology and morphology include the studies made by Radhakrishna (1955), Singh (1969), Kumar (1971), Singh (1974), Vaidyanadhan (1977), Desai and Peshwa (1978), Basu (1979), Bhattacharya (1981),

As regards intensive basin studies of the Brahmaputra River System, works of Coleman (1969), Goswami (1985a) and Sarma (1980) essentially come under reference. Coleman (op. cit, 1969) has studied the channel processes, sedimentation and flow patterns including their hydrodynamic interpretations for the Bangladesh portion of the Brahmaputra River. Goswami's works (op.cit, 1982, 1985a) on physiography, valley aggradation, basin denudation, flow pattern and sediment budgeting for the Assam section of the Brahmaputra River are noteworthy. His other works (1985b, 1988a, 1989a) on the river basins of the Brahmaputra System in respect of their flow and sediment transport patterns are equally significant. A detailed and systematic study on the drainage basin of the Burhi Dihing River in Assam is available from the works of Sarma (op.cit, 1980). Studies on bank line migration(Sarma and Basumallick, 1984) and channel form and process (Sarma and Basumallick, 1986) of the Burhi Dihing River provide adequate reference in the line.

A number of geological and geohydrological investigations by some contemporary scholars relating to the eastern Himalayan region of Arunachal Pradesh including the Kameng District have paved the way for further research by providing valuable base line information on the Jia Bharali basin.
The Arunachal region of the eastern Himalayas has been investigated since 1972 by a team of geoscientists directly or indirectly associated with the Wadia Institute of Himalayan Geology (WIHG). These data and information are found recorded in the works of Thakur and Jain (1974), Verma and Tandon (1976), Jain and Thakur (1978) and the Annual Reports of WIHG (1977-78 and 1978-79).

On the basis of field and laboratory investigations, Kumar and Singh (WIHG Annual Report, 1977-78, 1978) classified the eastern Himalayas of Arunachal Pradesh into six litho-tectonic units, viz. Se La Group, Bomdila Group, Miri Quartzite, Rangit Pebble Slate, Gondwana Group and Tertiaries (Siwaliks). Some of the latter works by Kumar and Singh (WIHG Annual Report, 1978-79, 1979) in the Kameng and Subansiri Districts indicate that the Siwaliks, Gondwana, Miri, Bomdila and Se La Groups of rocks have ENE-WSW to NE-SW trends. The thrust along which the Se La Group overlies the Bomdila Group may be equivalent to the Main Central Thrust of the Western Himalaya. The foothill areas of the Kameng District were investigated first by La Touche (1885) who mentioned about the occurrence of the Siwalik and the Gondwans. In recent years, Banerjee (1954), Balasundaram (1956), Baweja (1961) and Govinda Rao (1965) of the Geological Survey of India have carried out some geological investigations. Balasundaram (op.cit, 1956) prefers to apply the terms like Siwaliks, Gondwanas, Buxas, Dalings and
Darjeeling's to describe the various sequences. A general sketch of the physiography and geology of the catchment areas of the rivers in the Bhutan and Arunachal Himalayas is available in the classic works of Burrard, Hayden and Heron (1933) and Gansser (1964). A comprehensive description of the geological and structural features of the Arunachal Himalayas is available in the systematic works of Nandy et al (1971) and Das et al (1971). A similar study on the sedimentary rocks of the foothills of Kameng District of Arunachal Pradesh was carried out by Hazarika (1977). However, a detailed account of the geology of the Himalayas including that of the Eastern Himalayas is available in the seminal works of Wadia (1968). Recently Ives and Messerli (1989) have discussed the degraded physical environments and alarming erosion scenario of the Himalayas while examining the prevailing environmental impact in the region.

So far as the Brahmaputra Valley including the Assam part of the Jia Bharali basin is concerned, general notes on geology, seismicity, landforms, river systems and geohydrology could be traced to the past scholarly works of Medlicott (1865), La Tauche (op.cit, 1885), Oldham (1899) and Allen (1905), besides the recent investigations of a number of scholars. Medlicot (op.cit, 1865) gave a general description of geology and landforms of Assam and the southern hills. La Touche (op cit, 1885) was the first
to investigate the foothills of the Kameng District and identified the occurrence of the Siwalik and the Gondwana. Allen (op.cit, 1905) was the pioneer in providing some basic information regarding the geology and geomorphology for further research in the area. He described in details that the whole of the Darrang District (presently covering the Darrang and Sonitpur Districts) consists of alluvial deposits of clay and sand in varying proportions, ranging from pure sand near the Brahmaputra to more stiff clay at places away from it which is rather unsuitable for cultivation. He further referred to the Biswanath Plain and an elevated tract of land north of Tezpur as the high bank. This basic work of Allen was followed up by Coulson (1942) who was the first to carry out geohydrological investigations in the Darrang District. Later, Niyogi (1963) investigated the general geohydrological conditions of the Jia Bharali basin and other parts of Darrang District. As regards geomorphological studies, the Jia Bharali basin and adjoining areas in the Darrang District were covered by Roy and Niyogi (1970) and Roy (1967).

In view of the magnitude and complexity of the flood problem in the Brahmaputra Valley, the Government of India and the Government of Assam constituted the Brahmaputra Flood Control Commission in the year 1970 to study the
flood problem and to suggest remedial measures. As a sequel to this, the Geological Survey of India carried out a comprehensive study of the Brahmaputra Valley in 1970-71. Accordingly, in the first year, three sub-basins viz. the Manas, the Subansiri and the Jia Bharali were selected for geomorphological studies. Geo-technical investigations in respect of the Pagladia, Jia Bharali (Viswanathan and Chakrabarty, 1977; Roy, 1977), Subansiri and Siang Rivers were also completed during the first phase. Recently, Bora and Goswami (1988a, 1988b, 1990a) have made some observations on the flow characteristics of the river and the geomorphological characteristics of its basin based on measured flow data as well as satellite-observed parameters.

This chapter on review of background literature will remain incomplete unless suitable reference is made to the works based on application of remote sensing techniques in geomorphological studies. It is considered necessary because of the use of this technique in a part of the present study. Satellite Remote Sensing which plays an important role in a broad spectrum of geomorphological studies finds suitable applications in the proposed line of research. In this context the range of references includes the works of Estes (1966), Olson (1967), Miller (1968), Cooke and Harris (1970), Vaidyanadhan and Raju (1981), Raghavswamy (1982), Biswas (1988), Negeswara Rao (1988) and Bora and Goswami (1990b). Of these, the works of Raghavswamy (op.cit, 1982) and Bora and
Goswami (op.cit, 1990b) relate directly to the geomorphological study of the Jia Bharali basin using satellite remote sensing techniques.

The works so far reviewed in the foregoing paragraphs are significant in presenting the basic methods and concepts and background information about the study area. Thus, the chapter is the result of an attempt to bring together the diverse yet relevant views widely scattered in scientific literature, having direct or indirect relevance to the proposed line of research on the geomorphology of the Jia Bharali River.