Chapter XI

THESES

In the preceeding chapters, applied geomorphological issues ranging from floods, flood control measures and their impacts on selected hydro-geomorphological parameters to river-bed land use in the Lower Damodar were decomposed and discussed in separate chapters. Purport of this segmented discussion was to highlight individual issues. In the chapter 3 several concepts were discussed as heuristic assumptions. Now these segmented issues need to be unified and validity of heuristic assumptions has to be established.

East west trend of the Lower Damodar, southward deflection below Barsul-Chanchai and it's deferred junction with the Hugli are conditioned by regional slope and sub-surface lineaments. River bank was the natural boundary of the river. It's flood propensity was inherited from hydro-geomorphological and meteorological conditions prevailing in the entire Damodar basin. The Lower Damodar used to adjust with excess discharge through a well defined distributary system on the left and spill channels or hanas on the right, failing which extensive areas in the present Barddhaman, Hugli and Haora districts used to be flooded. The Lower Damodar started loosing its identity as a natural river since later half of the eighteenth century with the construction of embankments though sectoral and ill-planned. The near gradation of the river was disturbed in different phases by artificial base levels created by the Jujuti sluice, the Rhondia weir, the Durgapur barrage, the Panchet reservoir and finally, by the Ulughata sluice. Since the completion of the Panchet reservoir in 1959 it has become a "reservoir channel", the term borrowed from Petts (1984). The Lower Damodar is now identified by control structures or cultural features or man made indicators. This is the *first thesis*.

From this thesis that the Lower Damodar needs to be culturally defined has emerged the *second thesis* of this research that forms, processes and materials in the controlled sector are quasi-natural in character because of human intervention with the natural fluvial system by means of control structures. This thesis has again been examined in chapters eight, nine and ten within a river-bed land use perspective.

It is not to be denied that emergence, migration and stabilization of bars are products of fluvial process. But stabilization of bars has become more significant due to sediment trapping by roots of cultivated vegetation. Even the inundation-prone peripheral zones of settled bars do not remain fallow. Either grasses are grown or crops of low value or quick maturing crops are grown as additional crops at Bara Mana, Kasba Mana etc. Decaying channels with clay deposits are also used for wet rice at Ramkrishnapalli, Pallishri, Bara Mana, Rangamatia, Fatehpur etc. In Paikpara, the bed of the Damodar is intensively cultivated in non-monsoon period. Furthermore, domesticated vegetation and addition of artificial fertilizers have changed the very composition of soil. All these cultural practices have helped in stabilization and extension of riverine bars and in developing man-induced modified soil profiles.

The above statements not necessarily imply that the stabilization of bars and changing soil composition due to land use practices should be interpreted as anthropogenic

processes. Man may be a geologic agent, a concept supported by Sherlock (1922), Thomas (1958), Brown (1970) and others. The role of man as a geologic agent in shaping the earth surface depends mainly on the level of technological expertise but sedimentation and pedogenic processes are governed by universal physical laws. In contrast, land utilization, an anthropogenic process in true sense is governed by location specific socio-cultural and politico-economic situations. By comparing observations and conclusion deduced from several case studies on the river-bed land utilization in the Lower Damodar a conclusion can be justifiably drawn that simultaneous operation of fluvial and pedogenic processes on the one hand and anthropogenic process in form of land utilization on the other, forms, processes and materials in the Lower Damodar are 'quasi–natural' in character. This thesis was introduced in chapter 6 while examining the hydro-geomorphic consequences of control structures and this thesis has been re-examined while assessing river-bed land utilization. In a physical environment everything is natural but for a historical environment, we resolve, the term 'quasi-natural' be adopted as an adjective for geomorphic forms, processes and materials.

In the analysis of river-bed land use and settlements less emphasis was given on origin but more on the adjustment pattern in a physical and socio-cultural milieu. The river-bed was assumed to be a resource base and not a resource itself.

In the studied section of the Damodar potential resources of the river-bed are not very much spatially differentiated. Almost everywhere, it is sandy loam, but spatially and temporarily differentiated uses of undifferentiated bed-materials have been controlled by rationals of specific culture.

The river-bed users are mostly Bengalees but there are a few families of Biharis also in Gangtikali, Gaitanpur etc. Because of disperate food habits paddy is the main crop in Bengalee dominated settlements where as wheat is prioritised in crop selection in Bihari dominated sand-bars.

Bengalee refugees from the very beginning have introduced jute as a cash crop in the settled bar as they were used to jute culture in their previous habitat where as local cultural influence is strongly felt in the introduction of potato culture. In many parts of the settled bars potato culture was introduced by locals who migrated from the Hugli district noted for potato cultivation, after the '78 floods and settled in Rangamatia, Fatehpur and Kasba Mana.

Imprints of acquired local culture have been observed in Bara Mana and Majher Mana where mulberry plantations have become significant components of the cultural landscape after 1978. The linkage between mulberry plantations and silk culture of Bankura-Bishnupur does not require any further explanation.

Floriculture in Chhayani Gujrat, Panchani Gujrat etc., is no doubt governed by a strong economic factor i.e., market facilities in Haora, but selection of flowers like merigold, hibuscus and rose has been decided by religious demand. Betel leaf chewing habit is a widely prevalent Indian habit. Apart from market facilities, in Haora, this national cultural trait has played a decisive role in betel leaf plantations in the river-bed of the Amta channel.

Admission of the concept of culture in resource appraisal is not new in applied geomorphological research. This concept is used in explaining functional relations between river-bed resource base and it's users.

Most of the river-bed occupiers are Bengalee migrants, but their very status is refugee, the term which has a legal, social and economic connotation (Kuper and Kuper, 1996). Moreover, in the river-bed they are no longer majority identified refugees, but self alienated refugees. This very definition and status have played a crucial role in sequential occupation of the river-bed by refugees and in land utilization

It is a global experience that refugees are not fully accepted by host communities particularly when a same economic sector has to be shared. The river-bed occupiers were from farm sector in erstwhile East Pakistan or present Bengladesh. The farm sector in West Bengal was already saturated when millions of Bengalees crossed the border. So, from the very beginning host communities in farm sectors perceived these Bengalee migrants as parasites. Refugees themselves were aware of their refugee status.

They were not differentiated from the West Bengalees in terms of language spoken or religion. Prior to partition their social structure and organisation was conditioned almost by similar ecological and cultural factors. But their newly acquired status created a distance from the locals. This distance was a perceived distance. Though they were forced to share the same physical space or geometric space in West Bengal but their position in the sociological space was different. This perceived space is the social space as advocated by Durkheim in 1933 and also by Sorokin, (1928, 1958), Theodorson and Theodorson, (1969), Chombert de Lauwe, (1952, 1956), Buttimer, (1969, 1980). A section of the refugees deserted government sponsored colonies and camps. Thus from 'majority-identified refugees', they became self-alienated refugees. At this juncture the river-beds of West Bengal became their new addresses or 'niches'.

In the Lower Damodar sand bars with locational disadvantages were selected so that their self alienation could be retained and they could avoid resistance from the locals. In the plantation history of the world it has always been observed that newly arrived groups at the initial stage try to avoid clash with locals and start plantations in terrains perceived as less fertile by locals. This is the history of rubber plantation in Malaysia, tea and coffee plantations in India and present Sri Lanka. This a common feature of colonisation policy. So when the barren sand bars with grass jungles and far away from main transport routes were occupied by refugees the locals did not raise any protest because to them the sand bars were just fundamental entities.

Colonising *ab initio* in a totally different environment these self alienated refugees assessed the controlled river-bed not as it was but as it was perceived by them and their perception was conditioned by their perceptive position in the society i.e., social space. Their social mobility was restricted. So, they adopted a 'self-help' policy. They cleared the jungles and build their own huts. In food production to reach a minimum level of self-support they started growing essential food crops. Apart from paddy, an inferior species of bottlegourd (*Legenaria Siceraria*) locally known as 'khero' was introduced in fresh sands

of low nutrient status. The falling of leaves and animal droppings enhanced the fertility of sandbars. In later stages they tried to sell part of their crops grown for an additional income to attain a level of self-reliance. This is the experience in almost all refugee settled sand bars. Now they have been granted land deeds. With this land ownership rights they have to pay taxes but this legal procedure has helped in reducing social distance between locals and refugees and refugee dominated settlements have now reached a level of self sufficiency. This sequential changes from the level of self-help to the level of self sufficience in the refugee dominated settlements can be attributed to the social space of refugees. Rogge (1987) has observed these sequential changes in refugee settlements in Sudan but has not used the term 'social space'. Verstappen is eloquent about socio-economic controls on rural land use (Verstappen, 1983). We are just extending his statement. The *third thesis* is that one's perceived position in the society, perceived relations with others, perceived social distance or mobility etc., are *sine qua non* in developing a functional relation with a given resource base.

From this third thesis a question can be raised—Is there any relationship between changes in perceived environment and changes in real environment ?

Craik (1970), Clayton (1971), Cooke and Doornkamp (1974, 1990), Verstappen (1983) and Hart (1991) realized the need for applying perception concept in applied geomorphological research but there is a lack of empirical study in geomorphology applying this concept though Saarinen (1966) and others in hazard research have given emphasis on the concept of perception and perceived environment. We have examined these concepts mentioned above while reviewing the functional relations that have developed between the Lower Damodar river-bed and its occupiers. Changes in real environment are recorded on the geographic space. Different types of control structures, changing boundary of sand bars, opening of spill channel, deterioration of distributaries etc., leave their cognizable imprints on the surface. Perceived environment is reflected on the land use practises. As there is an overt expression of social space, similarly perceived environment has its overt expression through selection of settlement sites, crops to be grown etc.

In Gangtikali, there was a change in real environment when coal mines on the west were flooded in 1959. So long fund resources were in a usable state, agricultural resource potentials on the east were not perceived by the islanders. Second, in the pervious case the decision to open a coal mine was taken not by the islanders but by the Eastern Coalfield Ltd. The interaction with a given geological resource base was rather dictated by others who perceived only the geological resource potentialities of Gangtikali. At the same time job-opportunities at Gangtikali were perceived by the Biharis who migrated to this island to work in the collieries. It may be true also that their initial decision to migrate and perceived environment of Gangtikali were influenced by earlier labour migration from Bihar. But in later period that is after 1959 agricultural resource potentials of the east were perceived by the islanders themselves. The settlement sites have shifted from west to east (Fig.-8.1). As Gangtikali is located at higher elevation so release of water from the Panchet reservoir is welcome which helps in lift irrigation.

There were series of changes in geomorphic space and geomorphic resources in Paikpara with the opening of the Muchi-Begua hanas and the Kanki-Mundeswari. The main flow of the Damodar is now through the Kanki-Mundeswari and the old Damodar has deteriorated to such an extent that it's bed is agriculturally used during non-monsoon period. The bed of the old Damodar is perceived more as a fund resource and less as a flow resource. Moreover, it is also perceived that the Muchi-Begua hana side has become vulnerable due to bank erosion. In accordance with this there is an out migration from Paikpara and the main settlement site is shifting towards east (Fig.-9.2).

Observable changes in real geomorphic environment have occurred below the Ulughata sluice. The Lower Amta channel has almost become a defunct channel as has been unofficially declared defunct by executive engineer, Irrigation and Waterways Dept., Govt. of W.B. Environ-Sensitive betel leaf plantations are located here as it is perceived safe for these plantations.

All the examples indicate that perceived environment changes with the changes in the real environment thought not necessarily at equal space. Some times perceived environment changes faster than the changes to be observed in the real environment and vice versa. This statement can be clarified if we take examples from the refugee dominated settlements. We have stated earlier that there are hundreds of self-sought settlements in the river-beds of West Bengal and not all of these rivers are reservoir channels. Width of the river and stability of sand-bars were the main factors behind colonization. Locational disadvantages of distant bars were also perceived as positive ones for the fact that they could remain unidentified in these self-sought settlements. This was indeed a crucial factor at the initial stage of river-bed colonization.

When the first group of settlers arrived in the riverine bars the Durgapur barrage and the Panchet reservoir were yet to be constructed. There was a rapid change in real environment when these two emerged as major transverse control structures. Monsoon discharge decreased, peak flow reduced and there was a shift of peak flow from July-August to September (Fig. 6.3, 6.6, 6.7). There is no doubt that perceived environment constructed by the refugees changed. They can perceive which part of the bars will be inundated if water is released from the reservoir and barrage. They can also perceive whether their new niche will be inundated or totally destroyed during floods. Several riverine bars were severely damaged during '78 floods thus causing remarkable changes in real environment, but perceived environment of refugees did not change much because of their restricted social mobility and economic constraints. In this connection, it may be stated that after the '78 floods local Bengalees from the flood affected areas of the Hugli and Medinipur districts shifted to Rangamatia, Fatehpur and Kasba Mana and purchased land from the refugees. The *fourth thesis*, therefore, is that there is a close link between changing Geomorphic space and perceived environment and perceived environment is conditioned by social space.

Cardinal changes in perceived environment has occurred after granting land deeds to the refugees. For this legal step, the refugees have attained a level of self sufficiency from the level of self help of initial stage. Environmental perception was embedded in the

decision of embanking flood-prone Lower Damodar in removing the right bank embankment in places or in constructing modern control structures. But excecution or realization of decision was made possible only by government policy. This is true though not equally in agricultural practises. After the partition of India in 1947, cultivation of jute in West Bengal was encouraged by the government as major jute growing areas were in erstwhile East Pakistan and jute mills were in the Hugli industrial belt. From the above statements emerges the *fifth thesis* that legal issues, however sensitive they may be, need to be incorporated in applied geomorphological research. Geomorphological expertise can only be used to solve practical problems if it is supported by a public policy. Pitty (1982) has drawn attention to the importance of public policy in application of geomorphology in flood control measures while commenting on Hails's remark that most of the geomorphologists are interested in individual academic pursuit and not in solving practical problems (Hails, 1977; Pitty, 1982). Since colonisation refugees have been struggling to fortify their forcibly occupied resource base in self-sought settlements but it is only after gaining the land ownership rights they have taken the river-bed as their own. A kind of allegiance or topophilia has developed among refugees.

At a particular historical juncture the river-bed of the Lower Damodar became the second habitat of Bengalee refugees and alluvial bars were their new addresses or niches or micro habitats. The functional relations that have developed in between river-bed and refugees exemplify the concept of human ecology as proposed by Park and Burgess in 1921.

In the present research the concepts, however, have been modified taking a socialistic view-point. Refugees have extended their resource base right up to the inundation prone peripheral zones of sand bars by growing crops of low value as additional crops. Decaying channel beds have been used for paddy crops. In the bank-erosion prone areas they take immense care to grow grasses. Wherever horizontal extension of existing resource base is not possible they use the land for multiple cropping thus expanding resource base vertically (Fig. 8.11). Initially they were treated as parasites by host communities. That parasitic relationship has now been replaced by a relation of competitive co-operation and this relationship has come up due to exchange of commodities, extension of market facilities etc. The Bara Mana is a citable example of all human ecological issues in an alluvial bar. From growing inferior crops in nutrient poor fresh sands they have gone through several seral stages in agriculture and now they have almost reached a climax by growing plantation crops like mulberry. This has been possible due to increased accessibility to markets and enhanced social and economic mobility of the community. We deviate from the classical position of human ecology by resolving that survival potentialities of communities are not genetically transmitted but acquired through personal experience. The concept of survival of the fittest as proposed by Darwin and later followed by conventional human ecologists has been applied in this research but our argument is that fitness is technological fitness. Fitness is acquired cultural fitness as well. The people of Rangamatia is fighting against bank erosion by constructing a dyke. So, the concept of human ecology in a modified form can be applied in applied geomorphological research. This is the *sixth thesis*.

The river-bed dwellers mostly hail from deltaic Bangladesh where rivers are perennial, flood slope is gentle, speed of on set is slow and river-bed materials are clayey. In erstwhile East Pakistan or in Bangladesh they were not used to live in a river-bed. Moreover, Bangladesh rivers are yet to become reservoir channels. Physical characteristics of the Damodar are different in respect of flood-slope, flood-speed and bed materials etc. Circumstances forced the refugees to occupy a river-bed.

Thus the river-bed dwellers had no *a priori* model before them. Their decision on selecting settlement sites or changing settlement sites has been conditioned by their personal experiences which have changed over time. Similarly, their personal experiences have helped in selecting crops from cereals to high value cash crops. From personal experience the river-bed user of Paikpara has come to know that the old Damodar is drying up and the Muchi-Begua is posing a problem for them. So, there is a flight of population in face of an anticipated or perceived calamity. In contrast mulberry plantation has been introduced in the refugee dominated Bara Mana and Majher Mana. Islanders have learned through experience that the highest part of the bar remains above inundation level if water is released from Durgapur Barrage. Western philosophers like Hume, Burkley, and Indian philosophers belonging to the school of Carvac have always advocated for empericism or sense experience in explaining human behaviour. Through personal experience the islanders of Gangtikali have come to know that the release of water from the Panchet has no inundation risks for them whereas in Damodar Char Mohana release from the Panchet and backrush from the barrage becomes hazardous. Settlers have learned this through personal experience. This stretch between Durgapur barrage and Majher Char has become safer for the settlers for controlled flow from the Durgapur. The river-bed user know which parts of their settlements will be inundated and to what extent they will be inundated as have been stated earlier.

Through personal experience they have learnt the hydro-geomorphological consequences of several control structures and changes in over all socio-economic and political environments. So, ultimately it is personal experience that has played a decisive role in developing a functional relation between the river-bed of the Lower Damodar and its users. Thus, there can be no *a priori* model for man-environment interaction. Pattern of interaction with a given environment depends on experience and this is the *seventh thesis.*

The Lower Damodar shares many of its hydro-geomorphic characteristics with other controlled rivers not only in India but outside India also. But no other regulated river has such a high density of river-bed population. The controlled Lower Damodar is thus a product of twin processes; i, quasi-natural hydro-geomorphic processes and ii, anthropogenic land utilization process. This is the final or *eight thesis* of this research.

On the basis of these observations and explanation of floods, flood control measures, consequent changes in selected hydro-geomorphic phenomena, and land use practises in the Lower Damodar, the following theses can be stated :

i. The Lower Damodar should be culturally defined.

ii. Forms, processes and materials in controlled section are generically quasi-natural in character.

iii. Social space of Bengalee refugees has played a significant role in colonization in the river bed and in subsequent land use practices.

iv. There is a strong linkage between changing geomorphic space and perceived environment.

v. Land ownership rights are crucial factors in river-bed land utilization.

vi. Modified concept of human ecology helps in explaining land uses.

vii. There can be no *a priori* model for man-environment interaction. Interaction with environment depends on personal experience.

viii. The controlled Lower Damodar is a product of twin processes; quasi-natural hydro-geomorphic processes on the one hand and anthropogenic land-utilization process on the other.