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Dimensions Of Development And Change In Bangladesh, 1960-1980

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DIMENSIONS OF DEVELOPMENT AND CHANGE IN BANGLADESH, 1960-1980

by

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ABSTRACT

Bangladesh is a classic example of an overwhelmingly rural, low income, less developed country, seeking to achieve basic goals of development in both economic and social terms. Despite periodic physical disasters and crises, there has been a sustained effort, especially since 1971, by both the national government and outside agencies, to create a higher standard of living and greater equality of opportunity for the mass of people. In this study, what has been attempted is an analysis of change based on an array of 31 variables which are measures of social and economic well-being, and which relate to an overall concept of development based on social justice and equality of opportunity. Change has been measured over the period 1960 to 1980 using data from the 1961, 1974 and 1981 censuses, organized on the spatial base of Bangladesh's 71 Districts. The primary objective of the investigation was to analyze the regional characteristics of all variables on both an individual (univariate) and composite basis (multivariate), and in both an absolute and relative terms and thereby, to establish whether, despite persistent conditions of low income and economic underdevelopment, positive change had taken place, and whether, in the process, there had been significant alterations in regional patterns of development. Therefore, this investigation seeks to test the hypothesis that, over time and given the effort, some positive change did occur. Improvement is here defined less in terms of gross economic indices than in measures of

broader indications of social well-being and greater equity, with particular reference to decline in regional disparities within Bangladesh.

Individual variable analysis reveals a varied pattern of generally modest improvements with public sector investment (health, education) and non-agricultural employment leading the way. Factor analysis using dimensional mapping techniques suggests that there has been an increase in well-being and equalization of benefits, but that improvements are concentrated outside and distinct from the agricultural sector which itself is fragmented. Composite analysis using cluster techniques suggests that in 1961 the cluster defined regions seem to correspond somewhat to the underlying physical base and traditional, rurally defined areas including one 'core' region (Dhaka District- the capital). In spatial terms, despite some dispersal of improvements by 1974 there remain strong differentiations between the two main urban axis (Dhaka-Chittagong and Khulna-Rajshahi) and much of the remaining, more rural hinterland. However, by 1981 there has emerged the more clear-cut development pattern incorporating 1) the better serviced areas, including major urban areas, but by no means an urban cluster; 2) a more specifically rural, less well serviced set of Districts, to some extent peripheral but not describing a coherent periphery, and 3) the set of poor Districts largely concentrated in the Chittagong Hill-Tracts of the south-east.

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CHAPTER 1

The Problem and Its Dimensions

Introduction

This study concerns the spatial dynamics of development in a Third World context, and specifically examines the nature of developmental change in Bangladesh from a regional and rural perspective (i.e. rural development), between 1960-1980. The major objectives of the research are to measure the temporal characteristics of socio-economic disadvantage and the extent of spatial inequality at national and district levels, and to explain the changes that have occurred in both absolute and relative terms.

The study starts with the simple assumption that there is a dimension of human existence called 'social well-being' or 'equity' (some prefer "quality of life") usually expressed in composite variable terms, and that people living in a given area can be differentiated, with respect to this concept, on either an interval or ordinal scale, from those living in other areas. Therefore, the determination of the levels of living or well-being is based on the understanding that the demographic, social and economic characteristics of the population in different areas of the country (e.g. districts) are useful discriminatory indicators of development (Berry, 1960; 1961a; 1961b; 1965a; Lewis, 1969; Wilson, 1969a; 1969b; Drewnoswski, 1970; 1974; U.S. Department of Health, Education and Welfare, 1970; United Nations, 1971a; Smith, 1972; 1973; Sharif, 1973; Knox, 1974; OECD, 1976; Abdullah, 1979; Szalai et al., 1980; World Bank, 1980; Carlay, 1981; Schroeder, 1981). However, there are several views about what constitutes well-being and how it might best be achieved. Among those, equality of opportunity (social justice) has probably been, in principle, the most widely accepted approach to well-being (Liebenstein, 1957; 1966; Rescher, 1966; Chapman, 1967; Rawls, 1969; United Nations, 1971b; Harvey, 1972; World Bank, 1975d; George and Wilding, 1976; Nurkse, 1976; Economic Council of Canada, 1977; Streeten, 1977; Mehmet, 1978; Gobby, 1981; Hardiman and Midgley, 1982).

This is largely an empirical study which examines individual and aggregate areal attributes of well-being over a twenty year period. Attributes include demographic characteristics, housing conditions, household amenities, employment by occupation groups, levels of per capita income, educational attainment, health and medical care provision, central services, public utilities, and agricultural conditions. Data was collected for 71 spatial observation units (i.e. districts), and three temporal base points (i.e. the Census years 1961, 1974 and 1981). Selected variables (M=31) are analysed and presented at the district level (N = 71), contributing to an individual and composite picture of spatial and temporal change and to an assessment of well-being or 'development'.

Prime consideration is given to variables which correspond to socalled world development indicators, as published by agencies such as the World Bank (1980; 1980c) and the United Nations Research Institute for Social Development (McGranamham et al., 1972). The final choice reflected an attempt to represent as closely as possible the latest view of the term 'development' and the general definition of "social well-being" discussed in Chapter-2 (Berry, 1960; 1961a; 1965a; Bauer, 1966; McVeigh, 1971; Smith, 1972; 1973; Baster, 1976; McHale 1978;

Abdullah, 1979; Carlay, 1981). The attributes were also chosen on the basis of their availability at district level and comparability across the temporal sequence.

It is part of the task to put spatio-temporal changes into the context of both actual development planning in Bangladesh and models of development of a broader nature. In this regard, a general conceptual discussion of the problems of spatial development is presented to justify the theoretical significance of the study (Chapter 2) and its relevance in the applied context of Bangladesh (Chapter 3) Historically, the development processes in Bangladesh have reflected international thinking and model application with an admixture of national themes, growth objectives and strategies which pre-and post-date the emergence of Bangladesh as a separate nation state. This combination makes Bangladesh a "classic case" for the study of development in an underdevedoped country. A review of the historical antecedents is thus a pre-requisite in this perspective (Chapter-3).

Further, there is also need to review the alternatives as to appropriate methodology and analytic procedures. These seek to accomplish two related tasks of spatial depiction; in individual and composite spatial variable terms first, to derive a meaningful index of levels of development and, second, to measure the developmental change, with the aid of both computerized mapping and multivariate statistical techniques (Chapter 4).

All in all, the topic constitutes a complex problem in development studies, including conceptual and theoretical, historical and applied, and methodological dimensions The next part of this chapter will provide a brief introduction to these distinct issues. The last part of the chapter reviews broad objectives, and the formulation of hypotheses.

Rural Development Approaches: A Background to the Study

Rural develpment, as a concept and as a series of experiments in alternative methods of organizing production, welfare and exchange based on rural activities, has a long history and is not the monopoly of any single system or country. The current focus on rural development in the Third World, both reflects the absolute needs of dominantly rural societies and is symptomatic of the failure of western economic growth strategies pursued by most developing countries in the 1950s and 1960s. The search for solutions to the twin problems of rural poverty and unemployment is being carried out by academics, national and international policy-makers. Their activities are reflected by the rapidly expanding literature on the subject of rural development (Weitz, 1971; Beteille, 1974; ISAE, 1974; Mittal and Khan, 1976 and Cavan et al., 1979).

The decades of the 1950s and 1960s were a period of optimism and simplistic solutions to development problems. Policy-makers confidently sought to increase productivity and per capita income through concentration on industry and manufacturing (Chapter 2). They achieved some but found that most programmes generally benefited the privileged class (i.e. local elites). Gaps between the rich and the poor at all territorial scales and in all sectors increased, and economic growth, even when achieved, did not "trickle down" to the poorest section of the community. The industrial, sectoral and urban based programmes led to expanding bureaucracies, and projects addressed to the poor reached only small target populations (Chapter 3) and often created vulnerable dependency relationships (core-periphery) between the metropolitan or major urban centres and the surrounding countryside. In short, in the 1950s and 1960s the total number of poor increased rapidly and inequalities of income, land, resources, and access to services became more marked. By the early 1970s it was obvious that a new approach to development was necessary not only to achieve growth in productivity, employment and incomes, but also to do something about the growing and potentially disruptive inequalities (Goulet, 1971; Griffin, 1974; Chenery, et al., 1974; Hunter, 1976; Haque et al., 1977; ILO, 1977; Ban et al., 1980; lea et al., 1983).

Bangladesh: A Classic Case

Bangladesh, initially East Pakistan, was created in 1947 in the partition of the Indian sub-continent. A south Asian country located in the humid tropics, it is predominantly rural and traditionally agrarian in nature. It has some cottage industries but only the beginnings of modern industry (Ahmed, 1976). Agriculture is the mainstay of economic life in Bangladesh. The lion's share of the gross national product (GNP) is derived solely from agriculture and export earnings are almost totally dependent on agricultural commodities. Therefore, the rural-agricultural sector has a dominant function in the national economy (Islam, 1976).

Despite the concentration of activity within the rural-agricultural sector, however, Bangladesh has experienced a more or less consistent foodgrain deficit since its emergence 40 years ago as the eastern wing of Pakistan. Moreover, yields of the primary staple (i.e. rice) remain among the lowest in the world and fertilizer use per acre[1] is among the lowest in south and south-east Asia. Farms are small and fragmented. Cultivators, who produce foodgrains mainly for domestic consumption, are poor and lack the resources to invest in improved production technology. About one third of the rural labour force suffers from unemployment or underemployment (Bergen, 1967; Islam, 1976; Hossain and Jones, 1983).

Further, environmental hazards, particularly floods and cyclones, but also including drought, and saline intrusions from the Bay of Bengal, frequently disrupt agricultural production. In this context, the need to relieve poverty assumes great urgency, because for the poor it is a constant struggle for physical survival. Therefore, in view of the predominance of the rural sector in Bangladesh, the measure of rural development in social as well as economic terms holds the key to the evaluation of past and present progress in terms of well-being, which may or may not include specific economic gains.

Need for the Study

Much has been written on the topic of the national development crisis in Bangladesh and a considerable number of studies have been undertaken by individual researchers, universities, research institutions and specialized government agencies on rural-agricultural development, poverty reduction, malnutrition, disease,

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[1] Imperial measurement is used throughout the text.

and mass education at the national level (World Bank, 1972; 1978; 1979; 1981; Dutt et al., 1973; Kavalsky, 1973; Alamgir, 1974; 1975; 1978a; 1978b; 1980; Rahman, 1974; Abdullah, 1976; Ahmed, 1976b; Faaland and Parkinson, 1976; Haq, 1977; Hossain, 1977; 1981; Khan, 1977; Stepanek, 1979; GOB/World Bank, 1981; Soban, 1982). What is singularly lacking in most of these studies is an intra-national (regional) spatial perspective based on criteria of well-being. This reflects in the fact that a regional approach to rural development planning has been generally neglected in Bangladesh (Islam, 1977; Paul, 1981). To help fill this research gap and to provide a possible framework for planning, this study focusses attention on the distributive aspects of development, or more correctly elements of "social justice".

It is a topic of importance to geographers who are interested in the problems of socio-economic inequalities, not only between classes of society or sectors of the economy, but also in the differentiation of these characteristics between areas (Berry, 1961, 1965a; Smith, 1972, Abdullah, 1979; Chowdhury, 1984). Furthermore, if geography is, as its practitioners say it is, vitally interested in social justice' (Harvey, 1972) there are sound conceptual reasons for attention to many social variables previously ignored in the analysis of development (Peet, 1972). And, if geography is concerned with areal differentiation, then the social variables constitute relevant criteria in regional spatial terms. The acceptance of a wide range of contemporary social variables, representing "social well-being" as legitimate subject matter for geographical inquiry opens up many new research possibilities in developing nations (Berry, 1967, Garver, 1969, Ray, 1969, Morrill, 1970, Harvey, 1972, Peet, 1972, Smith, 1972, OECD, 1976, Carley, 1981). Therefore, the work reported in this dissertation represents an initial attempt to describe the broad features of geographical variations in social well-being in Bangladesh on a regional framework and a composite basis suitable for regional development planning.

There is a need for precise information on the regional approach to development planning. During the last twenty years or so, a number of geographers and economists have tried to delimit regions of economic development globally and within developed countries at differing scales (Ginsburg, 1960; 1961; Spence, 1961; Gould, 1964; Bell and Stevenson, 1964; Berry, 1965; Stevens, 1968; Smith, 1972), but relatively few attempts have been made to delimit regions within developing countries (Forde, 1968; Abdullah, 1979; Ali, 1986). A major problem which has faced researchers in developing countries was the general scarcity of relevant small area data. However, in many countries, some data can now be obtained from national censuses, including those of Bangladesh (1961, 1974 & 1981). Based on these data, measurement and analysis of socio-economic inequalities and spatial well-being can be attempted with the applied objective of providing a more precise information base for rural-regional development planning.

One notable feature of the Bangladesh approach to rural-regional development has been the absence of a systematic division of the country into either formal or functional planning regions (except administrative). This study uses the newly defined 71 administrative districts of Bangladesh as the basic units of observation and makes the assumption that these units not only allow greater differentiation of conditions, but will correspond more and more to the set of planning units for the country. The units are of similar size, and compare the level at which most of the required data on social well-being are available in consolidated form. By combining census tracts the data can be assembled on a comparable basis for all 3 census years. Evidence of the utility of using districts as the basic units of observation comes from other studies both in Bangladesh and elsewhere (Ali, 1984; Abdullah, 1979 and Osborn, 1978). The significance of the districts as observation units is discussed in greater detail in Chapter 4

However, the recurrent problem in such an attempt to portray development on a composite basis and to synthesise the data, is the absence of well-defined models incorporating a wide range of socio-economic variables, or reasonably clear hypotheses dealing with their interrelations (Takamori and Yamashita, 1973, Hardiman and Midgley, 1982) Consequently, although this study concentrates on the interpretation of empirical evidence in its attempt to provide insight into the spatial extent and temporal change and relationship between the array of social and economic development variables it seeks to explain the results in terms of application of general models This issue underlies the conceptual and theoretical discussion of development and the search for models which may be relevant to the study It also reflects an overall attempt that is made to evaluate composite spatial change in terms of the core-periphery model

The Conceptual and Theoretical Dimensions of Development

The Meaning of Development

The spatial distribution (allocation) of development can be described and analyzed in the same ways as the spatial distribution of other phenomena, provided that development is reduced to and defined in measurement terms.

Economic development has traditionally been defined as a long-term sustained increase in real output, broadly conceptualized as human productivity (Kuznets, 1959). Not surprisingly, such a narrow economic national accounting approach to development has been widely criticized (Olson, 1969; McGranaham et al., 1972; Baster, 1976; OECD, 1976). As a result, attempts have been made to extend the concept of development beyond economic performance, alone (Seers, 1969; 1972). It has been argued that "what people want is not more national product but better social conditions, increased well-being, or superior quality of life" for the mass (Drewnowski, 1974, P.1).

Rural Development, according to the World Bank,

> "is a strategy designed to improve the economic and social life of a specific group of people-the rural poor. It involves extending the benefits of development to the poorest among those who seek a livelihood in the rural area. The group includes small-scale farmers, tenants and the landless" (World Bank, 1975a, p. 3).

A balance view of development thus requires an investigation into a wide range of aspects (economic and social) of human well-being. Economic aspects of development relate to production and consumption, whereas social aspects are more varied and include such attributes as demography, education, health, nutrition, housing quality, household amenities, central services and so on. In these terms, the term "development" has a wide meaning with rich emotional appeal, diversified themes and multi-dimensional sentiments (Todaro, 1981; 1982). A definition of economic development in operational terms that is compareable to the above characterization is given by Randall:

> "the process of economic development is the interaction of operations and conditions which contribute to what is conceived to be the satisfaction of human needs as expressed in some particular value terms" (Randall, 1957, P. 7).

Because of its multivariate character it can not be operationally defined by a single indicator.

Constructing Spatial Social Indicators

During the past decades (1960s to 1980s) there has been a dramatic awakening of academic and governmental interest in the measurement of the social state of the nation. Although it is fashionable in certain circles to refer to "social accounting" or "monitoring the social system", the major thrust of this emerging trend has to do with the development of composite social indicators. The strength of the social indicators movement may be judged by the volume of its literature accumulated during 1970s (Allen, 1970, McVeigh, 1970; Morrill, 1970; Shonfield and Shaw, 1972, Gambling, 1974, Henderson, 1974; Land, 1975a, 1975b; Abrams, 1976, 1978, Andrews, 1976, OECD, 1976, Hayden, 1977; Liu, 1977, Caplan and Barton, 1978, Gehrmann, 1978, Kuz, 1978, Hicks and Streeten, 1979, Carley, 1981)

Towards a Social Report (1969) defines social indicators as follows:

> "A social indicator as the term used here, may be defined to be a statistic of a direct normative interest which facilitates concise, comprehensive and balanced judgements about the condition of major aspects of a society. It is all cases a direct measure of welfare and is subject to the interpretation that, if it changes in "right" direction, while other things remain equal, things have gotten "better off" (US Department of Health, Education and Welfare, 1969, P. 97).

The ultimate objective of the much of the social indicators movement is to able to construct models of society in a way that enable specific goals to be set and social systems to be manipulated. To those ends, national accounting and econometric models are now used in the design of public policy (Olson, 1969). The aim is to bring the same sophistication to social planning as presently exists in economic planning. However, one of the major deficiencies of the social indicators movement is the frequent lack of a geographic or its spatial perspective (Peet, 1972; Smith, 1972; 1973; Abdullah, 1979).

Despite some interest in "urban indicators", some local social reporting, and a few impressive empirical studies (Schneidermeyer, 1968; Wilson, 1969; Jones and Flax, 1970; Perle, 1970), the emphasis has been on the development of aggregate national statistics measuring social trends over time. Yet there is evidence of extreme spatial variation at the sub-national level in many of the conditions which contribute to social well-being, and this regional variation is an important component of the social state of the nation. In keeping with the latest views of development, this study stresses the concept of "well-being" as applied to individuals, by regions, and equity among them, as basic goals for society (Berry, 1965; Rescher, 1966; Runciman, 1966; Chapman, 1967; Davies, 1968; Rawls, 1969; Harvey, 1972; Smith, 1972; 1973). To evaluate development according to this concept requires the use of social indicators on a regional/spatial basis which, if applied, can highlight the condition of regional variation and perhaps ensure that it is taken into account in the formulation of public policy. A major aim of the study is thus the construction of composite spatial indices based on the variables which contribute to the notion of "social justice". Discussion on "social justice" as a normative concept and concepts of "social well-being" and "equity" are amplified in chapter 2. Basic economic growth models and theories (e.g. export base/staple theory, growth pole/centre, theory of circular and cumulative causation etc.) based on equalization principles (i.e. modernization, spatial equilibrium through "spread effect"/"trickle down effect") are also reviewed in Chapter 2. These are discussed as mechanisms of regional growth in general, however, their appropriateness in illuminating the changing structure of spatial variation (development) in Third World countries is also evaluated.

Historical and Applied Dimensions of Development

Having identified conceptual and theoretical dimensions of development one needs to recognize its specific context, i.e. the historical antecedents of development in Bangladesh These are divided into two aspects: the first introduces the state of the nation prior to colonialism and the legacy of history, including the colonial period; the second outlines the sequence of public policies adopted for rural development in Bangladesh since 1947, with an emphasis on those operations between 1960 and 1980.

For centuries the land which is Bangladesh was an area of relatively ample food self-sufficiency (Faaland and Parkinson, 1976). The beginning of agriculture go back to pre-Aryan times (Majumdar, 1943, p. 562). Records of the 7th to 13th centuries A.D. describe wide-spread cultivation of the land. In the 7th century the Chinese traveller Hsuan Tsang remarked on the regular and intensive cultivation of land and the abundant production of grains, fruits and flowers (Ibid., p. 649). Reference to other crops during Roman times are mentioned in the Periplus of the Erythrean Sea (Schoff, 1912, p. 147). Throughout the 13th, 14th and 15th centuries the area continued to prosper agriculturally despite foreign invasions. The advent of Muslim rule in the early 13th century, far from disturbing this economy, established valuable links with the fast-developing and more cosmopolitan world of northern India. Under the peaceful and generally efficient rule of the Moughal regime the area achieved prosperity based on increased and varied agricultural production, developing industry and expanding commerce and trade. Agricultural prosperity and the great abundance of food and raw materials caused the entire Bengal area to be considered a natural storehouse. Many famous travellers, including Marco Polo (1292), Ibn Batuta (1345), Mahuan (1406), Caeser Frederic (1565) and Ralph Fitch (1582) who visited to the richest part of distant Bengal (i.e. Bangladesh) spoke in glowing terms of its plentiful resources (Birt, 1906, Ahmad, 1968; 1976a). However, with the advent of colonial role in the middle of 18th century the initial prosperity of the land (i.e.

East Bengal) deteriorated over time into a state of dependency and underdevelopment.

The area, known as East Bengal, was a British colony for about 200 years, occupying a marginal situation in the Indian Empire, itself peripheral to the United Kingdom within the British Empire. British rule saw the area relegated to a supplier of agricultural raw materials for the factories of Calcutta, and thus reduced status of the predominantly muslim population. With the end of British rule and the partition of India in August 1947, East Bengal lost what locational advantage it held and became the distant eastern wing of the new state of Pakistan and was known as East Pakistan (Ahmad, 1968; 1976; Rashid, 1977; Johnson, 1982). With the creation of new state, East Pakistan was nominally part of an independent state, but, in fact, remained in a quasi-colonial situation politically and economically disadvantaged, and peripheral within Pakistan, until 1971 (Stepanek, 1979; Westergaard, 1985). The two dozen years of relative neglect as East Pakistan meant that, at independence, and after a civil war (1971), the new state of Bangladesh was possibly the poorest nation in the world, with an underdeveloped infrastructure, stagnant agriculture and a rapidly growing population (Johnson, 1982)

Policy Models and Development Strategies: 1947-1980

Prior to 1960 only very limited attempts at rural development in Bangladesh (East Bengal or East Pakistan) can be identified. The British, spurred by famines in the late nineteenth century, encouraged the rural co-operative movement and initiated a program of rice research in the early years of this century. Then, because of continuing concern with recurrent famines and the lack of dynamism in agriculture, they established a full-fledged department of rural reconstruction in 1940. Soon after Partition (1947) the Pakistan government started a community development programme known as V-AID (Village, Agriculture and Industrial Development), but this, like the earlier British attempts, only operated on a limited scale. Neither the British nor the early Pakistani programmes had a significant impact on lagging agricultural production or broader problems of rural underdevelopment (Hossian, 1977).

However, focusing on "social well-being" as the basic societal goal, this study reviews two major and distinct national development strategies which have been pursued in the context of Bangladesh (Chapter 3): First, development planning in Pakistan was mainly through the promotion of "growth poles", applied as a mechanism of long term sustained national growth. This process was to increase industrialization and urbanization in the country as a whole and is known as the export-oriented Pakistani urban-industrial growth model of 1960s (Stepanek, 1979). The strategy was based on the historical experience of western nations bearing the notion that economic growth has been accompained by specialization, centralization, maximization, urbanization and industrialization (Lea et al., 1983).

Local efforts to promote rural development in East Pakistan started in the early 1960s, which were a period of planning and experimentation, during which the local government development organizations adopted growth oriented strategies (to maximize production) and set up programmes and almost from scratch (see

Chapter 3). Finally, by the early 1970s, the birth of Bangladesh led to a new national development strategy based on the application of technological innovations with particular emphasis on the modernization of the agricultural sector. This was based on expansion provisions for capital (credit) and technological inputs, with the assistance of international donors (Islam, 1977). Programmes were launched at the regional-local level through the Bangladesh Water Development Board (BWDB), the Bangladesh Agricultural Development Corporation (BADC) and Integrated Rural Development Programme (IRDP), both as short and long-term policy options to meet the objective of increased food supply (Faaland and Parkinson, 1976; GOB, 1976; Stepanek, 1979; Hossain and Jones, 1983). These strategies of national and rural-regional development are discussed from both the theoretical perspective and in the appropriate context of recent development in Bangladesh in Chapters 2 and 3, respectively.

During the late 1970s and specifically during the First Five Year Plan Period, (1973-1978), increasing attention was paid to the distributive aspects of rural policy. In a major policy statement- "Rural Development Expansion Programme",- a rural development strategy for the country was outlined with three main objectives to increase agricultural production, to create new employment opportunities for the rural poor through rural works and rural based industrialization, and to strengthen rural institutions for the effective delivery of development services to all socio-economic groups (GOB, 1977) In this light, it is not surprising to find one of the main objectives of the Second Five Year Plan (1980-1985) to be comprehensive rural development by which is meant, "the reduction of poverty, provision of basic needs, expansion of gainful employment opportunities and, in short,- to improve the quality of life of common people" (GOB, 1980; Chapter VII). One of the underlying questions being investigated in this study is whether public policies instituted before 1971 and 1980 seem to have stimulated actual regional development in such terms (i.e. spatial convergence over time of characteristics of social justice/well-being).

Core-Periphery Structure and Spatial Dichotomy

From the preceeding discussion it is apparent that Bangladesh occupied a marginal location in both spatial and economic terms during both the British and the Pakistani regimes. Further, from a historico-spatial perspective, within the country a more progressive core region may be distinguished from the peripheral areas.

The reasons for a core-periphery situation lies in the fact that the spatial development of the areas, known as East Bengal and more particularly as East Pakistan and Bangladesh, has been uneven (Chowdhury, 1981; 1984; Paul, 1981). Dhaka and Chittagong became the twin foci of a "core" region or major urban axis of the country with a considerable degree of relative affluence in terms of principal components of development. Dhaka is now the capital of Bangladesh and is centrally located to receive almost all comparative advantages of national economic development. Similarly, Chittagong is a major sea port city and a leading industrial and commercial centre in the country. In contrast, outlying areas, including the southern active delta plain, the eastern hill-tracts, depressed basins, northern and central pleistocene terraces and especially the north Bengal which is physically separated from the rest of the country by the Padma (Ganges) and the Jamuna river systems, are all in a disadvantaged position relative to the Dhaka-Chittagong Axis. In order to bridge the gaps between the centre and the periphery and between east and west, both spatial interaction and diffusion of development throughout the country are required.

The core-periphery situation is relateable to the general model stemming from work of Friedmann (1956; 1959; 1961; 1963; 1966; 1972; Friedmann and Alonso, 1964; Darwent, 1969) and others regarding spatial resultants of the processes of unequal development, and in dynamic terms provides a basis to describe how spatial disparity narrows or is accentuated. The process may be viewed as unacceptable when development of a powerful central region, reduces the rest of the economy by draining out its resources, manpower and capital and the reminder of the country is relegated to a second-class, marginal position and placed in a quasi-colonial relationship to the centre (Myrdal, 1957; 1972; Schultz, 1957; Prebisch, 1959). In this case the factors of production redound to the "centre" where economic growth will tend to be rapid, sustained and cumulative and may result in differences in the widening of relative levels of living between core and periphery (Williamson, 1965, Adelman and Morris, 1974; Chenery and Ahluwalia, 1974; Haque and Mehta, 1977). Therefore, a lasting core-periphery relationship is harmful to a country. It leads to extreme inequalities in welfare among regions, at least in Third World context.

However, the "core" may also function as the necessary catalyst or growth pole, which both generates development and as the centre of its diffusion to peripheral regions. (Perroux, 1955; Boudeville, 1966; Hirschman, 1958; 1962; Friedmann and Alonso, 1964; Pred, 1965; 1966; Hermansen, 1971; 1972; Mera, 1976; Hansen, 1982). In this case the relative decline of the core, and/or its physical expansion over time may signify some positive development activity. Discussion on the concepts of the "core-periphery" relationship, its existance at different geographic scales, and its interpretation over time and space are presented in Chapter 2. The changing core-periphery relationship provides a major framework for the composite analysis (Chapter 6).

Methodological Dimension

Given the problems of rural development in Bangladesh and an assumption of differential spatial patterns at sub-national level at each time period (i.e. 1961, 1974 and 1981), one searches for the appropriate methodology for the investigation of change over time and space. Three concepts underly the choice of methodological dimensions, these are: 1) the consideration of the still aggregate nature of census data collected for the district level, 2) the availability of data for only three points on the temporal scale i.e. 1961, 1974 and 1981, to measure the extent of developmental change (creating space-time units) and 3) the recognition of and the need to address the complex multivariate structure of the problem.

In principle, we may hold that distribution made at any scale or across any aggregates should reflect the individual level of analysis. This is difficult to substantiate for the district level study, in which districts contain a range of from 70,000 to over 4 million (1981) inhabitants but for the purposes of the investigation we shall assume that social justice achieved at the regional spatial level of analysis (i.e. the 71 districts) implies individual justice, even though we are all too aware this is not necessarily the case (Harvey, 1972).

Discussion on the relative merits of temporal base points are provided in Chapter 4 (methodology), but there exist no alternatives to this choice if one seeks the range of comparable spatial data accross the set of variables.

The distributive aspect of development may be examined according to many single criteria (Chapter 5), but it is best conceptualized and therefore, ideally also examined on a composite basis (Chapter 6 and 7). While individual variables may be analysed by distinct measures e.g. GNP per capita, per capita calorie intake (food consumption), infant mortality rate, literacy rate, and so on, and these may be treated separately as individual social indicators, their composite existence represents a further, more powerful social indicator. Thus, in this study, we proceed from an analysis of the spatial distribution and change over time for an array of individual variables, to composite, multivariate analysis. The latter, is expected to reveal the common underlying regularity or broad dimensions of differentiation in the data set. The rationale for a composite analysis of development- i.e. a shift from an univariate to a multivariate approach, is that it allows for a depiction of both the elements of the system, and the rural system, in total.

Multivariate Techniques

In recognition of the complex multivariate nature of the problem of social well-being, two contrasting, yet complementary, multivariate analytical techniques-i.e., trend seeking ordination (factoring) and recognition of group structure (clustering) are employed, with a common goal of delimitation of spatio-temporal regions. These techniques represent a sophisticated approach to socio-economic regionalization (Berry, 1960; 1961a; 1961b; 1965a; 1967, 1968; Ginsburg, 1960; 1961; Bell and Stevenson, 1964; Spence, 1968; Stevens, 1968; Gould, 1971; Smith, 1972; 1973; 1977; Glasson, 1974; Troughton, 1976; Abdullah, 1979; Ali, 1986). By using a combination of factor and cluster analysis and certain other forms of dimensional analysis (on the basis of factor scores), one may seek to conclude; a) how many different dimensions of social and economic disadvantage are actually being embraced by these many original criteria and b) what composite regional pattern of disadvantage is evidenced by the combinations of dimensions. Then, by a process of interpretation which depends, in part, upon an understanding of the principles by which the society and its economy are organized spatially, one may determine what relationships these types and patterns bear in the interdependencies giving form to space (Berry, 1965a). The specific analytic techniques are discussed more fully in Chapter 4.

Objectives of the Study

This study is an attempt to identify the major dimensions of development or its lack and the changing spatial structure in the context of Bangladesh. The ultimate thrust of the study is rural development viewed from an intra-regional perspective. The major objective is to illustrate the dynamic structure of spatial development (social well-being) in rural Bangladesh at three distinct times i.e. 1961, 1974 and 1981. This time period (1960-1980) covers two decades (1961-1971 and 1971-1981) of developmental change before and after the independence of Bangladesh (1971) and as a result, distinct pattern and direction of a spatial and temporal change are anticipated, including that in the key, core-periphery spatial structure.

Hypotheses

The study seeks to incorporate and relate the different dimensions introduced above (i.e. theoretical, historical and methodological); basing itself on the conceptual models deemed appropriate to Bangladesh and identifying the approaches to development that have been applied; using the range of appropriate data and analytic techniques to yield both the individual and the composite variable portrayal of spatial and temporal change; and arriving at some assessment of the direction and degree of change/ development over the study period. This integrated study objective can be stated in terms of a number of expected or hypothesised relationships, as follows:

1. The overall or summary expectation rests on the assumption that, in view of the recognition of broad levels of absolute change and a more or less continuous attempt to achieve development during the 1960-1980 period (albeit, with different levels of

effectiveness) that there will be evidence of an overall improvement in economic and social well-being in Bangladesh during the study period.

2. However, this overall expectation will be subject to major differentiations over time and space, as follows:

2a. Given the different sources of development policy, i.e. Pakistani until 1971, and Bangladeshi since 1971, and the increased influnce of UN stimulated policies in the latter decade, then it is expected that the level of increase in development will be more pronounced in the 1974-1980 period than in the 1960-1974 period.

2b. Given the variable geographic nature of the country, including a strong core-periphery differentiation already apparent in 1960, there will be continued variation in the levels of development and the degree of change between districts, and overall core-peripheral differences will persist.

2c. On the other hand, it is expected that the core-peripheral dichotomy, while it may show evidence of increased strength in the initial period, may be expected to weaken or show evidence of spatial diffusion towards the periphery in the later period.

2d. With respect to individual variable differentiation, overall change over time in a generally positive direction is expected for all variables, together with changing patterns of detailed spatial distribution of variable measures. However, it is also expected that the patterns and levels of change will vary with respect to distinctions between variables, especially in terms of their susceptibility to government/ public programme initiation and provision. Thus it is expected that public service provisions (e.g.

health, education) will achieve higher levels of positive change and a broader pattern of spatial diffusion, than variables related more to the private sector (e.g. agriculture, manufacturing employment).

2e. With respect to composite variable assessment, it is expected that this will reveal a changing pattern of regional development over the study period in which increasing numbers of districts will evidence the effects of development, and that the overall "measure" of change will incorporate a higher degree of integration of districts within the national fabric.

2f. It is also, expected, however, that the relative positive changes in Bangladesh will be of moderate dimensions, and will reinforce the need for greater emphasis on integrated regional development in future.

CHAPTER 2

Conceptual and Theoretical Dimensions of Development

The overall purpose in this chapter is to review the various models of and approaches to development that are appropriate to the case of Bangladesh, both in terms of assessing the nature of its development problem and the policies and programmes that have been applied to that problem, and of providing the framework within which data have been gathered and are analysed in this study.

The first part of the chapter contains a discussion of the evolution of what is seen as the currently dominant international development paradigm (United Nations, 1969; 1971b; Weaver and Jameson, 1981). It describes how the previous approaches under the "Residual Social Policy Model" have been largely replaced by what the United Nations (UN) terms a "Unified Approach" (Hardiman and Midgley, 1982). Having introduced the current paradigm in broad terms, the review examines a number of concepts that are part of the background to the "Unified Approach" and which provide the basis for the choice of an approach to and variables relating to the Bangladesh case study. These concepts include: 1) definition of development that is logical and operational in composite socio-economic terms, 2) the ideals of normative analysis including the development of multi-variable, measureable criteria, applied to concepts such as social justice, well-being, poverty, and socio-economic disadvantage and, 3) more explicit examination of the geographic scales at which underdevelopment may be identified and, in particular the manifestation of regional spatial inequality.

The second part of the chapter looks more closely at the operational aspects of development, especially the manner in which different broad approaches to regional development theory have been applied. The contrast is drawn and the differences examined between economic growth strategies (e.g., economic/export base theory, international trade (or aid), growth pole/centre, technology transfer etc.). Bangladesh has experienced a mixture of development programs applied largely at the national level and to some extent regionally within the country. Identification of the approaches contributes to interpretation of the patterns revealed by both individual and composite variable analysis. In addition, the combination of prescriptive programmes and other inherent geographic characteristics, have produced a marked resultant pattern of development, most notably the core-periphery dichotomy between the Dhaka-Chittagong axis and the rest of the country. The last section of the chapter discusses both the negative and positive aspects of the core-periphery condition as the basis of interpretation of changes that are expected in national/regional dimensions over the study period.

The Problem of Development

1. The Shifting Paradigm of International Development

In the immediate post World War II period, as the idea of the conscious promotion of development in colonial and ex-colonial countries gained acceptance, its primary focus was economic, and its main objective was modernization through industrialization of largely agricultural-rural economies (Sundaram, 1983) Furthermore, the problem was seen as relatively simple, based on the transfer of technology and structures from the developed to the underdeveloped world. The key criterion for success was the rate of economic growth, which was to be as rapid as possible. Economic growth, it was believed, would not only transform the economy *per se*, but would initiate development based on industrial processes and an increasingly urbanized population (Dasgupta, 1976; Mittal and Khan, 1976). The role of the agriculture and the rural sector was to furnish labour and raw materials, but surprisingly, in the light of western development, not much significance was placed on its modernization or development as a source of capital particularly in generating rural savings (Nurkse, 1953; Alamgir, 1975; 1976; 1978a; 1978b; Lea and Chaudhri, 1983) and, thereby, to promote further investments and enhance development (Harrod 1946; Domar, 1948).

As part of this industrial-based strategy it was assumed that improvements in social welfare would follow and, presumably, be supported by the modernizing and wealth generating sectors. It was not that social conditions were ignored, but that their betterment was believed to be an inevitable by-product of economic growth (Lewis, 1955; Perroux, 1955; Hirschman, 1958; Rostow, 1960). This too, was surprising, given the rise of welfare economies in many western countries, but was perhaps submerged in the period of general economic growth of the 1950s. Inspired by the 'laissez-faire' philosophy of nineteenth century liberalism, some contemporary progressive conservative economists went even further and suggested that social services (education, health, housing etc.) should be treated as consumer goods and should find their place in the private sector market (Friedmann, 1962; Lees, 1965; Acton, 1970), again in strong contrast to the growth of the welfare state in most developed market economies.

In general terms, the proponents of economic development were strong advocates of a Residual Social Policy Model, which emphasised the residual nature of social welfare and freed the state from overall responsibility for its provision. They believed that government interference to meet social needs should be kept to a minimum (Hardiman and Midgley, 1982). They looked essentially to an earlier period of economic growth in western nations, which seemed to have been based on rapid industrialization (Kuznets, 1959a, 1959b; 1965; 1966; Rostow, 1960; Kindleberger, 1964; Pred, 1965; 1966) The key model was Rostow's 'take-off' (Rostow, 1960) which stressed industrialization, without which a country would remain underdeveloped . These theories largely ignored historical aspects of the earlier development process (dependency), including colonialism itself with its cheap raw materials and captive market, and the opportunities furnished by migration and the colonization of rich, new lands (Furdato, 1970; Cardoso, 1971; Amin, 1972; 1974; 1976, Frank, 1972; Foster, 1974; DosSantos, 1976; Todaro, 1982). Western economies are a product of labour-poor, resource-rich countries and it may be pointed out that massive urban unemployment in Europe during the Industrial Revolution would have led to social unrest, and possibly altered political structures, if 40 million people had not migrated to the resource rich frontiers of the Americas and Australasia. However, in labour-rich, resource-poor developing countries, similar migrations cannot now take place, and capital growth models do not stress the underlying socio-structural and ethical changes that enabled and later reinforced the industrialization of Europe (Ward, 1973; Adelman and Morris, 1973; Stepanek, 1979).

Perhaps embedded in the seemingly simplistic approach was a naive belief in the power of burgeoning technology to solve what seemed simple problems, and, thus, an unwillingness to commit aid to uses other than those which promised economic return, and a neo-colonial attitude to the whole situation (Woddis, 1969). The results are well-known; although some industrial development occured, it was capital intensive and, in many cases, uncompetitive; technological attempts to modernize agriculture were often massive failures through both lack of proper understanding of the system and of the more subtle needs of technology transfers; while even improved infrastructure did little to shift the balance of population and virtually nothing to improve the well-being of the mass of population (Agarwala, 1968; Chenery and Ahluwalia, 1974; Ahluwalia, 1976; Alamgir, 1978; Stepanek, 1979; Lea and Chaudhri, 1983). There still exist elements of this approach, especially in some of the large scale projects operated both bilaterally and by such agencies as the World Bank, but, in a more general sense, the economic emphasis on industrialization and the residual social policy model/paradigm, began to be replaced in the late 1960s and early 1970s (United Nations, 1969; 1971a).

The impetus for change came from a number of directions; first, the obvious failures inherent in the existing models, which saw many countries slide back in terms of GNP/ per capita and provision of the most basic social services. Second, the alternative approaches and critical appraisals being introduced by non-governmental organizations (NGOs) and some of the more socially advanced aid providers (e.g., Scandinavian countries). Finally, the idea crystallized through the United Nations and its agencies. The U.N. had become more involved through UNESCO, WHO and, after 1963, the World Food Programme (WFP) under the Food and Agricultural Organization (FAO). Its own reports suggested the need for policies in underdeveloped countries which recognized the existence of the mass of people and of their marginal conditions, and for a policy of development that would reach them (United Nations, 1971c). A key role was played by UN expert commissions, one of which was under the chairmanship of the Swedish economist Gunnar Myrdal.

The UN Myrdal commission reviewed the role of social planning in the development process. It took a more fundamental view of the existing conditions and of the need to improve agriculture with its mass dependent population, and the need for a 'bottom up' development strategy. It took the view that social planning was inseparable from economic planning and that the overall concern should be with the attainment of social objectives, which might be the underpinnings for more gradual development based on the indigenous economy, rather than a transplanted industrial one. The shift in emphasis was reflected in the U.N. resolution for the Second Development Decade, endorsed by the Economic and Social Council and adopted by the General Assembly in its resolution "The Unified Approach to Economic and Social Planning in National Development" of 11th December of 1970. The U.N. resolution stressed the need to reduce inequality across the range of social and economic criteria for the majority of the population, and urged UN member governments to adopt and support a socalled "Unified Approach". Included in the unified approach were the objectives of just and equal societies, with more equitable distribution of wealth, increased participation and higher levels of welfare and national integration (United Nations 1971a; Hardiman and Midgley, 1982). In addition to the UN document refered to already, examples of this approach may also be found in publications by the World Bank and the International Labour Organization (ILO) concerned with their 'redistribution with growth' and 'basic needs' strategies, as well as writers such as Apthorpe and Wilson (1970), Apthorpe (1970), Mehmet (1978) and Todaro (1982).

However, it must be pointed out that, like contemporary progressive conservative writers on welfare issues, those on the radical authoritarian left have an equal dislike of social planning, or at least of social planning in any other context than that of the Marxist state. They argue that social problems cannot be solved while capitalist values are permitted to prevail. Since capitalism is antithetical to welfarism, social planning is likely to achieve token reforms which neither remove the fundamental causes of social need and injustice nor adequately treat their manifestations. Social planning can, they believe, be useful only if capitalism is overthrown and replaced by the collective ownership of means of production and the allocation of resources solely on the basis of need. Marxist writers also believe that the overthrow of capitalism would not only result in equality and social justice but provide the resources required to eradicate poverty and provide a comprehensive range of social services for all (George and Wilding, 1976; Warren, 1979). Both

Bienefeld (1970) and Navarro (1974) argued against the 'myth' of scarce resources for social welfare in the Third World; if the wealth hoarded by capitalists were expropriated, they believe it would be possible to achieve this goal.

While it is important to note that there is still no universally accepted approach to development, and that, particularly in the areas of bi-lateral aid and strategic requirements, there is still a very heavy emphasis on large, prestige projects, high technology transfer (including military hardware), and imports of both food and consumer goods, there has been a noticeable shift in emphasis, especially in those countries, and here one would include Bangladesh, which were identified as most critical in terms of basic needs and least developed in economic terms (United Nations, 1971c). The Unified Approach has led the adoption of a more sectoral-incremental strategy in which increased expenditure on social services is emphasized. By their very nature, many of these services and their support facilities are of smaller, more widely dispersed nature than the earlier development projects. As such, they tend to affect a larger segment of the population, including its rural component. As the United Nations has reported, "public expenditures on social services continued to increase in most LDCs in spite of economic difficulties,.......and the share of the public sector in providing these services seems to have grown in all types of societies" (United Nations 1979, p. 37). Even some Marxists accept that there has been an extension of social service provision in the Third World since 1970 and that there have been improvements in levels of living (Hardiman and Midgley, 1982)

In terms of this study, which attempts to describe change over the period 1960-1980, we can look for some change in emphasis in development policy, with the Unified Approach being the dominant paradigm during the second decade of the study period. However, to recognize a paradigm shift is not to provide a base for empirical investigation. Consequently, in the next section there are examined the more explicit definitions of development, as a prelude to the attempt to identify the terms and objectives to which characteristics and values must be attached if measurement of change is to be attempted.

2. The Meaning of Development

Development was initially and most precisely defined in purely economic terms, and although the Residual Social Policy Model has to some extent given way to Unified Approach, economic elements and goals do remain. In the course of development, several inter-related processes occur simultaneously (Goulet, 1972). In economic terms, development looks to the transformation of simple, subsistence economies into more diversified monetary systems. A key process involves the decline in the proportion of production that is produced for home consumption, and an increase in the proportion that is sold or exchanged (i.e. surplus). The transformation is seen as based on a relative (and, hopefully, an absolute) decline in the agricultural labour force and an increase in the non-agricultural labour force who both produce new goods and services and consume (pay for) surplus food output. Thus, economic development requires an alteration in the structure of production and employment.

In the past, development strategies focused on rapid industrial growth and urbanization. Economic development was defined as a long-term sustained increase in real output of a given, usually industrial population (Kuznets, 1959) This productivity could be measured in both output and monetary terms as gross national product (GNP) The promotion of increased GNP based on industrial output was seen in 1950s and 1960s as the means to effecting the structural changes, leading to increased opportunities outside agriculture, and general 'trickle down' economic benefits which would be translated into better social and living conditions With this goal, initial discrepancies in income distribution, and even short term unemployment and locally increased poverty were less important than getting the 'growth job done' (Todaro, 1982)

Unfortunately, in many cases the industrial sector remained small and although there were increases in GNP, even to the extent of an overall average increase on a per capita basis, generally, the measure hid a condition of increasing variation in the distribution of income In addition, as has been pointed out (Bruton, 1967) GNP is a far from adequate measure of actual productive capacity, especially given a large subsistence sector, and says virtually nothing about the overall social conditions (Morgenstern, 1963, Baster, 1972, 1976, McGranaham, 1972) For the latter, one must turn to measures of the other processes at work

While many economists would argue that without an increase in GNP, better social conditions may not materialize for want of revenue, others argue that social improvement is essentially a separate goal Critics of the ~~national~~ economic accounting approach

(Seers, 1969; Ness, 1970; Baster, 1972; Smith, 1977) have argued that what people want is not more national product but better social conditions, increased well-being, or superior "quality of life", the attainment of which may even be precluded by too great an attention to purely economic development. They argue that increases in GNP have actually paralleled declines in the social well-being of the majority of the population, and that rarely have the structural goals of economic development based on industrialization been met; the term 'growth without development' has been used (Todaro, 1982).

Social well-being (defined more strictly below) can be conceived as a multi-dimensional process including changes in attitudes and institutions. While it looks to increase in material well-being and especially the eradiction of absolute poverty, it also seeks the reduction of inequality, and access by the majority to basic levels of service. In this context, development recognises a wide array of changes whereby an entire social system, tuned to the basic needs and desires of individuals and groups within it, moves away from a condition of life widely perceived as unsatisfactory (disadvantaged), and towards a situation or condition of life regarded as both mentally and spiritually 'better'. A closer examination of the terms social well-being, and equity appear below (3) but first a generalized definition:

Development must include both social and economic components, although there is a growing tendency in the Unified Approach to give greatest weight to the latter, in the belief that less disadvantage and greater equality will result in the realization of greater level of productive capacity, which may include an alternative to industrial and urban development. Overall, however, and as perceived in this study, development is defined in terms of a set of diverse characteristics (variables) integrated with respect to given geographic and temporal space. The diverse characteristics will include economic and social well-being measures based on a Unified Approach concept of the basic needs of a society. Integration is measured for each of the spatial components but observed with respect to the aggregate relational situation (Teune and Mlinar, 1978). This is an attempt to, literally, apply a Unified Approach to the development process, measuring integration and diversity over time and space. There remains, however, the question of what system characteristics to employ and measure.

3. Social Criteria and Normative Analysis

In emphasizing development based on societal values and goals expressed in terms of social criteria, one comes face to face with a major problem, namely, the identification of the societal values which one seeks to evaluate in overall terms, and the societal criteria which are ~~both~~ a valid expression of them, and which are amenable to aggregate analysis. The subject involves some controversial issues.

The first is that, since development means progress to something better, it is normative process. However, decisions as to the meaning of better or what to achieve from this normative process involve value judgements, of the people, of the planners or programme implementers, and of observers of the process. In this context, one can identify values that are explicit or implicit in stated social policy objectives and recommendations put forward by national governments (Runchiman, 1966; Rawls, 1969; Harvey, 1972). The most commonly stated, is 'so that the greatest prosperity can be achieved by the rural mass'. However, while this might seem acceptable, albeit vague and materialistic, in fact it is open to question when one is trying to measure social development in an objective fashion.

According to Baster (1972), most national development functions reflect a mixture of values; of the planners, of the some people, as well as those determined by the market and politics. In practice, however, it seems that the people's values are rarely reflected in development goals in a true sense, unless the election process of a truly democratic government and its enactment of policies upon which it was elected, can be taken as approval of a development goal. Reality is somewhat different; in most developing countries, central planners, political leaders, and other elites, assume the role of defining societal goals and the means to achieve them, with the result that these tend to be a combination of a narrowly perceived set of interests and other factors such as market mechanism of resource allocation and political aspirations (Harvey, 1972). Furthermore, insofar as it is the government that decides on national development goals and objectives, these may be expected to change with a change in government or in response to change in the economic, social or political situation as perceived by government. As such, while it is necessary to note official statements of policy and directed changes, even the declared objectives of a National

Development Plan may not necessarily embody basic long-term national needs of the majority of the population Rather, it is important to look beyond policy and try to establish the fundamental parameters of the situation and base measurement and evaluation of change on performance in relation to those parameters

The initial parameters that are recognized are those of Poverty and Disadvantage. The view point taken is that lack of development, or underdevelopment, especially that as severe as effects Bangladesh, reflects a situation in which the majority of the population are seriously disadvantaged and are experiencing poverty, in the broadest sense of the term

Poverty, therefore, is used synonymously with disadvantage, which is the assumed condition of most of those in an underdeveloped state, of possessing fewer resources than required for providing oneself with the physical and conventional necessities of life. It is a social rather than a physical concept, changing with time and space (Harp and Hotley, 1971) The condition of poverty is a consciously experienced state of deprivation, rendered especially intolerable as more and more people acquire information about the development of other societies (Todaro, 1982) Broadly, there are two types of poverty, absolute and relative Absolute poverty is a condition of life so characterized by malnutrition, illiteracy, and disease as to be beneath any reasonable definition of human decency While absolute poverty may exist it is assumed to be a minority condition On the other hand, relative poverty is defined relative to average living standards (World Bank Annual Report, 1980) and is widespread

Both sociologists and economists have written about poverty. Generally, the latter apply such terms as 'standard of living', 'income' and 'income distribution', while the former refer to conditions of 'class', 'stratification' and 'marginality'. While the economic terms can be measured more directly and precisely they catch only the partial meaning, while the sociological terms introduce other levels of description rather than definition. Those concerned with social policy have coined the term 'level of living', but this too needs to be defined in more than relative terms (Hoselitz, 1960; Frank, 1972; Smith, 1972; Hoogvelt, 1976).

Geographers try to be more comprehensive and more explicit, in trying to coordinate different viewpoints in a spatial construct. As both a social and economic condition, poverty is a physical reality and a state of mind, that exists in time and space, and is seen as a measureable characteristic, able to be measured and depicted at a range of scales, particularly at and within the national state (Berry, 1960; 1961a; 1961b; 1965a; 1972; Smith; 1972; Abdullah, 1979). The geographic construct of poverty includes a wide range of individual variables, but is essentially composite in nature simply because it is an aggregate condition of univariate reality changing with time and space. This view carries over into other constructs of development and underlies the belief that it is essential to examine its changing structure in spatial terms (see below, spatial inequality).

Given that the initial condition is one of poverty or disadvantage one seeks for a concept that embodies a positive change in that state, and on the basis of the lowest common denominator. The most appropriate concepts seem to be those of <u>well-being and</u>

equity. These terms begin to give some meaning to the term 'level of living'. Well-being may be defined as a situation in which a certain basic level of material, socio-cultural, psychological and other needs of a society are met. Equity is the appropriate distribution of well-being among members of society and has strong spatial connotations. There are divergent views as to what constitutes equity and the means to its achievement, with 'equal opportunity' the most widely accepted, in principle (Economic Council of Canada, 1977) If one agrees that well-being, at some level, represents an escape from poverty and, therefore, at least a beginning to development in an overall sense, then the key question is to define well-being in concrete terms

According to various writers (Runciman, 1966, Rawls, 1969, Harvey, 1972; Economic Council of Canada, 1977), there is a need to focus upon and break down into its components, the concept of well-being, and in particular to make precise the meaning of social well-being. Some (Bauer; 1966, Springer, 1970) have continued to argue that while well-being can be defined in economic terms, especially using income variables, no similar approach can be applied to the social system. However, approaching the problem pragmatically, it has been pointed out there is a measure of consensus of the major concerns of a social nature Discussion on this point has centred on another concept, that seems to represent a more specific version of well-being, namely Social Justice

As articulated by Runciman (1966) and Harvey (1970), social justice can be placed within a framework of three general ordered characheristics, namely, Need, Contribution to Common Good, and Merit Of the three, Need is the most basic and serves to provide a concrete basis for a set of individual and composite measures against which to assess both the base level of disadvantage (poverty) and the degree of well-being achieved. Need refers to the concept that all individuals have right to equal benefits (i.e. income), which means that an equal allocation can take place to balance needs. All individuals have equal claims on benefits, irrespective of their contribution. Need is a relative concept. Needs are not constant, for they are categories of human consciousness and, as human society is transformed, so the consciousness of need is transformed. Needs however, can be defined, with respect to a number of different categories of activity, and these categories remain fairly constant over time. One list might mention nine of them: food; housing; medical care; education; social and environmental services; consumer goods; recreational opportunities; neighbourhood amenities; transport facilities (Runciman, 1966; Harvey, 1972; Peet, 1972).

Given these categories, one can begin to define minimum levels of availability which may be equated with need; a minimum which may vary according to social norms accepted at a given time, but which may be acceptable to establish measurable criteria.

The other concepts associated with social justice, i.e. contribution to common good and merit, refer to claims for benefits by the majority people (i.e. rural mass), and those whose labour is most meritorious (arduous or unpleasant such as agriculture), respectively. While benefits may be allocated on these principles in operational terms, both as an encouragement and as a reward, at the aggregate level of long term national development, need and its specific categories offer the requisite starting point. The categories of need offer a concrete basis for establishing economic and social criteria which reflect the range of elements contributing to 'levels of living', 'quality of life', etc.. This application of the specifics of Need, as the key to the realization of social justice, allows 'level of living' to emerge as the set of factual circumstances that define change along a continuum that runs from poverty to well-being (Ghai, 1977) The level of living of persons resident within a given geographical area is determined by the overall composition of the degree to which the need for food, housing, health, education, employment, social status, affluence, leisure, social security and stability are met, by the aggregate population of that unit area.

There remain two aspects to discuss,, one, the operationalization of the criteria of need in terms of specific variables, measurable on a uniform basis over time and space in the Third World context, is left to the chapter on the methods of data collection and analysis (Chapter 4); the other, the need to be explicit as to spatial inequality as a dimension of disadvantage and at least interim development, is discussed below

4. **Spatial Inequality and Underdevelopment**

In almost every country, factors of production and resource endowments are not evenly distributed in space, this is nature's dispensation. However, through the application of science and technology, man can considerably enhance their marginal utility by creating efficient patterns of production, management, and use Thus, inequality imposed by nature which is a static and fundamental inequality in space, may also be called geographic inequality. Such inequalities give rise to certain basic differences in social and economic opportunities among different regions of the country (Sundaram, 1983).

Upon this fundamental pattern of geographical inequalities, man's development efforts inscribe other patterns of inequality, caused by differential interventions in space. Such types are caused by differences in growth rates of the indigenous supplies of factors of production, mainly labour and capital. This is called developmental inequality which is dynamic in nature (Friedmann, 1956; 1959; 1966; Darwent, 1969).

Apart from geographic and developmental inequalities, there are also the so called socio-economic inequalities characterizing the human resource endowment. These stem from class, group, religious, ethnic, cultural, and income differences among human beings, and differences in opportunity structures and access to development benefits. The latter inequalities are particularly sharp in LDCs. It must be noted that whereas geographical inequalities are present in a horizontal direction, developmental as well as socio-economic inequalities are present in both vertical and horizontal directions. Geographical inequalities, compounded by developmental and other socio-economic inequalities impinge on space and manifest themselves in varying degrees and complex patterns of concentration and dispersal over time (Williamson, 1965; Money, 1978; Sundaram, 1983).

This complex spatial configuration of inequality and a mixture of both static and dynamic elements is what we have meant by the term spatial inequality. Thus within the rubric of spatial inequality all different kinds of inequality are contained. It is therefore a comprehensive term. In real life situations, it is difficult to isolate them because they are closely intertwined, and operate together as mutually reinforcing variables. We find that the element of the one is usually reflected in others.

It must be noted that many of the causes; consequences and manifestations of inequality are dominantly structural ((Frank, 1966, Laclau, 1971; Amin, 1972; Foster-Carter, 1974). Thus by spatial inequality is meant the study of uneven development in space from a dynamic (historic) perspective, which is characterized by a certain pattern of association of different variables in an area, contributing to a syndrome of differentiation in both individual and composite variable terms Such association may be causal, or incidental, or both. It is this broader definition of spatial inequality that has been adopted in this study

The existence of critical economic inequalities between the developed countries (DCs) and the less developed countries (LDCs) of the world has long been recognized (Ginsburg, 1961, Williamson, 1965, Adelman and Morris, 1974, Chenery, 1974; Wallerstein, 1975, World Bank, 1975d; 1980; Gilbert and Goodman, 1976, Rothstein, 1977, Fishlow, 1978) The existance of immense disparities of power and wealth among nations and the persistence of acute human deprivation within countries are generating powerful demands for change, and have become the two fundamental issues of "North-South" relations (Wriggins and Karlsson, 1978). Certain countries i e members of European Economic Community, the United States, Canada, Australia, New Zealand and Japan are better served with respect to some key variables (i.e. per capita income/GNP, birth, death and infant mortality rates, literacy, employment, per capita energy consumption and so on) compared to their Asian, African and Latin American counterparts. While individual variables illustrate discrepancies on a global scale, nevertheless, their existance may also be rationalized in aggregate terms as is inherent in such terms as 'less developed', 'Third World' etc.

Concern with lagging economic regions and spatial inequality is more general and profound in LDCs where the problem is fundamental to the process of development. Although, LDCs include almost all the countries of Asia, Africa and Latin America, there are significant differences between the continents with respect to 'quality of life'. Generally speaking, Latin American countries are more affluent than their Asian and African counterparts but the distribution of wealth is extremely skewed. On the other hand, most Asian nations are suffering from population pressure on limited agricultural land, while Africa's natural resources potential is generally underutilized due to lack of proper technology. In each case the result is spatial inequality (Money, 1978).

Relative disadvantage/ spatial inequality also exists within LDCs on a spatial basis. Some areas are viable. others are not: some areas are stagnant and others are declining from the stand point of certain indices (compared to national average). The spatial economic stress together with technological changes give rise to a variety of deep rooted problems with social and political implications.

Therefore, the problem of spatial inequality is both a universal and a unique one. It is universal in the sense that it is met within both the developed and the LDCs of the world at varying degrees and magnitudes and can not be viewed separately from the international economic system. It is unique in the sense that each case of underdevelopment operates within a specific national social policy context for planning and development purposes. Even within a single country there may be different types of backwardness calling for unique and and specific treatment. These spatial inequalities are compounded by several heterogeneous factors (i.e., physical differences, resource endowment, cultural diversity, ethnic composition, rural-urban dichotomy, shifts of population from agriculture to industry and so on) any one of which may account for a marked spatial variation. The macro-growth policies usually ignore the uniqueness of particular areas and have failed to capture all their problems (Adelman and Morris, 1974, Chenery and Ahluwalia, 1974)).

The overriding point remains, however, that spatial variation is inherent in development needs, and that its depiction and explanation are fundamental aspects of the understanding of the state of development and of the planning process in relation to it. It follows, that an important part of the evaluation of any state of, or stage in, development requires an understanding of the manner in which broad approaches to regional development theory have been formulated and applied. Consequently, the remainder of the chapter is devoted to a review of some theories and applications of regional development of relevance in the case of Bangladesh.

Regional Development Theory and Application

As has been noted in the first part of this chapter, there have been a number of paradigms formulated as to the appropriate nature of development in an international context, with a major shift in orientation identified between a dominantly economic objective and a Residual Social Policy, and the more comprehensive and socially oriented Unified Approach. The Unified Approach has formed the basis for the choice of the appropriate approach to defining and measuring development used in this study, because the conceptualization of development in the Unified Approach, and especially in the concept of social justice is the most basic and universal.

However, while the empirical investigation which follows, based on the concept of social justice and its variable characteristics, will, hopefully, provide an objective and comprehensive measure of development over time and space, the interpretation of the spatial patterns and temporal changes must be relateable to the nature and results of actual development policies that have been variously applied to Bangladesh. A more detailed chonology of development plans is presented in Chapter 3, as part of the background to the empirical case study, but it is necessary here, as part of the review of conceptual frameworks influencing development in Bangladesh, to review in general the models that have been applied to the country.

1. The Case for Regional Development Planning

The logic of a need for regional development planning is simple and obvious, and was well expressed during the period when the residual social policy model of development was in vouge:

> Where economic development occurs unequally across the nation's territory, regional differences in the level of welfare are likely to become urgent political issues with social and economic implications (Friedmann and Alonso, 1964, p. 2).

The paradox of the statement, however, lies in the fact that one of the primary strategies employed in economic development was that of regionally differentiated inputs, with the goal of stimulating growth at specific points.

Friedmann and Alonso (1964) responded to this factor by noting that although economic development tends to be spatially focused, with decisions as to the allocation of scarce resources and investment, this process itself needs to be explicitly recognized in conjunction with other inherent (physical and cultural) regionalizing characteristics, and that the regional impact, insofar as it creates greater inequalities (at least in the short run), must be explicitly dealt with by the strategy and by the specific planning based upon that strategy. Consequently, many economic models spent considerable time, and engendered the greatest contention between them, on the matter of whether the approach in question would lead to development not only in the targeted areas, but in the total set of regions. There was general agreement that it should, in order not to exacerbate existing inequalities and provoke political problems, but considerable disagreement as to the mechanics and the time-frame of the regionalization of economic development.

This disagreement, inevitably, affected the actual nature and objectives of specific development plans. In a general sense, both the theorists and those formulating and implementing development plans, saw both the overall magnitude of the problem and its needs. It was explicitly recognized that the needs of development included both the material and non-material aspects of life, of economic and social advances, and ideally, advances in both the rural-agricultural and urban-industrial sectors (Seers, 1969; 1972; Todaro; 1982). But, most of those involved have rejected the possibilities for advances to be made simultaneously on all fronts, and have specified selected sectors as offering the best chance to capitalize on limited inputs. It has already been noted that in the first instance, a strong economic rather than a social orientation dominated the thinking. This led, in terms of actual development strategies, to emphasis on the development of economic growth, and, particularly, at first, to a concentration on the urban-industrial sector (Meier and Baldwin, 1957; Higgins, 1959; Kuznets, 1959b; Kindleberger, 1964; Pred 1965; 1966; Leontief, 1971; Lipton, 1977). A major effect of the shift in paradigm to the Unified Approach (influenced by problems with urban-industrial development) was a shift in emphasis to the rural-agricultural sector, and to greater social development (Drewnoswski, 1970; 1974; United Nations, 1971b; Dumont, 1973a; Chenery and Ahluwalia, 1974; World Bank, 1975d; Drudy, 1976; Gilbert and Goodman, 1976; Ghai, 1977; Griffin and Khan, 1978; Chambers, 1981; Hardiman and Midgley, 1982). It is important to note, however, that although the paradigm stressed a more social view point, and introduced the concept of development based on social justice, actual development planning continued to have a strong economic orientation. On the other hand, the shift from urban-industrial to rural-agricultural has the natural tendency to reduce the capacity for regional variation because of the widespread distribution of agricultural versus the localization of industry.

In examining the primary models that have underlain development planning and that have had both regional objectives and regional results, one can identify a series of economic models, beginning with those based on Hirschmann's (1958) growth and take-off model and shifting to variants of the so-called growth-pole model (Perroux, 1955; Ullman, 1958; Hicks, 1959; Paauw, 1961; Hagen, 1962; Pred, 1965; 1966; Boudeville, 1966; Brown, 1968; Hodge, 1968; Hermansen, 1971; 1972; Lasuen, 1972; Mishra, 1974; Mera, 1976; Hansen, 1982). Both were criticized for failing to achieve their goals of economic growth, and attention swung to answering the problems of cumulative causation which observors saw as inherent in the growth oriented models (Myrdal, 1956; 1957; 1972; Bachmura, 1959; Borts, 1960; Chenery, 1961; Chenery and Ahluwalia, 1974; Williamson, 1965; Mishan, 1967; Adelman and Morris, 1971, Ahluwalia, 1976; Sundaram, 1983). In some ways the cumulative causation theory was more critical than constructive, but eventually it played a role in both the alteration of the development into the more widely diffused agricultural sector. As a result, public investment in non-economic or welfare-economic objectives increased, in line with attempts to carry at least some aspects of development to all the people and the idea that indigenous development would have to address the majority rural-agricultural condition.

2. Emergence of the Economic Models of Development

The existance of variation in level of development, both locally and at national levels stimulated thinking about so-called development processes. Schumpeter (1943) linked development to innovation, and stimulated others to reflect how innovations can spread in economic and geographic space (Hagerstrand, 1953; Perroux, 1955; Hirschman, 1958; Boudville, 1966; Brown, 1968).

One of the significant models which developed from the work of Innis and other Canadian and later American economic historians, was the so-called staple theory (economic base). The theory was offered as the explanation for economic (and social) development based on the exploitation of a sequence of specific natural resources each of which stimulated both forward and backward economic linkages and created spread effects; eventually leading to the transformation of the staple into the more diversified and industrial economy (Innis, 1930, Lower, 1933, North, 1955, Perloff and Wingo, 1961; Watkins, 1963). This concept found a place in development theory under the rubric Export Base Theory, and was developed in the treatise, Regions, Resources and Economic Growth, by Perloff (1960).

In the development context, export base theory provided a concrete framework for the more theoretical ideas of Rostow's concept of the need to stimulate the conditions necessary for 'take-off' into sustained economic growth (Rostow, 1955; North, 1958; 1959; Drummond, 1961; Ohlin, 1961), and for Hirschmann who sought to focus in on 'leading sectors of the economy' which could provide the leading edge for development (Hirschmann, 1958).

In a general sense, export base theory, argues that every region has a comparative advantage in the production of some commodity which could be developed as its 'export'. The export item will stimulate trade between the source and other regions which, if successful, will result in a degree of specialization in the export region, leading to economics of scale of production and higher productivity. Increased income from the export commodity brings higher income, saving, investment and the process of development is set in motion either through the regional income multiplier effeets or through the cumulative causation effects, or both (Hilhorst, 1967).

One problem with the export base approach is that it requires a major natural resource that can be developed in terms of comparative advantage. In many cases, and Bangladesh is one, an appropriate resource was not forthcoming. In Bangladesh the only natural advantage was perhaps that which accrued to production of jute, utilizing favourable physical conditions and cheap labour. However, this resource, developed under colonial circumstances, had led to exploitation rather than development, with the industry at the mercy of foreign markets, including their depressed prices and competitive substitutes. The jute industry, while significant, was a low wage sector and it could even be argued that jute production is a questionable use of the agricultural resource base because of the shrinking world market with an increasing production and use of synthetic materials.

A more attractive theory for LDCs which also produced a major strategic approach to regional development was that based on Growth Poles or Centres. Formulation of the theory is generally credited to the French economist Perroux (1955), who developed a rather abstract construct of inter-actions among industrial sectors, in which he emphasized that growth is highly localized at particular points or poles from which it was transmitted at various intensities and through various channels. His concept was economic space dominated by propulsive industries (polarized structure) from which centrifugal forces emanate and to which centripital forces are attracted (Perroux, 1955; Chorley and Hagget, 1967; Glasson, 1974).

The spatial development implications and potential applications of Perroux's theory were expounded by Boudeville (1966). He suggested that a complex of activities agglomerated around a propulsive centre was a pole of development, and that, consequently, spatial planning was an exercise in urban growth strategy. The ideal was that if a development pole could be established, consisting of a set of expanding industries located in an urban area and inducing further development of economic activity through its zone of influence. The strategy focussed on the establishment of a new dynamic sectoral clusters and upon industrial growth as the key to more general regional development (Hirschman, 1958; 1962; Ullman, 1958; Hicks, 1961).

This concept satisfied a number of criteria and concepts of the time; it emphasized economic growth based on industrialization; it was localized but justified; thus meshing with the sectoral ideas of Hirschmann; and it promised a rapid growth to 'take-off' as formulated by Rostow. In addition, it provided a rationale for specific allocation of scarce domestic and external capital investment, and in the process, left the agricultural sector and social change as a secondary consideration, throughly in the style of the residual social policy model. It might also be noted that the emphasis on industrial growth matched the prevailing models of the primary capital investors and aid givers of the day both capitalist and socialist.

A particular elaboration of the growth pole theory made it even more attractive. According to Hirschmann (1958) growth is communicated from the leading sectors of the economy to others. Hirschmann saw growth as an essentially unbalanced process through a 'chain of disequilibria'; the expansion of one industry creating external economics for another, and inter-industry linkages both backward and forward leading to the establishment of a growing point. In course of time, as 'polarization' effects become less favourable, 'trickle down' or 'spread' effect will start as a mechanism for developing backward areas or those that have lagged so far in the process. Thus, in the long run, regional differences will tend to disappear. Hirschman's theory, allied to those of Boudeville, provided a captivating combination. There was justification for the unbalanced investment, the dynamics of growth pole, and the mitigating mechanism of the 'trickle down' effect which would iron out imblances in the long term (Hirschman, 1958; 1962; Hermansen, 1971; 1972; Lasuen, 1972; Glasson, 1974; ; Hansen, 1982; Sundaram, 1983).

Variants of growth pole theory became the widespread basis of development in both lagging regions of developed countries such as U.S.A. and Canada.(North, 1958; Friedman, 1959; 1964; 1972; Ohlin, 1961; Pred, 1965; 1966; Berry, 1969; 1970) and as the basis for national development strategies in the developing world in the 1960s (Mishra et al., 1974; Mera, 1976). In the later context, although these approaches were characterized as internally focused, as opposed to the externally oriented export base approaches, they were the primary vehicle for development and investment formulated and funded by bilateral and multinational aid, albeit with the aquiescence of national development planners.

In a situation like Bangladesh, in which the main indigenous resource is the agricultural labour force and the perceived need is to reduce dependence upon the agricultural sector, the growth pole-industrial model was an attractive one as a means to re-direct labour and relative pressure. As will be noted (Chapter 3) it underlay policy during much of the period until the First Five Year Plan (i.e., until 1973).

Both export base theory and growth pole approaches to economic development constitute equalization models, i.e. they postulate a long-term spread effect which will eventually affect all sectors and regions of the country. Critics, however, have pointed out that the models neither address existing and persistent spatial variations and regional inequality, nor is equalization necessarily the result (Myrdal, 1957; Bachmura, 1959; Borts, 1960; Chisholm, 1962; Schuh and Leeds, 1963; Baer, 1964; Williamson, 1965; Chorley and Haggett, 1967; Haq, 1973; 1976a; 1976b; 1976c; Adelman and Morris, 1974; Chenery and Ahluwalia, 1974; Gilbert and Goodman, 1976; Haq, 1977; Hunter, 1978; Stepanek, 1979; Clifford and Nicholson, 1981; Lea and Chaudhri, 1983; Sundaram, 1983). Myrdal, in particular, although seeking an economic development model, drew attention to what he saw as the greater likelihood of greater regional differentiation. As a corrolary to growth pole strategies, he suggested that a particular industrial complex, may initiate a process of divergence between the region of investment and other regions (Myrdal, 1957).

His model of this, termed Cumulative Causation, suggested that the free play of market forces, especially in a developing economy, with the limited foci of growth poles, would act to exacerbate the inequality created by the establishment of the growth centre, Increments of growth and activity would tend to be concentrated in the growth region. Myrdal claims that rather than a 'spread' or 'trickle down' effect, there would be a 'backwash', whereby the pole would attract capital and labour from other regions on the basis of the higher returns obtainable. Other regions would lose their skilled and enterprising workers and locally generated capital. At the same time, goods and services originating in the growth region would flood the markets of the remaining regions, damaging what little local secondary and tertiary activity may have developed there. Myrdal based his warning on perceived results of growth pole establishment in limited Third World economics lacking infrastructure, and the ability of government to provide it (Myrdal, 1956; 1957; 1972; Chorley and Haggett, 1967; Sundaram, 1983).

The circular inter-locking of negative forces ~~and Myrdal's~~ process of Cumulative Causation in the context of developing economics is comprehended by Todaro (1982). He proposed a framework of underdevelopment (Figure 2.1) which represents a schematic attempt to portray and summarise the main economic and non-economic aspects of what is meant by underdevelopment i.e. low levels of income (1), low self-esteem (2) and limited freedom (3). In Figure 2.1 these three components with arrows indicate general line of

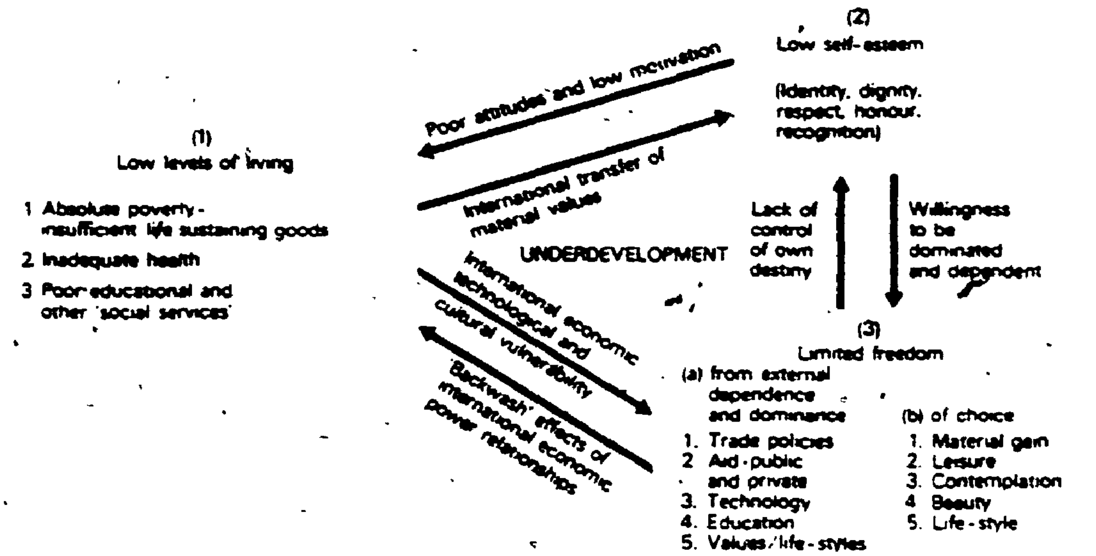

Figure 2.1 Underdevelopment: A Multidimensional Schematic Summary
Source: Todaro, 1982.

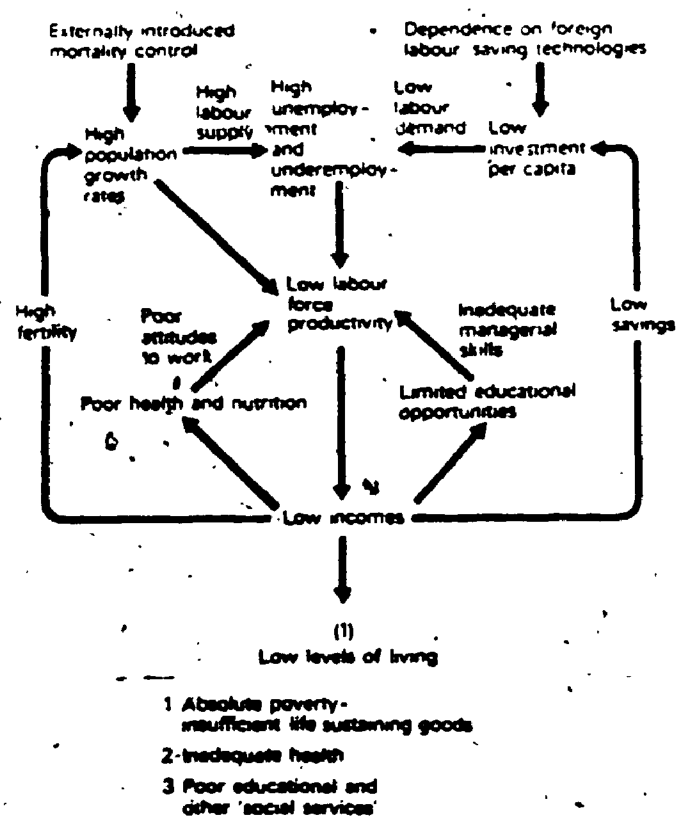

Figure 2.2 Myrdal's Process of Cumulative Causation- A Simple Illustration of the Ramifications in LDCs.
Source: Todaro, 1982.

causation. The left side of the diagram is related to the determinants of levels of living (1) and portrays the principal economic aspects of underdevelopment while the two others (2 & 3) are non-economic aspects.

The line of circular and cumulative causation in the principal economic aspects (1) of underdevelopment is illustrated in Figure 2.2. First, we see that low levels of living (insufficient self-sustaining goods, poor health, education etc.) are all related in one form or another to low incomes. These low incomes result from the low average productivity of the entire labour force, which, in turn, is a supply side factor of poor health, nutrition and work attitudes, high population growth rate, high unemployment and underemployment. On the demand side, poor education characterized by inadequate skills, poor managerial talents and lower educational attainments by workers along with the importation from developed countries of labour saving technologies of production, result in the substitution of capital for labour in domestic production. The combination of low labour demand and large supplies, therefore, results in the widespread underutilization of labour. Moreover, low incomes lead to low savings and investment, thus also restricting the total number of employment opportunities.

Note that the arrows in the upper left side of Figure 2.1 (the productivity-income relationship) form a series of continuous loops indicating that a process of circular causation or 'vicious circles' of poverty is in operation. The important point to remember is that low productivity, low incomes and low levels of living are mutually reinforcing phenomena. They constitute what Myrdal has called a process of 'circular cumulative causation' in which low incomes lead to low levels of living (income plus poor health, education, etc.) which keeps productivity low, which, in turn perpetuates low incomes, and so on.

In contrast, however, Myrdal suggested that 'cumulative causation' could be a positive process, if a broadly based set of relationships could be established, for example improvements in food supply, health care, education and employment. The most obvious basis for such an approach was development of the agricultural sector. However, for quite a time this sector proved less amenable to development; technological transfers of machinery were ineffective, and it proved difficult to persuade governments and agencies to shift from what seemed 'modern' and 'presteigious' development to gradual transformation of the traditional sector.

Nevertheless, over time, emphasis did shift to rural development. A major factor was undoubtedly the success of the introduction of the elements of the 'Green Revolution' which, despite unequal benefits, indicated that agricultural inputs could have spectacular results and could generate both food and capital (Brown, 1966). The inputs of science and technology stimulated a closer look at overall rural-agricultural needs and highlighted the severe problems of increasing rural poverty and landlessness (Asian Development Bank, 1977). The acuteness of the situation, in which the most obvious needs were of the most basic type and where the condition was virtually untouched by localized and or industrial development, led, finally to greater emphasis on development stressing the needs of social justice, and the so-called Unified Approach (United Nations, 1971b; Ward, 1973;

USAID, 1974; World Bank, 1975d; Hardiman and Midgley, 1982). This shift and its effect on national policy is well illustrated in the attempts to achieve development made by Bangladesh government, especially in the period after 1972 and which are detailed in the next chapter.

3. **Resultant Models of Rural Development**

The prescriptive models reviewed above suggest a gradual shift from industrial to agriculturally oriented economic growth (Friedmann and Douglass, 1978), and from economic development to social development (United Nations, 1969; 1971b; Weitz, 1971; Weiss, 1983). Whereas the shifts also suggest a more general spatial application, it is unlikely that application will ever be achieved on a uniform basis. This suggests that, inevitably, any model of the resultants of development will postulate a degree of spatial inequality, although reduction in the level of inequality may be seen as a sign of progress. In this last section, attention is drawn to the most pervasive and seemingly appropriate spatial resultant model of development; the 'core-periphery' model. This model is both a general assessment of the manner in which development creates a regional dichotomy, and has been discussed and investigated to the degree that the significance in change to the core-periphery situation can be identified as indicators of the direction of change in overall development (Prebisch, 1950; 1959; Schultz, 1950; 1957; Friedmann, 1966).

The 'core-periphery' model has both general and specific characteristics. Core-periphery relationships, i.e. a relatively small and concentrated area which possesses the highest levels of economic activity, wealth [illegible]come, and which can both draw from and wield power over outlying or peripheral areas, have been identified widely over time and space (Prebisch, 1950; United Nations, 1955; Friedmann, 1956; 1959; 1961; 1966; Meier and Baldwin, 1957; Schultz, 1957; North, 1959; Perloff and Wingo, 1961; Friedmann and Alonso, 1964; Darwent, 1969; Abdullah, 1979). Cores have arisen from the combination of advantageous circumstances, including location, resource availability and key inventions, and have been catalytic areas for national and international development. The relatively small area of Western Europe stretching from southern England to Ruhr, was the core area of the Industrial Revolution (United Nations, 1955) and still maintains a position such that a peripheral region embracing the rest of Europe can be identified in relation to it, such that incomes and levels of economic development decline with distance from the core (United Nations, 1955; Friedmann, 1966). Similarly in North America, an expanding but still localized core in the Northeastern U.S.A. has dominated a periphery of continental proportions (Perloff and Wingo, 1961). On an ever broader scale, Meier and Baldwin (1957) suggest that the axis between Western Europe and the Northeast U.S. represents a global core to which all other economics are peripheral. This position was consolidated in a period of colonial development but has persisted in the post-colonial era. Bangladesh held an extreme peripheral situation in colonial times and the relationship persists (see Chapter 3).

The core-periphery situation has been extremely significant and dynamic in economic terms. In general terms it is held to reflect the fact that [illegible]man activities, especially those of an industrial, tertiary and quarternary nature have centralizing tendencies. Functions concentrated in the core both strengthen its location and have the capacity to dominate activity on the periphery, including perpetuation of the tributary role of the latter. Once consolodated, this economic power is difficult to diseminate. Core-periphery relationships tend to exist at the national (and even sub-national) levels, even where overall development may be at a relatively low level. This universal characteristic provokes discussion as to the benefits and costs of the situation and as to the significance of shifts in the relative strengths of the two components.

As many observers have noted, the core's strength is often at the expense of the periphery (Frank, 1966; Friedmann, 1966; Furdato, 1970; Cardoso, 1971; Amin, 1974; 1976; DosSantos, 1976) occasioned by the 'siphoning -off' effect that draws capital, resources, and other activity to the core and 'drains' the peripheral zone or maintains it in a tribuary role (e.g. the classic metropolitan- colonial relationship), Concentration of economic power can be matched by the political and administrative functions, of revenue and investment, including that in services, which may further widen the levels of relative advantage and disadvantge. Based on these propensities, it is generally felt that a lasting core-periphery relationship is harmful to a country; it leads to extreme inequalities in welfare among regions; it encourages underutilization of natural and human resources, inefficient industrial location and restriction of the delopment of national consumer market (Friedmann, 1966).

On the other hand, and to some extent illustrated by the attraction of the growth pole model, the core can function as a dynamic focus, atttracting innovations and capital from outside, as well as within a country or region, and providing the hearth of diffusion. The core can, as the site of government and decision making in general, be the generation point from which economic development can be promoted (Clark, 1957; North, 1958; Pred, 1965; 1966).

However, in purely economic terms, there will probably be a tendency for concentration to occur. One weakening effect may be the establishment of multiple growth poles, competing, as it were, for territory and therefore spreading the impact of investment. On the other hand, it may be argued that if one views the relative strength of the core (s) and periphery/ peripheral zones vis-a-vis the prescriptive models being applied, then changes in the relationship may chart the path of different types of development. Specifically, it might be expected that, under approaches based on predominantly economic models (e.g. export base, growth pole) the effectiveness of the approaches, at least in the short term, would be reflected in a strengthening of the position of the core relative to the periphery. The relationship would be most likely in terms of measures of economic growth but would possibly reflect also in social conditions in line with the underlying residual social policy model.

On the other hand, a shift away from urban industrial economic orientation to economic growth based on the agricultural sector, which typically occupies the periphery, coupled with approaches that stress social inputs (e.g. provision of education, health facilities etc.) stemming largely from public sector and deliberately stimulating diffusion, may be expected to result in reduction of core-periphery differences. In the latter case, one might postulate that a relative weakening of the relationship, and or a wide spread diffusion of characteristics previously centred on the core, would signify some level of development was being achieved.

Having reviewed some development models that, it is felt, have relevance for the conditions under which Bangladesh operated during the study period (1960-1980), we turn now, in Chapter 3 to a description of the country itself, its geography, its core-peripheral relationships and a review of the policies which sought to effect development.

CHAPTER 3

Bangladesh: Historical & Applied Dimensions of Development

The Anatomy of the Problem: An Introduction

Bangladesh is a country of large population, great poverty and very limited natural resources, and, as such, is one of the poorest countries in the world in terms of per capita income (World Bank Annual Report, 1987). From its inception as the eastern wing of Pakistan in 1947, Bangladesh inherited a poor, undiversified economy, characterized by an underdeveloped infrastructure, stagnant agriculture and a rapidly growing population (Johnson, 1982). The gravity of population pressure on limited agricultural land is evident from the fact that the population density is over 1700 per square mile, one of the highest rates in the world for a country of comparable size and dominantly rural economy (Islam, 1978).

Rural poverty and inequality are not only the product of unequal land holdings but have also worsened through the falling trend of average real wages in agriculture which were 50 per cent lower in 1975 compared with 1963 (Islam 1978); increases in money wages were more than offset by a dramatic rise in the cost of living, dominated by the price of rice. Whereas the proportion of those engaged in agriculture has fallen, absolute numbers have increased, with employment in agricultural activities lagging behind the increase in agricultural labour force. According to Esman (1973) 28 per cent of the rural labour force is landless and as much as 89 per cent landless and near landless. About 30 per cent of the rural labour force suffers from unemployment (Alamgir, 1975a; Islam, 1977; 1978).

The problem of rural development in Bangladesh, however, is not simply one of increasing agricultural production. About 30 per cent of rural households are landless, and another 30 per cent own less than 1 acre of land. Such families are unlikely to benefit as much as landed households from a production oriented strategy. Moreover, as a result of both demographic pressures and of marginal farmers having to sell out to larger, more affluent farmers, the number of landless households is growing faster than the general population growth rate. At present, underemployment among the landless and marginal farmers is estimated to be 30-40 per cent, but unless rural development strategies are designed to create rural employment opportunities for the growing number of rural poor, this figure will increase dramatically. Bangladesh, therefore, must try to combine the two major development objectives- growth and equity (Alamgir, 1974; 1975a; 1975b; 1976; 1978; 1980; Islam, 1978; Faaland and Parkinson, 1976; Asian Development Bank, 1977; ILO, 1977; Stepanek, 1979).

Over the past three decades population has grown at 2.6 per cent annually but food grain production has increased by little more then 2.2 per cent. Thus, the benefits of agricultural growth are absorbed by the excessive population and have resulted in a foodgrain deficit of more than 15 per cent of consumption requirements over the decade 1970-80 that had to be met with imports. As a result, overall economic development of the country which is critically dependent on increasing agricultural production has lagged (Jones, 1979; World Bank, 1979).

Moreover, rice yields in Bangladesh are still among the lowest in the world. Only 18 per cent of the arable land is irrigated, and about 21 per cent of the area under foodgrains is devoted to high yielding varieties (HYVs). Fertilizer use per acre is among the lowest in south and south-east Asia. Farms are small, sub-divided and fragmented. Cultivators, who produce foodgrains mainly for consumption, are poor and lack the resources to invest in improved production technology. Further, environmental hazards, particularly floods and cyclones, but including also droughts and saline intrusions from the Bay of Bengal, frequently disrupt agricultural production (World Bank, 1972, 1979; Hossain, 1977; Jones, 1979; Alamgir, 1980).

In the context of very low per capita income, the prevailing inequality of distribution of income and wealth implies that those at the lower end of the income scale are absolutely much worse off than they would have been if the average income was higher. In this context, the need to relieve poverty assumes great urgency, because for the poor it is a constant struggle for physical survival in the face of starvation and death. Therefore, in view of the current predominance of the rural sector in Bangladesh and the possible future rates of growth including rural industrialization, rural development holds the key to the future economic progress in Bangladesh (Islam, 1977; 1978; Alamgir, 1980; Hossain and Jones, 1983).

However, despite the severity of the range of physical, economic and demographic problems, and the difficulty of achieving development in terms of economic indicators, there has been considerable effort made in the provision of social services which justifies the orientation of this study and the expectation of broader levels of socio-economic development having been achieved.

This chapter reviews the historical antecedents and gross national characteristics of Bangladesh in the context of this study. The physical geography of the country, salient economic features, dimensions of rural poverty and statistics at the national level are introduced. Secondly, the legacy of history since the creation of Pakistan (1947) is enlarged upon and issues are highlighted, with specific examples of regional disparity between East and West Pakistan, in order to grasp the historic roots of present underdevelopment. Finally, different development approaches and political responses applied to Bangladesh are reviewed, to support the general hypothesis and, thereby, to confirm the logical base of the study.

Geography of Bangladesh: A Case Study

Area, Size and Location

Bangladesh is an Asian Country in the humid tropics. It is situated in the north-eastern part of the South Asian sub-continent, between latitudes 20.30' N and 26.45' N, and between longitudes 88.0' E and 92.56' E. With a population of about 90 million (1981), the land area comprises 55,598 sq. miles and in overall size is comparable with the U.S. states of Illinois, or Iowa and slightly larger than Canada's Maritime provinces (Ahmad, 1976; Rashid, 1977; Johnson, 1982).

Administrative and Planning Units

Bangladesh comprises the four broad Administrative Divisions of Dhaka (Central), Chittagong (Eastern), Rajshahi (Northern) and Khulna (Southern), corresponding somewhat to the major physiographic divisions of the country, especially those created by the three dominant river systems i.e. the Padma (Ganges), the Jamuna (Brahmaputra) and the Meghna (Figure 3.1a). After the creation of West Pakistan and prior to the independence of Bangladesh in 1971 there were 17 districts (Figure 3.1b). Immediately after the independence (1971-1978), two new Districts were created for administrative convenience by breaking down Barisal and Mymensingh for a total of 19 (Figure 3.1a). Each District had a number of Sub-Divisions, 64 in all in the 19 Districts (Figure-3.1b). However, in 1979 those 64 Sub-Divisions were incorporated into District status. At present there are 71 such Districts in Bangladesh with the additional 7 Districts created for statistical purpose only (Figure 3 1c). These 71 Districts form the observational basis for statistical analysis in the study (see Chapter 4, Figure 4.1). It may be noted that the 71 Districts consist of a number of 416 Thanas (presently Upazillas) which are police stations or revenue and administrative units at the intermediate level between District and local Village Union. There are 416 Upazillas and 4355 Village Unions (representing 65,000 villages) at the level of local government in Bangladesh (Figure 3.1b). It is now important to highlight the four Administrative Divisions of Bangladesh as a framework of geographic reference which is especially relevent to this study (Ahmad, 1976; GOB, 1980; Paul, 1981).

<u>The Central (Dhaka) Administrative Division:</u> comprises the districts between the Jamuna and the Meghna river system. The region extends from the district of Jamalpur (JAM) in the north-west to Munshiganj (MU) in the south and from Tangail

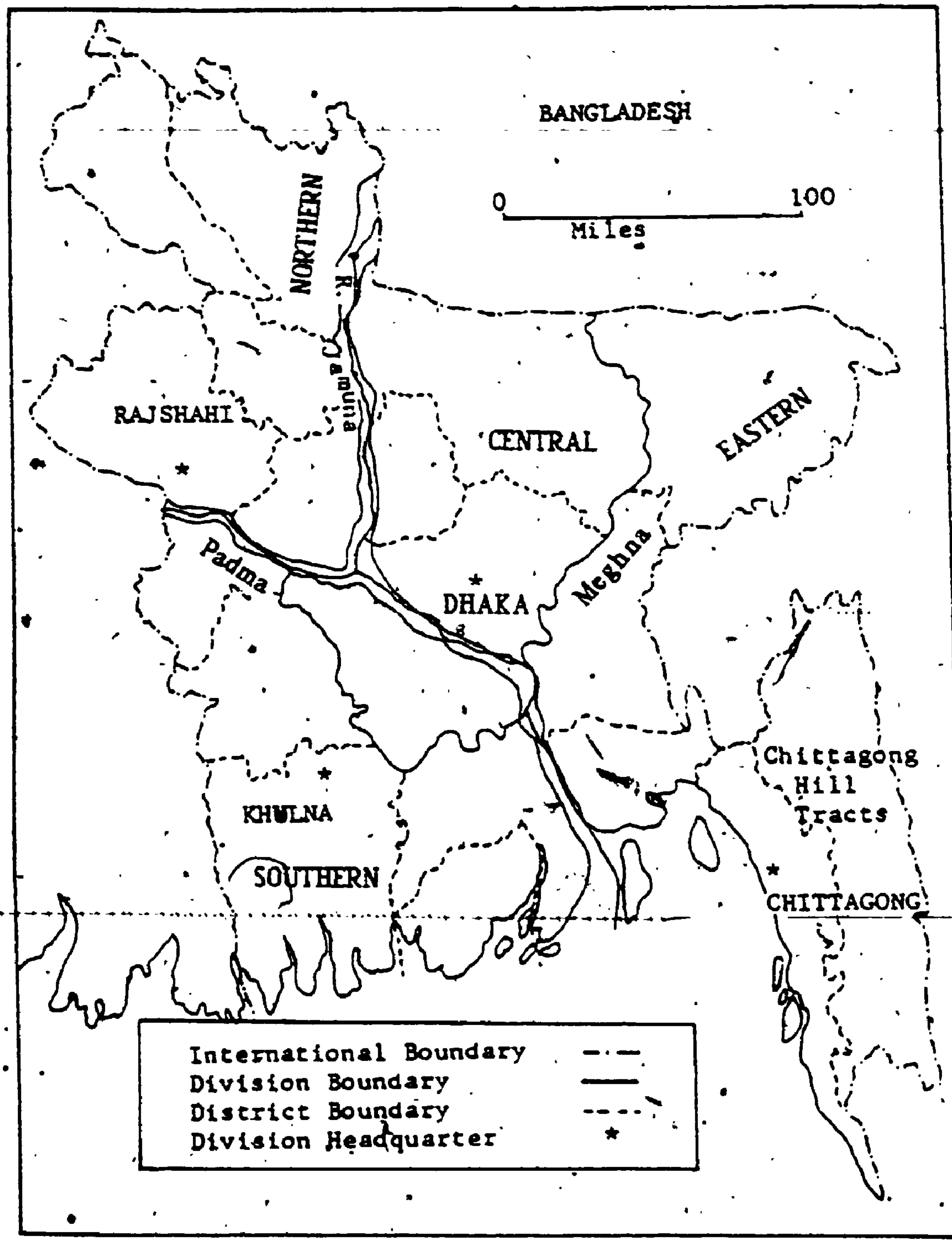

Figure 3.1a. Administrative Divisions of Bangladesh (1978)
Source: Paul, 1981.

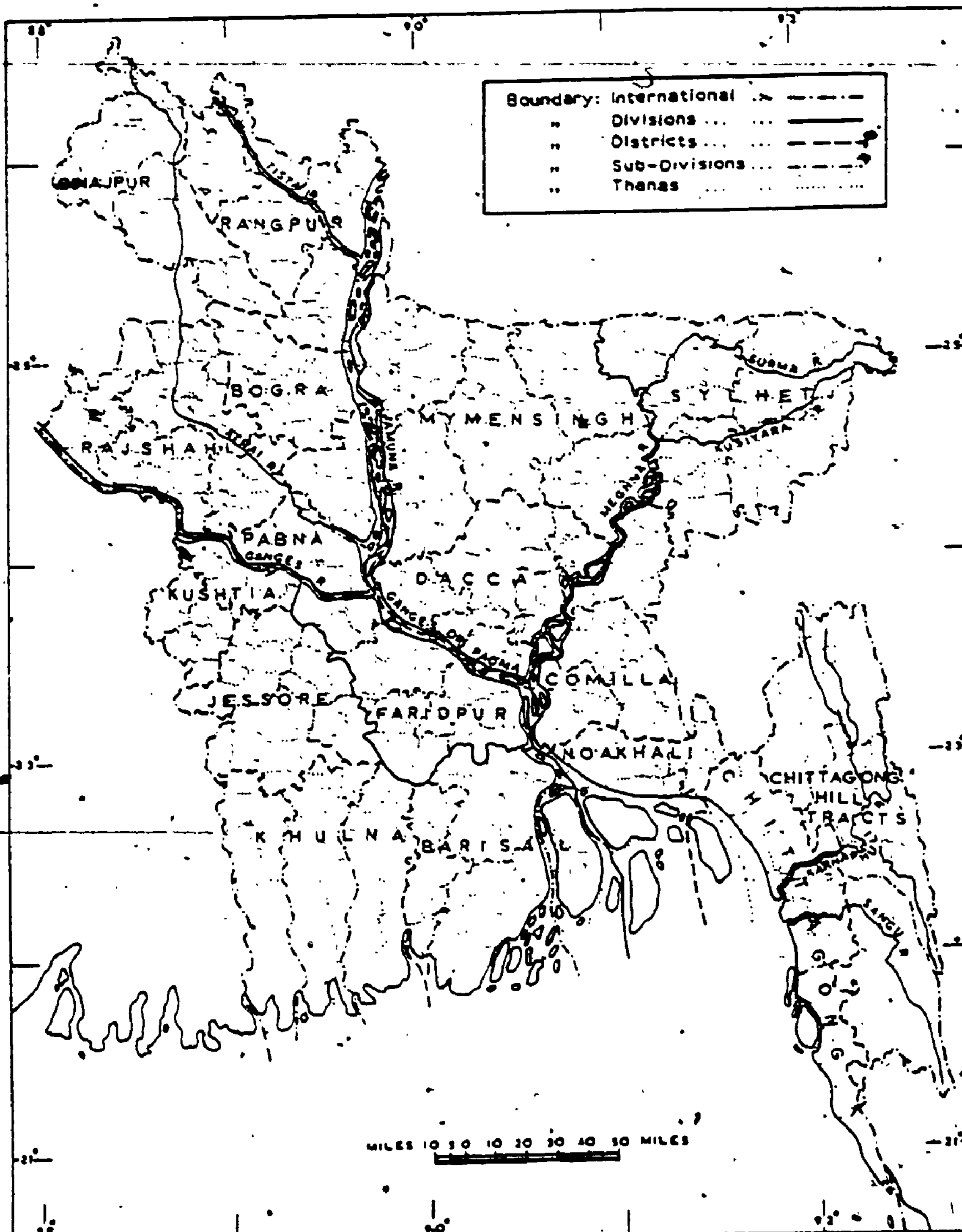

Figure 3.1b Administrative Districts (1964)
Source: Ahmad, 1968.

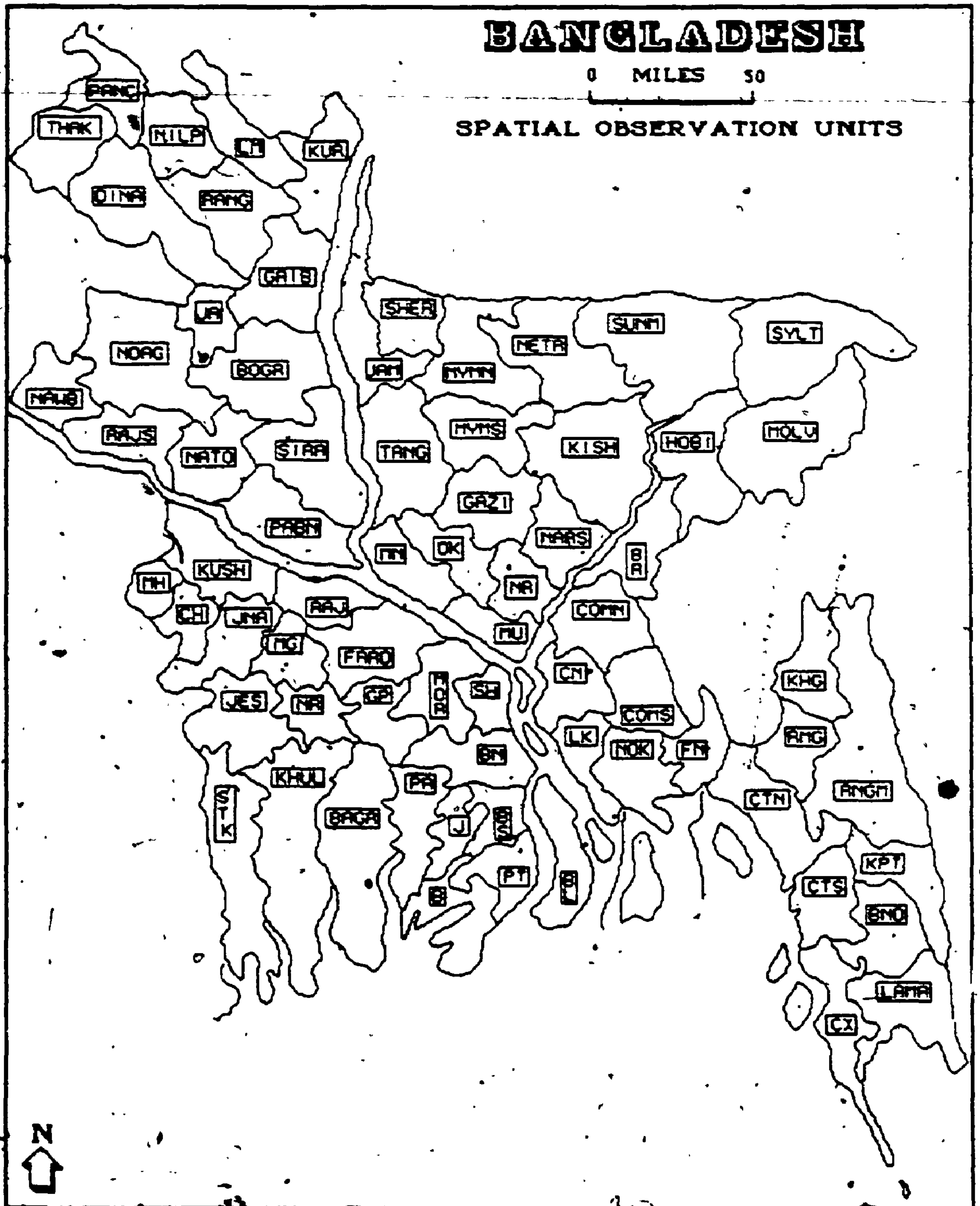

Figure 3.1c Administrative Districts (1980)

(TANG) in the west to Kishoreganj (KISH) in the east. The Central Administrative Division also includes greater Faridpur (Figure 3.1b) district (i.e. RAJ, FARD, GP, MARD and SH) south of the Padma-Jamuna river systems (Figure 3.1c). It must be noted that Dhaka has long been unrivalled as the regional capital of what is now Bangladesh. Geographical centrality (Figure 3.1a), reinforced by the fortunate combination of physiographic features favourable to both land and water communications with a populous and highly productive region, has ensured its status as the main "core" area of the country (Johnson, 1982).

The Eastern (Chittagong) Administrative Division: comprises districts to the east of the Meghna river extending from Sunamganj (SUNM)/Sylhet (SYLT) in the north-east to Cox's Bazar (CX) in the south-east (Figure 3.1c) including the Chittagong Hill-Tracts (Figure 3.1b). Chittagong (Figure 3.1a) is the major sea port city and leading industrial and commercial centre in the country (second core area). Dhaka and Chittagong have become the twin foci of a "core" region or major urban axis of the country with a considerable degree of relative affluence in terms of principal components of development.

The Northern (Rajshahi) Administrative Division: popularly known as North Bengal, this region is separated from the rest of the country by the major Padma and Jamuna river systems. This region includes those northern districts extending from Panchagarh (PANC) in the north to Pabna (PABN) in the south (Figure 3.1c). Rajshahi (Figure 3.1a) is the major urban-education centre in the whole region, which however, is relatively isolated from the Central and Eastern Divisions.

The Southern (Khulna) Administrative Division: is a great deltaic plain separated from the rest of the country by the dominant Padma-Jamuna-Meghna river system. Districts in this region extend from Kushtia (KUSH) in the north to Patuakhali (PT) in the south (Figure 3.1c). Economically, this region is in a volatile position. Khulna (Figure 3.1a) is a major sea port (next to Chittagong) and the fourth largest urban centre with an industrial orientation in the country.

It must be noted that, to a major degree, the Administrative Divisions which correspond to the major physiographic divisions also function as major planning regions. The only exception is the transfer of greater Faridpur (Figure 3.1b) district (i.e. RAJ, FARD, GP, MARD and SH) to the Southern planning region from the Central (Dhaka) Administrative Division.

Physical Setting

The major administrative and planning divisions of Bangladesh have been outlined, but its economic geography demands also a consideration of its physical setting, which is an integral part of a country's personality and is closely related to the economic life of its people. Bangladesh is a land of rivers meandering over a vast alluvial plain, much of which constitutes the enormous, composite delta of the Padma, the Jamuna and the Meghna river systems (Figure 3.2). However, the country includes two sharply contrasting major physical divisions; the vast alluvial plain of new and old alluvium and the tertiary marginal hills (Figure 3.3a). Except for these tertiary fold mountains in the south-east, some hilly regions in

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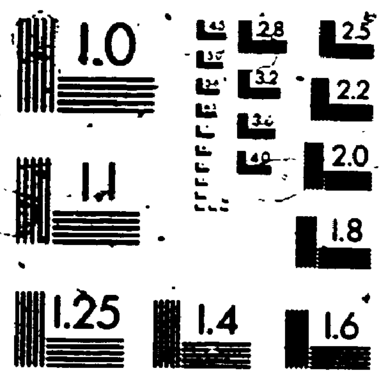

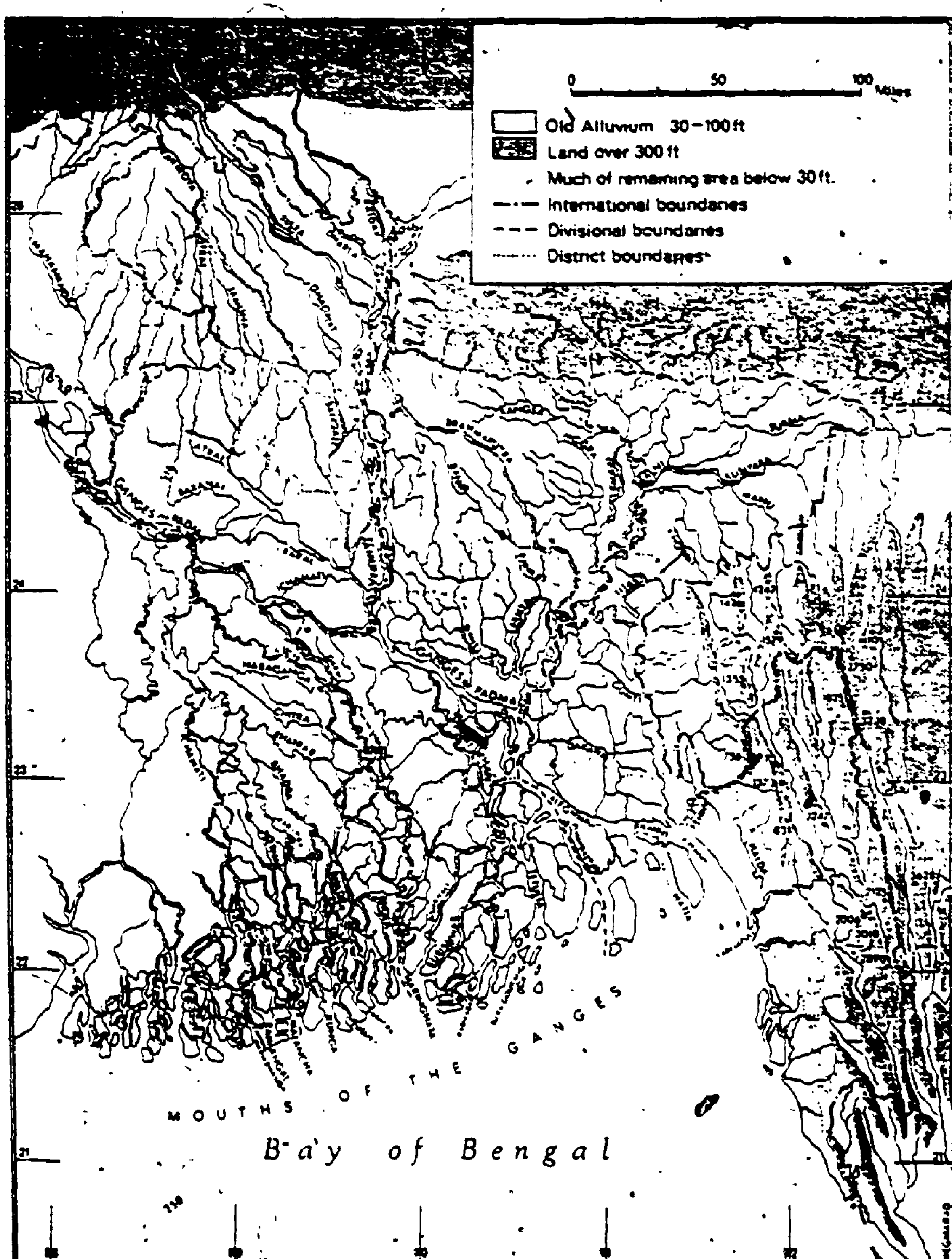

Figure 3.2 Rivers and Relief
Source: Ahmad, 1968.

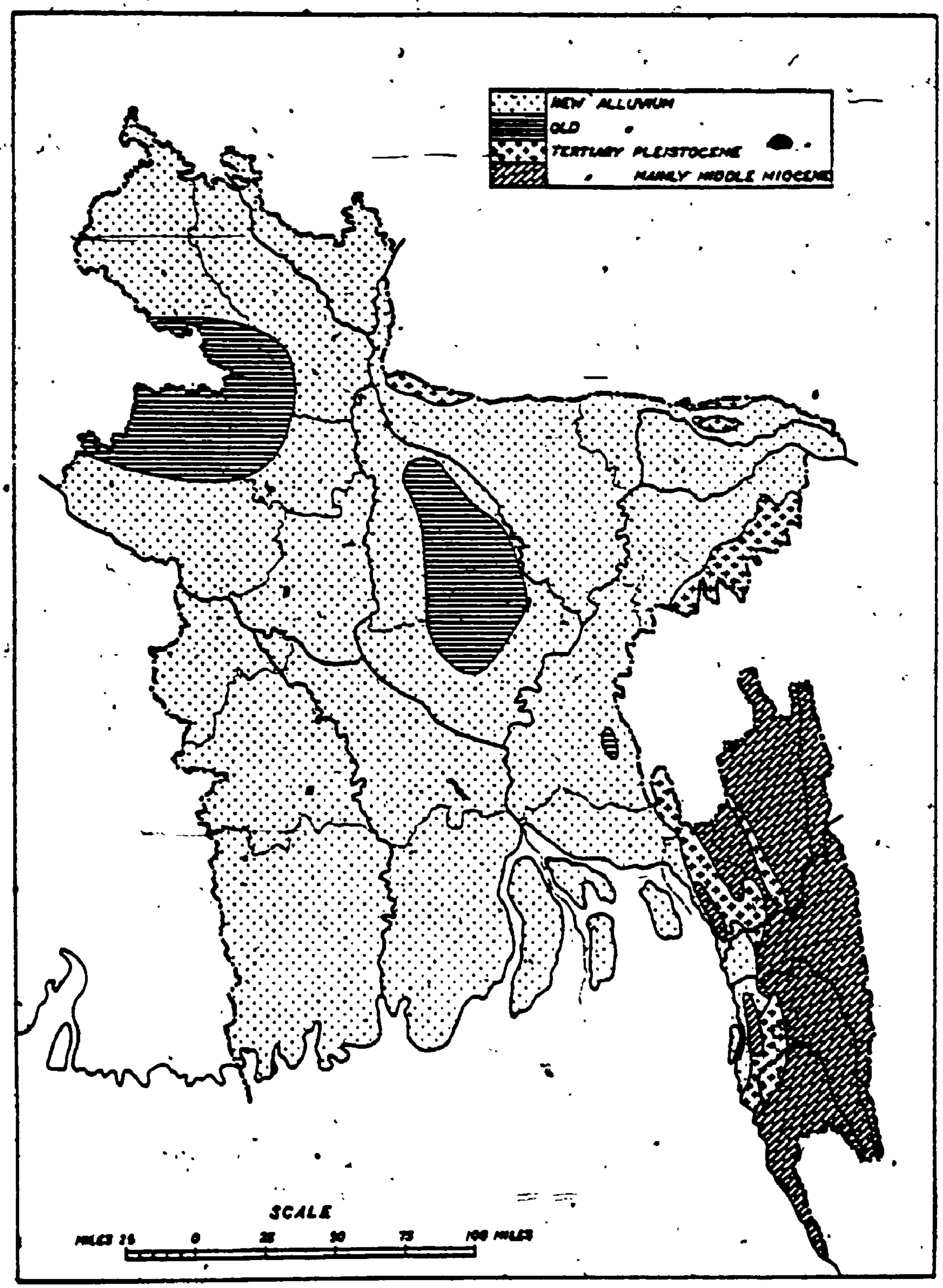

Figure 3.3a Geological Features: Generalized
Source: Ahmad, 1968.

the north-east and few pleistocene terraces of old alluvium in the Central and Northern Administrative Divisions, the whole country consists of low, flat, fertile flood, coastal and deltaic (active and mature) plains of new alluvium (Figure-3.3b).

Major physical characteristics (Figure 3.3a) of the country are discussed under broad headings and minor but distinct physiographic units (e.g. piedmont alluvial plain) within the major geographic features (e.g. the plain) are amplified (Figure 3.3c). The following are the distinct physiographic divisions that are focused upon in this study:

The Plain: This has been formed by the deep infilling (sedimentation process) of the great rivers (the Padma-Jamuna-Meghna-Brahmaputra): The two stages of the process are visible in the present landscape, represented by the new alluvium (including a piedmont alluvial plain, different flood plains including those of the Padma, Jamuna, Brahmaputra and Meghna, low-land basins, depressed basins, coastal and the deltaic plains both moribund and active) and the old alluvium (i.e. Pleistocene Terraces- Barind Tract and Madhupur Tract and the Tippera Surface).

i) The New Alluvium: Characteristically, the new alluvium of the plain (Figure 3.3a) gives an impression of absolute flatness over great distances, broken only where the old alluvium rises abruptly to not more than 100 feet above the see level. The seaward slope is so slight that a rise of sea level of 30 feet would put almost all of it under water (Ahmad, 1968; 1976). The new alluvium, by virtue of its vastly superior productivity and because it occupies about three times the area of the old alluvium, dominates the agricultural

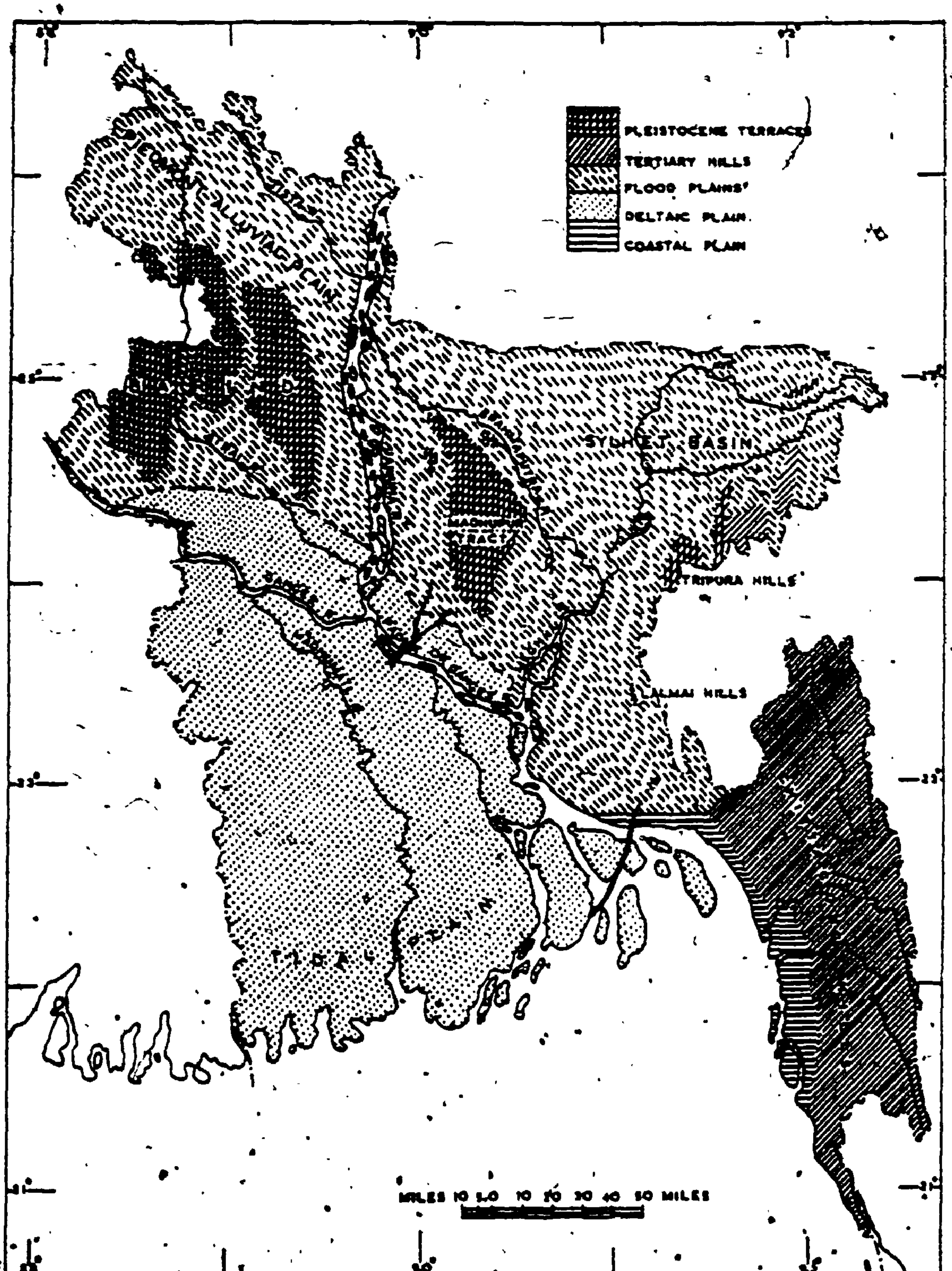

Figure 3.3b Major Physiographic Divisions
Source: Ahmad, 1968

landscape and economy of Bangladesh. The following units can be distinguished within the new alluvium.

a) <u>Southern Moribund and Active Delta Plain:</u> This particular physiographic unit covers entire land area of the Southern Administrative Division, separated from the rest of the country by the Padma-Meghna river systems (Figure 3.3b). However, a clarification is needed to separate the mature delta from an active one. It must be noted that numerous rivers which are of fundamental importance to the life and work of Bangladesh may be distinguished between two very different categories- the dead (or decaying) rivers, and active rivers (Majumdar, 1942). South of the Padma, between the boundary with India in the west and the Meghna estuary in the east, are three major right bank distributaries, each in its turn once the main outlet channel of the Ganges, but with its progressive eastward shift successively reduced in stature (Strickland, 1940; Bagchi, 1944). This area is the great delta plain and the major rivers from west to east are the Ichamati-Mathabhanga-Hariabhanga (forming the boundary with India), the Garai-Madhumati and Arial Khan. The Arial Khan is still an active river, carrying a large volume of Ganges water to the Bay of Bengal. But rivers west of the Garai-Madhumati and their branches, distributaries and inter-connections, may be classified as decaying rivers (Figure 3.2). In general these rivers have well marked banks and usually do not flood (Fergusson, 1863). This area comprises districts extending from Kushtia (KUSH) in the north to Bagrarhat (BAGR) in the south and is known as the mature delta (Figure 3.3c; Index Nos. 6, 7 & 8). It lies slightly higher than the eastern (active)

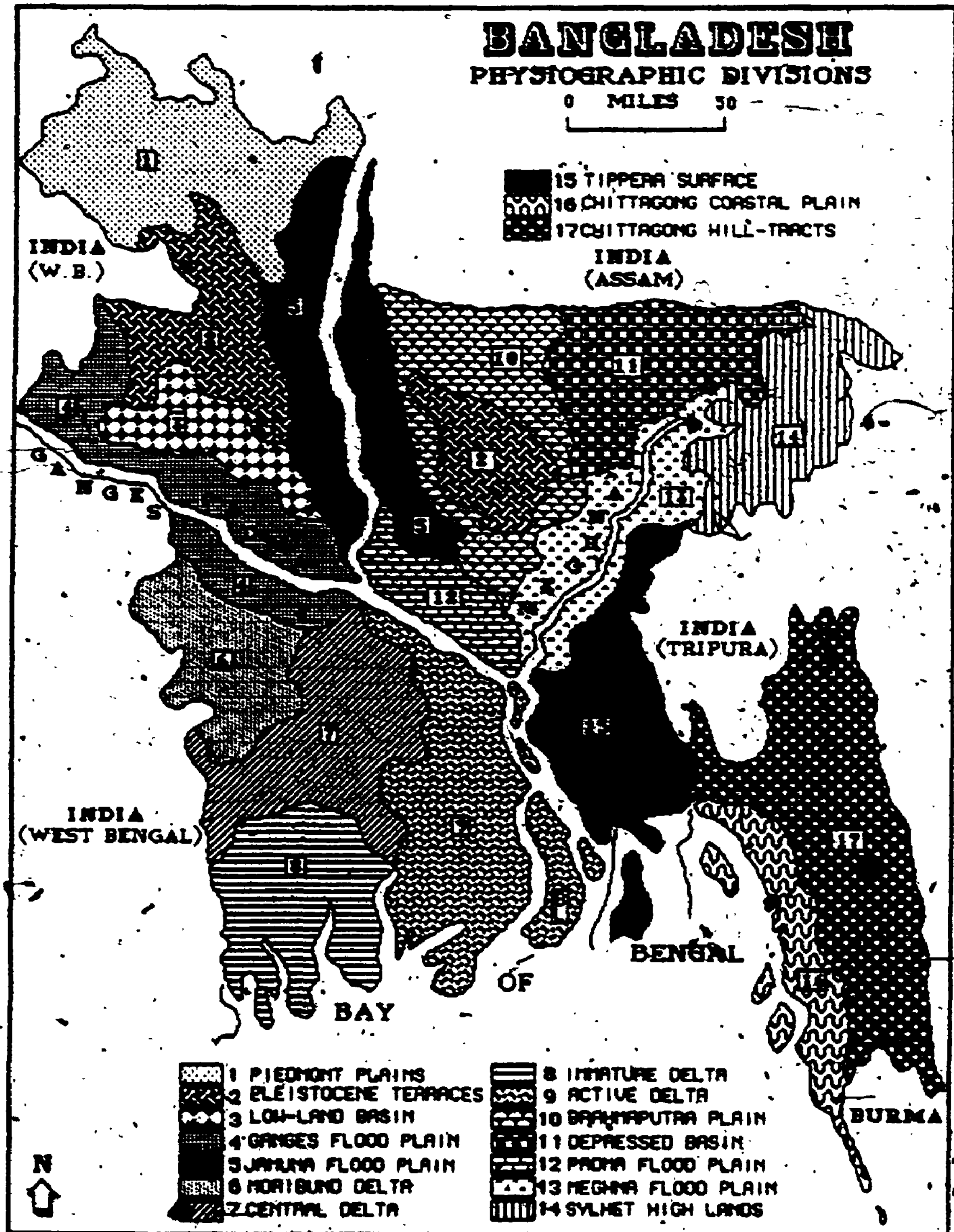

Figure 3.3c Physiographic Divisions: Detailed
Source: Rashid, 1965.

part of the delta and its surface is marked with numerous depressions representing mainly "left-outs" of former river beds now abandoned. It lacks the fertilizing silt deposited by regular river floods. On the other hand, the active delta (Figure 3.3c, tidal plain with its saline fringe lying lower in the east of the Madhumati river) gets flooded regularly and inundated with silt (Ahmad, 1968; 1976; Rashid, 1977).

Agriculturally the moribund delta is a relatively poor area, and becoming poorer. The soils are generally of poor quality (largely clayey loam with sand content) and after two or three year's cultivation need rest for an equal period. Swampy, saline and sandy soils are predominent near the coast (Figure 3.4). Soils in this southern part of the deltaic plain contain a great deal of humus from dried-up marshes. The thick accumulation of organic matter in waterlogged areas, under marshy conditions, leads to the formation of peaty soils. The alkaline conditions in the southern saline zone are caused by temporary abundance of moisture in the humid period and capillary action in the intervening dry periods. Although the shortness of dry period and the abundance of rain wash away much of the salts, as a whole their alkaline content is high, and organic and nitrogen proportions low (Ahmad, 1968; 1976). Therefore, they are poor agricultural soils.

b) <u>Northern Piedmont Alluvial Plain:</u> The North Bengal Piedmont Plain (Figure 3.3c, No. I), consisting of mainly coarse material (largely sandy loam with clay content, Figure 3.4), is a part of a broad alluvial fan built up by the river Tista in the past, but

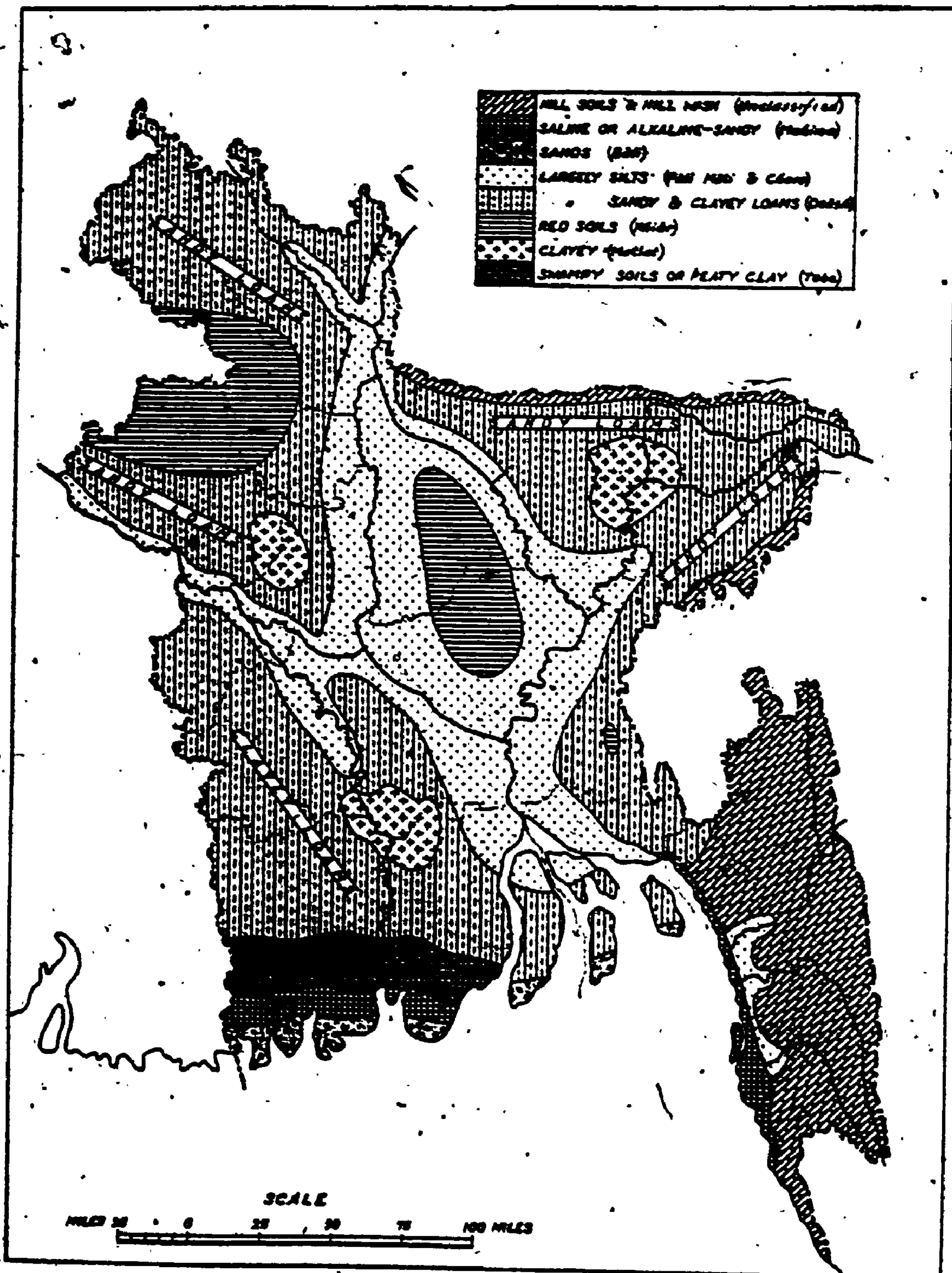

Figure 3.4 Soils: Generalized
Source: Ahmad, 1968

now abandoned. In the process of building its fan the Tista has varied its course from time to time. The removal of the Tista to join the Jamuna could have contributed to the decay of the Ganges's western distributaries, with serious consequences for the Moribund Delta Plain (Ahmad, 1968; 1976).

c) Northern Flood Plain and Low-Land Basin: Much of the North Bengal flood plains and low-land basin (Figure 3.3c; Nos. 3, 4 & 5) of new alluvium is now cut off from the Himalayan supply of water and its drainage is deteriorating (Mukharjee, 1938). The Atrai, for instance, is only a shadow of the river[1]. The Northern flood plains and low-land basins (including also the piedmont alluvial plain), until recently regions of only moderate to poor agricultural productivity (Ahmad, 1976; Johnson, 1982), have become revitalized by the development of the ground water resources contained in their coarse sediments (largely sandy loam with clay content, Figure 3.4).

d) Central-Eastern Flood Plains: The remainder of the country's new alluvium is the flood plains of the Padma-Jamuna-Brahmaputra-Meghna river systems (Figure 3.3c; Nos. 5, 10, 12 & 13). Agriculturally, the most productive physiographic regions of Bangladesh, they are characterized by silt with sandy loam content (Figure 3.4), and with fertility that is regenerated annually by flood waters.

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[1]It may be pointed out that a major upset to the course of the Tista occured in 1787 when an exceptional flood blocked the Atrai channel. The sudden influx of Tista water into the old Brahmaputra in 1787 may have caused a diversion of the latter into its present north-south channel known as the Jamuna

e) Central-Eastern Depressed Basin: This particular physiographic unit (Figure 3.3c; no. 11) consists of back swamps and other depressions created by the Meghna river (Pascoe, 1919). There are several depressions across the country, but, the Meghna depression is the most significant one in the north-eastern part of the country (jointly shared by the Central and Eastern Administrative Divisions). In Sunamganj (SUNM), eastern parts of Netrokona (NETR), Kishoreganj (KISH) and the northern parts of Hobiganj (HOBI) district, the Meghna depression, which is probably, due in part, to tectonic subsidence, which may still be continuing. It contains many low-lying permanent lakes some of which are only 10 feet above the sea level. During the monsoon period the whole depression becomes a vast shallow lake for about six months or more, when the waters discharged into the basin from the surrounding hills are unable to escape southwards through the Meghna river, because of the higher level of floodwaters in the Brahmaputra flowing on its aluvial ridge (Johnson, 1982). The Meghna depression becomes extensive water bodies in the rains, and so potential reservoirs for dry season irrigation. The soils are mainly clays, however, loosely characterized by hill wash and sandy loam (Figure 3.4).

f) Eastern Coastal Plain: The plain along the coast extends from the district of Feni (FN) in the north to Cox's Bazar (CX) in the south, a distance of about 125 miles (Figure 3.3c; No. 16). Its average breadth is approximately 10 miles (Rashid, 1965; 1977). The plain is composed of saline clays and most of it is affected by tides (Figure 3.4).

ii) Old Alluvium: The monotony of the low Bangladesh plains is relieved somewhat by the occurance of three distinct tracts of old alluvium (Figure 3.3c; Index Nos. 2 & 15), the Barind (in the Northern Administrative Division surrounded by new alluvium), the Madhupur Tract (in the Central Administrative Division surrounded by new alluvium) and the Tippera surface (in the middle of the Eastern Administrative Division). These are the the chief constituents of the Bangladesh plain (Rashid, 1965; 1977; Ahmad, 1968; 1976), the remnants of an older phase of flood plain depositation[2]. The Barind and Madhupur Tracts are commonly known as Pleistocene Terraces. However, there has been differential movement of strata between pleistocene and recent times (Morgan and McIntire, 1959; Johnson, 1982). The Pleistocene areas remain above the monsoon season floods and are drained by a few relatively small streams. The sediments in these areas are well oxidized and are generally a reddish brown colour (Figure 3.4).

a) Pleistocene Terraces: The Northern Barind Tract: This tract, lying between the Jamuna and the Padma river systems (Figure 3.3c; No. 2). The Bangladesh portion has an irrigular shape, and covers 3,600 square miles, giving it more than twice the area of the

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[2] **Throughout Pleistocene time and upto the present, sea level has not remained constant. At the period of maximim glaciation when there was a world-wide fall in sea level, the coast line may have stood 135m lower than at present. During warm inter-glacial periods sea level may have been 30m higher than now. It is possible that the surfaces of the old alluvial terraces of the Barind, the Madhupur Tract and the fringing benchlands of Sylhet and Chittagong are related to such a higher sea level. Tectonic instability has also played a part in modelling the land scape. The old alluvial terraces have been deformed by faulting and tilting.**

Madhupur tract. The elevation is slight, 20 to 40 feet, and the tract is characterized by wide, level plains, gentle undulations and very gentle slopes (Ahmed, 1976). The soils vary from yellow to red and are agriculturally poor(Figure 3.4).

b) Pleistocene Terraces: The Central Madhupur Tract: This tract covers about 1,600 square miles Central Administrative Division, extending from the Mymensingh South (MYMS) to the northern Dhaka (DK) district (Figure 3.3c; Index No. 2). The elevation varies from 50 to 100 feet, and typical reddish soils (Figure 3.4) exercised a profound influence on the drainage of the area, confining the large rivers- Jamuna, Brahmaputra and Dhaleswari, to skirting its edges. The red clays are agriculturally poor (Ahmad, 1968; 1976).

c) Eastern Tippera Surface: Lower in elevation than the Pleistocene Terraces, and probably intermediate in age between the new alluvium and the old alluvial terraces is a distinctive physiographic unit called the Tippera Surface (Figure 3.3c; No. 15), named by geologists Morgan and McIntire (1959), who considered that its slightly oxidized soils (Figure 3.4) together with morphological evidence point to the area being a surface of Early Recent geological age. This prominent topographical feature in the midst of the plains of Tippera (Eastern Administrative Division) is higher than the flood plain to its north and west. However, the average elevation does not exceed 21 feet and extends from the district of Brahmnbaria (BR) in the north to Noakhali (NOK) in the south (Rashid, 1965; Johnson, 1982).

Tertiary Hills: Hills occur along the two parts of the eastern border, in Sylhet (SYLT) in the north and in Chittagong (CTN & CTS) and Chittagong Hill-Tracts districts in the south-east. However, it must be noted that genetically similar to the North Bengal alluvial fan, in that they are composed of detrital material from the adjacent hills, but individually of much smaller scale, are a series of piedmont slopes forming an almost continuous belt along the southern base of Shillong Plateau and the hills of south Sylhet (SYLT). A separate but comparable zone flanks the hills in Chittagong Districts (both north and south). In these areas grey piedmont soils interfinger with grey flood plain soils along with some strips of sandy coastal formations (Johnson, 1982). These minor details are, however, lost in the simplified physiographic division portrayed in Figure 3.3c.

a) The Sylhet Hills: (Figure 3.3c, No. 14) Here the hills are low and isolated. Hills around Sylhet do not exceed 800 feet. The dominant soils type are sandy loam (Figure 3.4). Their natural cover is forest, bamboo or scrub, but they have become the country's main tea growing area (Rashid, 1965, 1977; Ahmad, 1968, 1976).

b) The Chittagong and Chittagong Hill-Tracts: are the only extensive hill area in Bangladesh, comprising the districts of Rangamati (RNGM), Ramgarh (RMG), Bandarban (BND), Kapti (KPT), Lama (LAMA), Khagrachari (KHG) and part of Chittagong (CTN, CTS) and Cox's Bazar (CX) districts (Figure 3.3c, No. 17). In general, the ranges gain in elevation to the east and varys from 2000 to 4000 feet (Rashid, 1965, 1977; Ahmad, 1968, 1976). This physiographic division is characterized by unclassified hill soils (Figure 3.4).

Climatic Conditions

As a broad generalization Bangladesh generally enjoys a tropical humid (monsoon) climate. The climate of the country is characterized by moderately high temperatures for about eight months in the year (March to October); humidity is high with the heavy rainfall in summer (June to September). Extremes of heat and cold are not experienced. The climate may be described, in broad terms, as moderately warm, equable and humid (Ahmad, 1968).

Rainfall, rather than temperature, is the most important climatic element in Bangladesh as far as agriculture is concerned. Ample monsoon rains, heat and humidity lead to luxuriant growth of vegetation and supports vast fields of jute, rice and other crops. Monsoon means rains from June to September or October. On the Bangladesh coast the monsoon winds are from the south, but as they penetrate into the country they become a south-east monsoon (Johnson, 1982). With the exception of the some Northern and Southern districts (e.g. Rajshahi and Kushtia), where the annual rainfall is about 55 inches, no other part of the country receives a monsoon rainfall less than 60 inches (Figure 3.5). In fact, only about one-third of the country, including the southern part of Northern Administrative Division and northern part of the Southern Administrative Division, receive a rainfall of less than 70 inches. A large area in the Southern and Eastern Divisions, comprising Khulna, Barisal Noakhali, Comilla, Chittagong and Chittagong Hill-Tracts, and to the Central and Northern Divisions including Mymensingh, Rangpur and northern Dinajpur, receives from 80 to 100 inches of precipitation (Figures 3.1b; 3.5). The south-eastern extremity (Eastern Division), the Cox's Bazar Area, gets about 120 to 140 inches, and the northern and north-eastern (Eastern Division) portions of Sylhet area receive from 110 to 200 inches of rain (Figures 3.1b; 3.5). The humidity

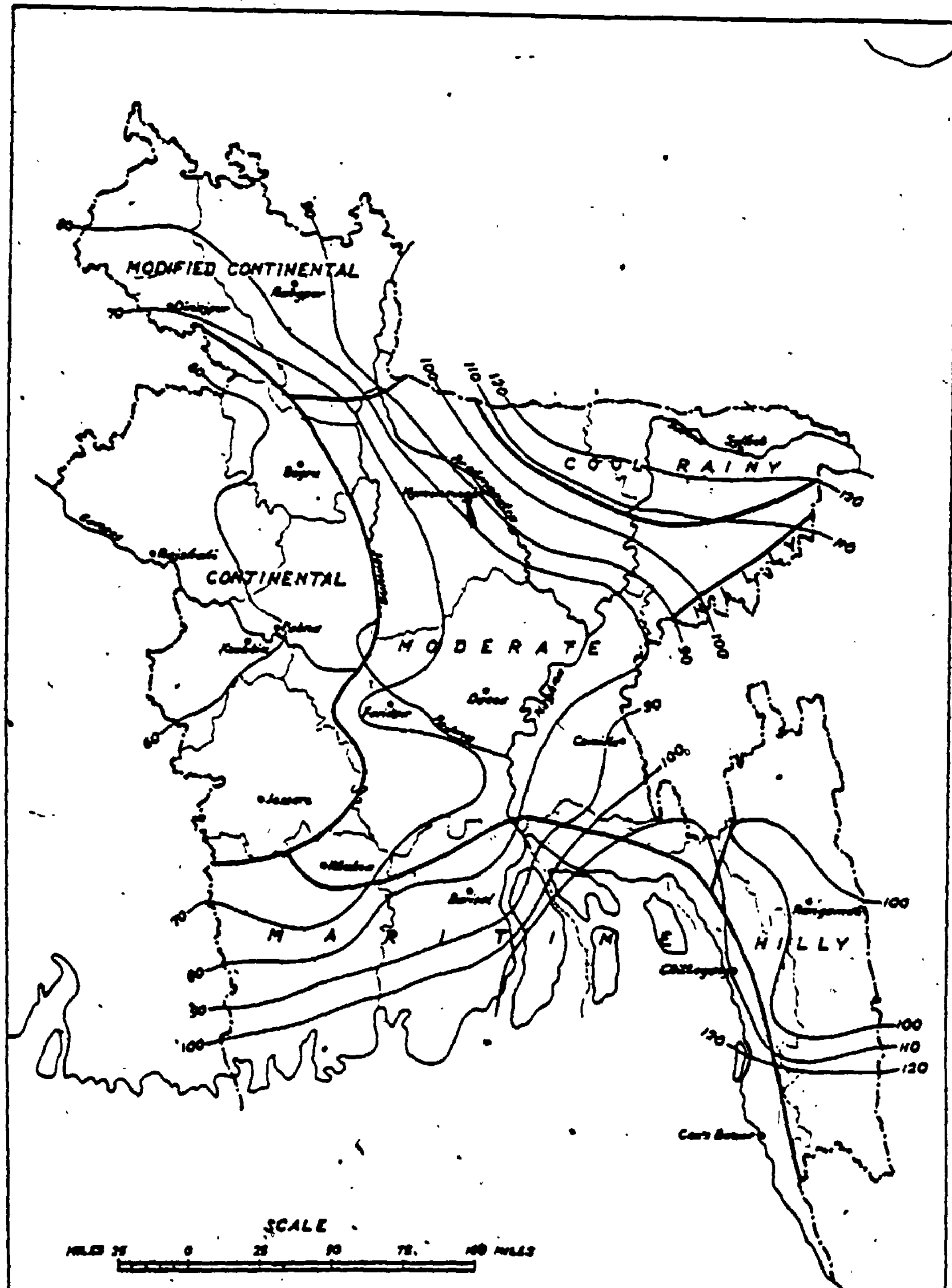

Figure 3.5 Climatic Divisions: Normal Annual Rainfall in Inches
Source: Ahmad, 1968.

is generally high throughout the year. The months of June and July are the most humid, with percentages of 84 to 90. Sometimes in the Southern and Eastern parts of the country, humidity increases to about 95 per cent (Rashid, 1965; 1977; Ahmad, 1968; 1976; Johnson, 1982).

In general terms, the major part of Bangladesh normally has excess rainfall rather than deficiency. But the failure of rain at its due time (drought), or too much or too little of it at certain times, seriously affect crop production. Abnormal excess often brings about unmanageable floods which damage crops. Excessive rainfall concentrated within a few days may not only lead to crops failing to mature, but may cause considerable damage. This is a frequent experience with regard to jute and rice (Ahmad, 1968; 1976).

Salient Features of the Economy

Apart from it's relatively fertile soil (Figure-3.4), Bangladesh has very limited natural resources. There are scarcely any mineral resources and the alluvial soil limits the supply of construction materials. There is no iron ore and the only coal reserves lie deep underground, so that even if the technological problem of deep coal mining in alluvial deposits could be solved, extraction would remain a very expensive operation (Islam, 1978). However, several gas fields in the Eastern Division of the country, particularly in the districts of Sylhet, Hobiganj and Brahmanbaria, (Figure 3.6a) have been discovered, from which natural gas is produced to meet some of the energy requirements of industries and households (Ahmad, 1976). Very recently an oil field was discovered in the Eastern Division, in the district of Sylhet, (Figure 3.6a) but extraction is on a very limited

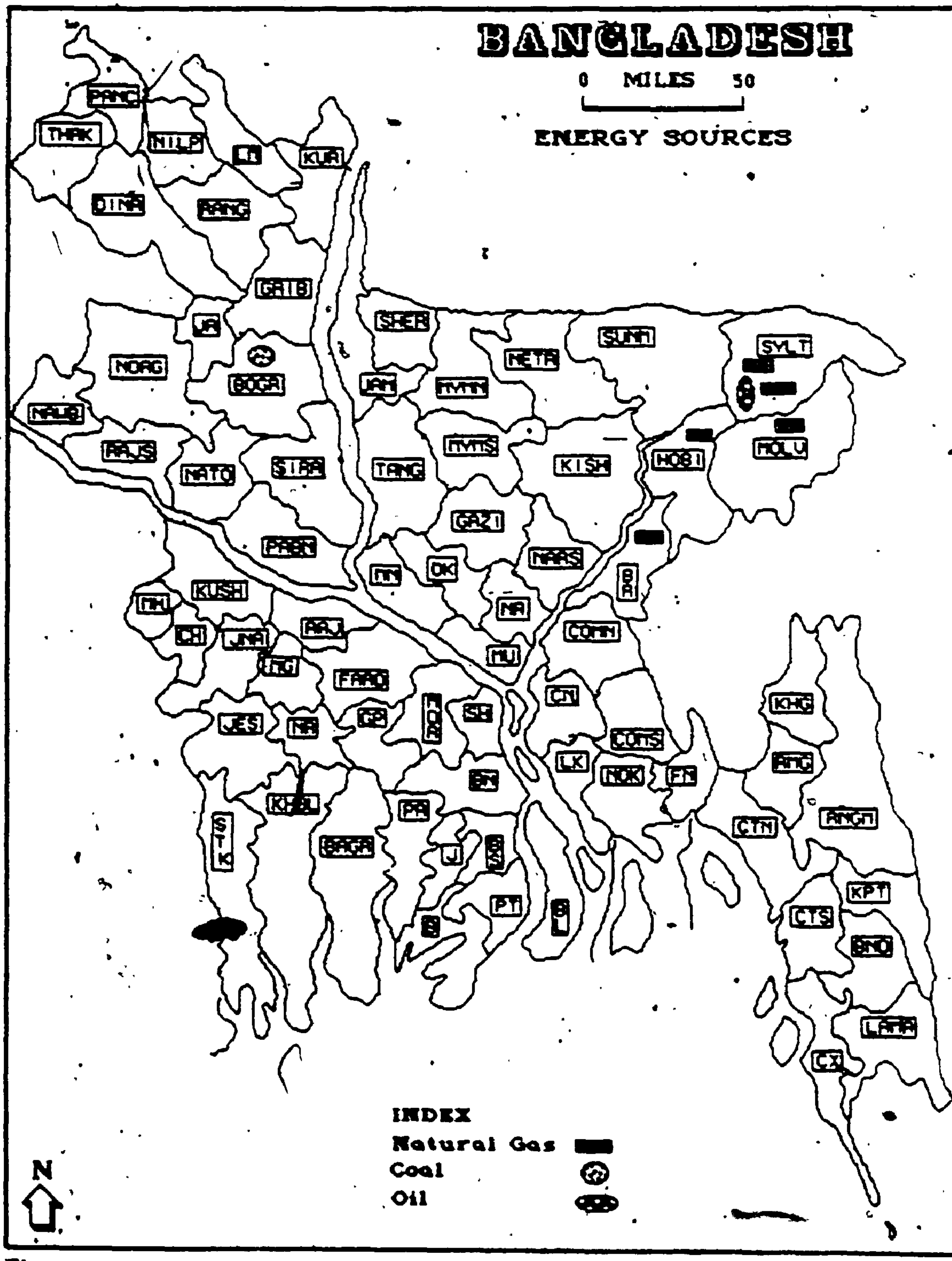

Figure 3.6a Distribution of Mineral Resources

scale. The main power supply in Bangladesh comes from thermal generating stations, while the only hydro-electric installation is on the Karnafulli river in the district of Kapti in the Chittagong Hill-Tracts. There are fourteen major thermal generating stations, in addition to a number of isolated diesel units. It is striking to note that the Northern and Southern Divisions together account for only 25 per cent of the total generation. In contrast, the Central and Eastern Divisions together reported 75 per cent of the total generation (Chowdhury, 1981). The essentially north-south regional distribution of electricity generation reflects the regional consumption pattern of the country because there is no east-west transmission inter-connector across the Jamuna river.

Large scale industrial output contributes no more than 7.6 per cent, and the small scale industry no more than 2.7 per cent of GNP (Alamgir, 1975). The existing large industries in Bangladesh may be classified into four major groups; i) agro based; ii) forest based; iii) mineral and metal based and iv) engineering industries. Among the agro-based industries, jute and cotton textiles are the most important categories. Most of these industries (78 jute and 49 textile in total) are concentrated in primate cities such as Dhaka, Narayanganj, Chittagong and Khulna (Figure 3.6b). Bangladesh is a major producer of tea and tea industries are largely concentrated in the districts of Sylhet, Hobiganj and Molvi Bazar and to a lesser extent in Chittagong and Chittagong Hill-Tracts (Figure 3.6b).

Forest based industries i.e. timber, match and paper factory are also concentrated in the primate cities, including Rajshahi, Sylhet and Comilla (Figure, 3.6b). Mineral and metal using industries include

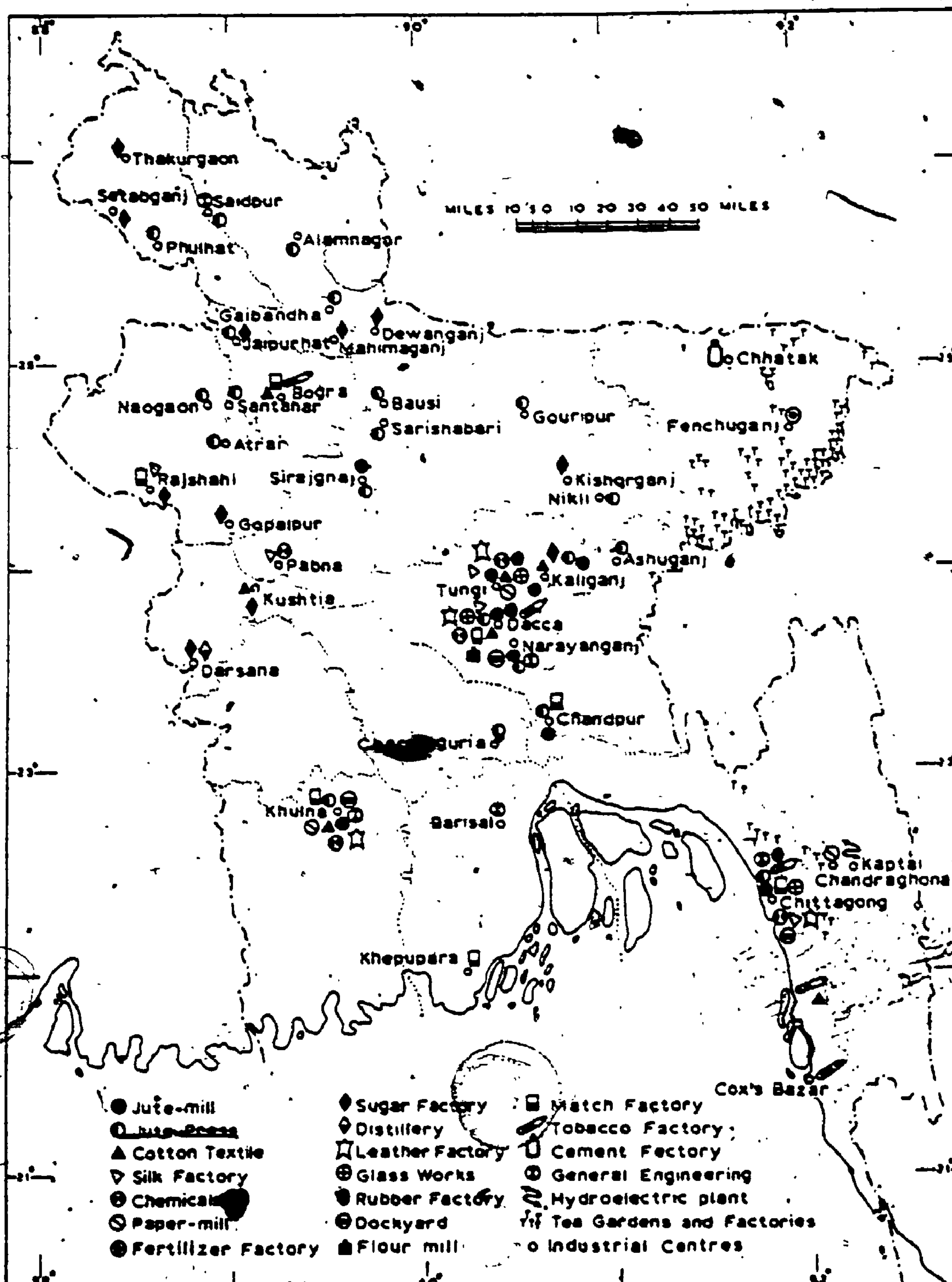

Figure 3.6b Distribution of Large Industries
Source: Ahmad, 1968

nine moderate size glass works located in Dhaka (4), Chittagong (3), Bogra (1) and Dinajpur (1). There are sixteen small aluminium factories located in Dhaka, Chittagong and Bogra and thirteen factories in and around Dhaka producing rubber goods from imported materials. Major pharmaceutical industries are also centered around Dhaka and Chittagong (Figure 3.6b). However, three fertilizer factories are located in Sylhet, Comilla and Ghorasal due to the proximity of the natural gas supply. The engineering category includes general engineering establishments, electrical engineering, railway workshops and dockyards. The last have been established at the three major ports of Chittagong, Khulna and Narayanganj (Figure 3.6b). Chittagong also has the only heavy steel industry of the country (not shown in Figure 3.6b). The pattern of organization of the weak industrial base of the country, whereby there are a few major agglomerations, definitely has an impact on the broader spatial economy, which can be related to individual and composite measure of analysis particularly in the explanation of spatial develpment patterns (Chapters 5, 6 & 7). However, since industry accounts for only a small portion of GNP, we turn to the examination of the dominant sector of the economy from a national perspective (Ahmad, 1968; 1976; Rashid, 1977).

Domination of Rural-Agricultural Sector

Bangladesh is predominantly rural and traditionally agrarian in nature. In absolute size it has the fourth largest agricultural population in the world, after China, India and the Soviet Union. About 91 per cent of its population of 90 million live in rural areas.

About 90 per cent of the labour force lives in rural areas and where nearly 80 per cent is engaged in agricultural production. Major share of the GNP is derived alone from agriculture (Alamgir, 1975b; 1980; Faaland and Parkinson, 1976). Most manufacturing industries are based on agriculture and export earnings are almost totally dependent on agricultural commodities. Therefore, the rural-agricultural sector plays a prominent function in the national economy (Islam, 1977; 1978; GOB, 1980).

Agriculture is the backbone of the economy of Bangladesh. Apart from producing nearly 90 per cent of the nation's food, agriculture is the source of a number of raw materials such as jute, tea, sugar, tobacco and oil-seeds which are of basic importance to industry and commerce. About 87.6 per cent of the cultivated area is being devoted to rice and jute. Oilseeds, sugar cane, wheat, tea and tobacco together accounted for 5.5 per cent of the total cultivated area in 1974 (Islam, 1978). Agricultural output accounted for 55 per cent of GDP at 1973 prices. About 40 per cent of GDP is derived from major crops and 28 per cent from rice alone. Fisheries and livestock contribute about 6 per cent and forestry about 1 per cent to GDP (GOB, 1976; Ahmad, 1976).

Bangladesh is one of the world's major areas of rice production which is the staple food of the Bangladeshi people. In 1970-1971, the total area under all kinds of rice was 24.5 million acres, a production of about 11 million tons and an average yield of 0.44 ton per acre. The average extent of the area under other food crops, including wheat, barley, gram, potatoes and pulses had an acreage of well under 2 million (Ahmad, 1976).

It must be pointed out that the percentage of HYV to the total area under rice has risen from 2.6 per cent in 1969-1970 to 17.7 per cent in 1978-1979. The comparable figures for production have been more impressive, HYV accounting for .8 per cent of the total in 1969-1970 and 31.4 per cent by 1978-1979. Indeed, a peak of 33.7 per cent was achieved in 1973-1974, immediately before the sharp rise in world oil prices, caused a rise in fertiliser costs and so slowed down the progress of the 'green revolution' (Johnson, 1982).

Bangladesh is the largest jute producer in the world. It provides raw material to a large modern industry, and is the leading export item of the country in both raw and manufactured shape. It is the largest foreign exchange earner, accounting for as much as 90 per cent of the total value of exports from the country in 1968-1969 (Ahmad, 1976). The Central and Eastern Divisions of the country are the top producing areas with the exception of old alluvium and tertiary hills.

The Historical Dimensions of Development

Having identified conceptual and applied dimensions of development in Chapter 2 here one examines its specific context, i.e. the historical antecedents of development in Bangladesh. Although Bangladesh only appeared on the world map as a sovereign state on December 16, 1971, its historical dimension can be traced back nearly 800 years. The area constituting the country was under Muslim (Moughal) rule for about 560 years after 1197, and passed into British hands as part of its Indian Empire in 1757. The British ruled over India until August 14, 1947, during which time Bangladesh was the eastern part of the imperial provinces of Bengal and Assam (Figure-3.7). Upon partition, the predominantly Muslim area became East Pakistan, part of the new Muslim state of Pakistan (Ahmad, 1976; Johnson, 1982). Finally in 1971, after a civil war, East Pakistan gained independence as Bangladesh.[3]

Dependency and Underdevelopment: The Legacy of History

The primarily agricultural character of the area of Bangladesh since time immemorial needs no emphasis. It was known as a "paradise" for its fertility, its abundance and variety of crops (see Chapter 1). The early beginnings of industry were based mainly on the resources of the land. In the ancient and medieval economy, handicrafts and small industries flourished to supply local needs (Majumdar, 1948). The urban rich and foreign traders made ever greater demands on manufactured goods. However, the supremacy of East Bengal's manufactured products declined in relative terms after the industrial revolution in Europe. East Bengal could not compete with the new methods of production of a fast developing industrial age in western nations. Cheap machine-made goods (from U.K.) took the place of old manufactures at home (Nehru, 1946; Ahmad, 1968).

Thus by the nineteenth century, the East Bengal area had lost practically all its former industrial skills and finally sank to the position of a raw material base, supplying the growing needs of

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[3] **The term 'Bangladesh' derived from the dual meanings of both 'Bangla' and 'Desh'. The term 'Bangla' is the derivative of the term Bengal which also denotes a specific language (Bengali) spoken by a group of people (Bengalee). On the other hand, 'Desh' is synonymous to the English term 'territory' and in this case indicates a geographic area. Therefore, Bangladesh refers to a specific geographic area dominated by the Bengali speaking people.**

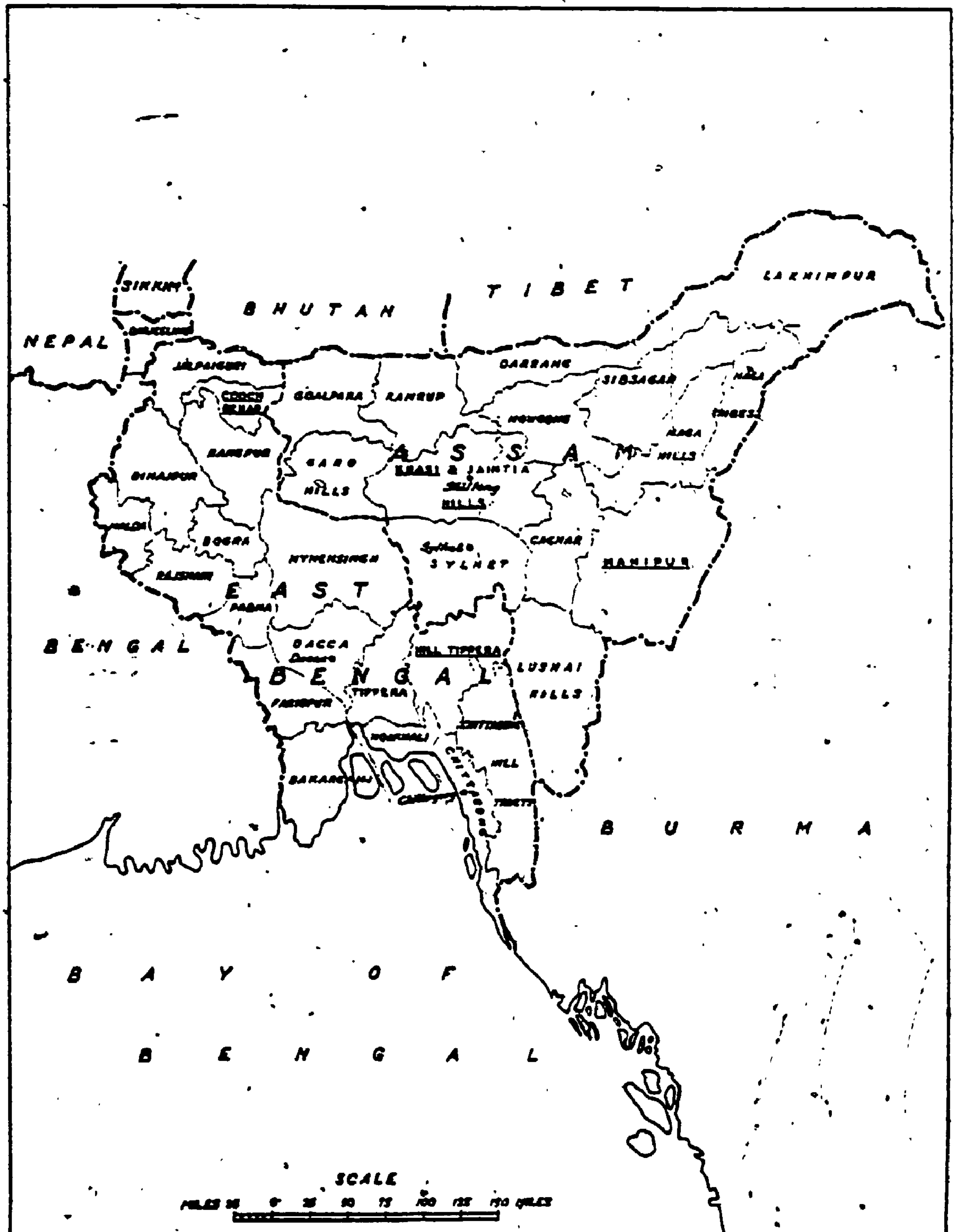


Figure 3.7 The New Province of East Bengal and Assam (1905-12)
Source: Ahmad, 1968.

Calcutta and the jute fibre demand of the outside world in a colonial fashion. Calcutta had grown into a large industrial centre and attracted not only labour and skills from far and wide but also a variety of raw materials from the adjoining areas of British Bengal (i.e. East). The East Bengal became a hinterland of this industrial nucleus. Jute fibre, hides and skins, tea, rice and fish moved into the Calcutta-Howrah-Hoogly industrial region and its vast urban complex. At the time of partition in 1947, the area of East Bengal, the new province of Pakistan (i.e. East Pakistan), was an industrially backward one which inherited only 10 cotton factories out of 400 in India, none of British Bengal's 106 jute mills, not even one iron and steel plant, paper mill, chemical works, coal mine or hydro-electric project. There were only 49 seasonal jute-baling presses, 58 small rice mills, 3 sugar factories and 1 cement factory (Ahmad, 1950).

It may be noted that the concentration of industry around Calcutta was dependent on a unique combination of facilities, which included the nearness of the largest area (i.e. East Bengal) of excellent raw material (jute), easy transport, coal supplies for power and port facilities. However, the influence of external economics in the shape of finance and initiative was no less pronounced. The flow of public and private British capital to India was at its height in the last decade of the nineteenth century. It was widely recognized that industrial investment became dependent on a momentum deriving from the ideas of foreign investors rather than from geographical factors. 'By 1902 there had begun an outburst of manufacturing activity, chiefly by European capital, and the metropolitan districts around Calcutta were becoming a vast industrial tract (Ahmad, 1950.

1968) while Calcutta, as the hub of European enterprise also indirectly prevented development elsewhere, particularly in the East Bengal (GOB, 1980). Whatever industrial facilities existed in East Bengal prior to 1947 were generally auxiliaries of Calcutta industries. Modern industry made hardly any progress in East Bengal, which, though rich in agricultural resources, lacked local entrepreneurship. The port facilities of Chittagong in relation to its hinterland were left half-developed, because of competition with Calcutta (Ahmad, 1950; 1968; 1976).

During the 200 years of the British Empire in India, the core-periphery relationship of the country was essentially a colonial one. The United Kingdom served as the core region which dominated both undivided India, along with other colonies, as a periphery. At the regional scale, East Bengal (Bangladesh) was the agricultural hinterland of the Calcutta industrial belt within the British colonial system. As noted above, East Bengal was mainly a supplier of raw materials to the industries and export houses located in and around Calcutta, which was the capital as well as industrial and commercial centre of British Indian province of Bengal and Assam (Figure-3.8). This initial structural imbalance of the regional economy within India, dominated by the unequal power relationships between local 'core' (Calcutta/west Bengal) and the 'periphery' (East Bengal), created a dependent economy in the hinterland, i.e. Bangladesh (Ahmad, 1976).

Development of Social Class

It has been argued by proponents of the dependency model that attempts by peripheral regions to be self-reliant and

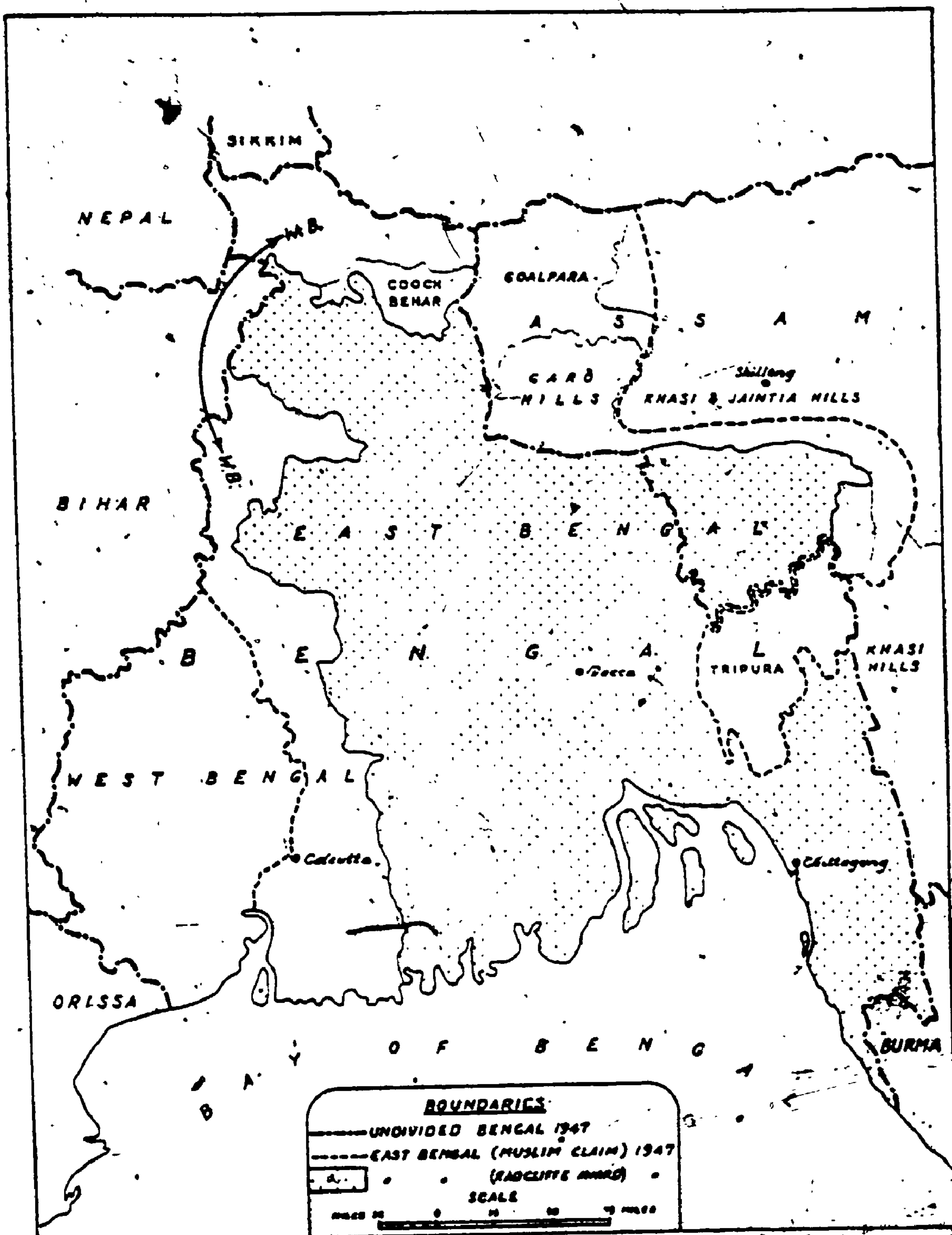


Figure 3.8 The Partition of Bengal and Assam (1947)
Source: Ahmad, 1968

independent in their development efforts are rather difficult and sometimes even impossible without bestowing some attention to the societal class structure in the Third World (Frank, 1967; Furtado, 1970; Dunn, 1975; Kay, 1975; DosSantos, 1976; Todaro, 1977; Cardoso, 1979; Petras, 1981). East Bengal presents a case where social grouping was of considerable importance in the partition of British India in 1947.

In addition to economic constraints, under the British rule the province of Bengal was included in the Permanent Settlement of 1793 (Westergard, 1985). This meant that most of the land was parcelled out in estates, and ownership rights were given primarily to a group of persons called 'Zamindars' (landlords), who during the Moughal Empire had acted as tax-collectors for the state. The tax-collection obligations continued under the British, and the amount paid from each estate was permanently fixed. Within the estates, taxes were collected from the actual cultivators, some of whom held various tenancy rights, while others were share-croppers. Zamindari rights could be bought and sold, or they could be leased to subsidiary landlords (Broomfield, 1976; Westergaard, 1985).

It should be pointed out that the undivided Bengal was inhibited by both Hindus and Muslims, but the latter were initially held in suspicion by the British who regarded them as direct representatives of the previous rulers (Moughals). It was primarily the Hindus who became employed by the British East India Company, and, as its agents, this group gained a strong footing in the economic organization of Bengal through dealing in its merchandise and other products. Relatively speaking, Hindus were wealthy, well-educated and better placed. Many of these used their surplus for investment in land; i.e. they bought up Zamindari estates, many of which were put on auction, as the traditional Zamindars were unable to meet their tax obligations. As most of the peasants in East Bengal were Muslims, the class difference coincided with the religious division in the form of Hindu landlords versus Muslim peasants. The development of a Hindu elite class played a vital role in giving a particular emphasis and its core-periphery structure to the spatial economy of undivided Bengal This uneven development in the two communities also became an urgent and vital political issue with social and economic implications (Bhaduri, 1973, Dutt et el, 1973, Broomfield, 1976, Westergaard, 1985)

By the 1930s and early 1940s the various sections of the Muslim population of Bengal clearly had developed separate class interests as well as geographical affinities (Ahmed, 1974) As an essential outcome of such social, cultural and political consciousness was the identity as part of Muslim Pakistan which emerged in August 1947 as a seperate nation state, The partition of greater India was thus based on religion, where Muslims dominated, Pakistan, and Hindus, India The specific division of Bengal was a compromise based on the Radcliffe Award (Figure 3 8) However, dependency was the genesis of this socio-cultural grouping in what became East Pakistan (Westergaard, 1985)

Neo-Colonialism: Disparity between East and West Pakistan

With the ending of British rule and partition in India in August 1947; the first thing to note is that Pakistan came into being as an independent federal state with a western and an eastern wing. East Bengal constituted the eastern wing of Pakistan and was known as East Pakistan, centred on Dhaka (regional capital), while West Pakistan was centred on Karachi- the federal state capital (Ahmad, 1976). The initial position regarding the economic status and potential of the two wings did not present any significant difference. The initial disparities were no more than marginal. Both the wings were almost wholly agricultural economies with hardly any modern industries and relying on imports for their requirements of manufactures, whether of consumer or capital goods. There was little in the nature of the economy which could have indicated the way the western wing would grow to dominate the eastern wing (Sengupta, 1972).

However, with the creation of a new state the position of the eastern wing was transformed into sub-colonial status. Calcutta with its industrial environs remained part of India, and East Pakistan was left as a marginal case, both regionally as regards its separation from the former regional centre and, increasingly within Pakistan. The difference in treatment of the two wings began almost from the very inception of Pakistan. In the political field, geography, historical background and political realism dictated a federal structure but in actual practice, a highly centralised unitary government was formed based in West Pakistan, centred first on Karachi and latter on Islamabad (west Punjab), and a typical neo-colonial set-up, characterized by extremely autocratic rule was established. In the system Bangladeshis had little representation or participation (in either political or military power). Bengalee economists see the association with West Pakistan as a time of economic exploitation, in fact, as a second colonial era.

There can be little doubt that in the early years of Pakistan the financial resources of East Pakistan were diverted to West Pakistan (Faaland and Parkinson, 1976). Numerous instances are cited by Sengupta (1972); for example, as the eastern wing contributed the bulk of the country's foreign exchange surplus, one would normally have expected a much higher rate of industrial growth in that part of the country. However, the rulers of Pakistan pursued a policy of economic exploitation of the eastern wing and drained out its resources for the enrichment and development of the western wing (Dutt et al., 1973). Battacharya (1972) in a well documented paper on the external trade of Bangladesh has provided a detailed account of how the rulers of Pakistan followed a commercial policy aimed at utilizing the surplus of East Pakistan, restricting its foreign imports and creating a sheltered market therein for West Pakistani products

Even with the growing dissatisfaction, Bangladesh remained part of Pakistan for about 24 years i e from August, 1947 to March, 1971. During this time the situation gradually worsened and became progressively more unhappy, both politically and economically (Faaland and Parkinson, 1976) Successive five year development plans were implemented, but East Pakistan did not get its due share compared to West Pakistan and remained relatively disadvantaged The following section is provided to focus on the dimensions of rural poverty in East Pakistan

Dimensions of Rural Poverty: 1960s Condition

Bangladesh is one of the poorest countries in the world in terms of per capita income (World Bank Annual Report, 1987). It also suffers from substantial inequality of income distribution (Alamgir, 1974). Reviewing the situation of income distribution in the 1960s, in the then East Pakistan, the following characteristics emerge. From a national perspective, the highest 20 per cent of the population received about 46 per cent of national income in 1963 whereas the lowest 20 per cent received only 7 per cent (Bergen, 1967; Islam, 1978). From a spatial perspective, the average income of the urban population was about two-thirds higher than the average rural income in the early 1960s (Table 3.1). The urban 'rich' were more affluent than the rural 'rich' and by more than the differential between average urban and rural incomes (Bergen, 1967).

According to the Ministry of Health Report (1962), about 61 per cent of the rural population suffered from protein deficiency in 1962. According to an International Labour Organization (ILO) study in 1963, about 85 per cent of rural households had per capita family income below the level required to provide an adequate intake of calories (2148). A survey in the late 1960s indicated that about 45 per cent of the rural families suffered from calorie deficiency (Islam, 1978). Defining "absolute poverty" as availability of calorie intake at 90 per cent and "extreme poverty" at 80 per cent of the recommended (2148 calories) intake, 40 per cent of rural population were estimated to suffer from absolute poverty in 1963; and about 5 per cent of the rural population were estimated to suffer from extreme poverty (Alamgir, 1975a). Since the overwhelming majority of the population live in rural areas, the profile of rural poverty truly portrayed the dimensions of deprivation and inequality in the country at the

Index	Year	Rural	Urban
Per Capita Income (Rs. in 1959-68 prices)	1959-60	244.0	625.0
	1969-70	279.0	761.0
Per Capita Consumption (Rs. in 1966-67 prices)	1963-64	318.0	454.0
	1066-67	348.0	471.0
Average Rate of Saving (in per cent)	1959-64	5.1	13.2
	1965-70	5.7	16.5
Per Capita Expenditure on Food (as % of total expenditure)	1963-64	68.0	56.1
	1966-67	73.8	62.5
Unemployment and Underemployment (as % of total labour force)	1964-70	32.0	15.0
People Below Poverty Level (in per cent)	1963-64	87.6	73.6
	1968-69	71.3	62.4

Table 3.1 Selected Economic Indices for Rural and Urban Areas
Source: Paul, 1981.

national level (Islam, 1978; Johnson, 1982).

During the late 1960s there was an increase in the incidence of rural poverty and inequality (GOP, 1968). For example, the absolute number of landless labourers increased from 1.51 million in 1951 to 3.40 million in 1967, whereas, as a percentage of agricultural population they increased from 14.3 per cent in 1951 to 19.8 per cent in 1967. The inequality of rural income is mainly caused by unequal land holdings. The total number of small farmers (defined as those with operational holdings of less than 2.5 acres) increased from 51.6 per cent to 56.6 per cent between 1960-1967. In 1968, about 57 per cent of the farms were less than 2.5 acres each and accounted for 21 per cent of the cultivated area, whereas 8 per cent of the farms, above the size of 7.5 acres, accounted for 31 per cent of the area (GOP, 1968; Islam, 1978; Alamgir, 1980). According to Esman (1973) 28 per cent of the rural labour force was landless.

Emergence of Bangladesh: Political Antecedents

The two dozen years of relative neglect as East Pakistan meant that Bangladesh at the time of independence in 1971 was probably the poorest nation in the world (Johnson, 1982). It was clear that the policies of the Pakistani regime had failed to capture the stated national objectives. Its attempts at national integration were unsuccessful, and at the end it turned out that the nation could not even be held together through force. Its economic policy had shown good results in terms of overall economic growth, but only a few had benefited; and disparities had grown not only between regions but also between social classes (Alamgir, 1975a; Faaland and Parkinson, 1976; Stepanek, 1979; Westergaard, 1985).

The defeat of the opposition in the 1965 presidential election marked a turning point in the Bengal nationalist movement (Jahan, 1973b). With the failure of Combined Opposition Parties to change the political system through the electoral system, the Awami League President Sheikh Mujibur Rahman adopted a more radical strategy, and prepared a proactive mobilization of the masses in support of demand for full regional autonomy. This was met with enthusiasm by majority of the people in East Pakistan, although not all sections of the political elite were in favour of the resurgence of the Awami League.

Meanwhile, both West Pakistan and East Pakistan were in chaos, and mass-movements took on increasingly radical demands. In this situation Ayub Khan (President of Pakistan) resigned in March 1969, and handed over control to the army, and martial law was imposed. In November 1969, Yahya Khan, the chief martial law administrator of the country announced a national election on the basis of population whereby the majority of the seats were given to East Pakistan. The elections were scheduled for October 1970, and later postponed to December 1970, because of a severe cyclone in East Pakistan The Awami League won almost all seats (167) in East Pakistan, however, it did not win a single seat in West Pakistan, where the majority (81 out of 140 seats) went to Bhutto's Pakistan People's Party The latter, however, did not win any seats in East Pakistan (Jahan, 1973b, Westergaard, 1985)

The election results thus reflected the complete polarization between East and West Pakistan. Furthermore, with the majority of the seats in the National Assembly, the Awami League was in a position to dictate the new constitution, which it insisted should be on the basis of the regional autonomy programme. This was clearly not acceptable to the Pakistan People's Party. Bhutto refused to attend the opening session of the national Assembly, and on 1st March 1971, Yahya Khan announced the postponement of the session. As a result, a non-cooperation movement emerged in East Pakistan and became intensified during the period 1 to 25 March. While Yahya Khan was engaged in negotiations with the Awami League Leadership, the army at the same time built up its strength in East Pakistan (mainly in Dhaka, Chittagong and Khulna), sending reinforcements by air and sea from West Pakistan. The military crack-down took place in the evening of 25 March, and at the same time Sheikh Mujib was taken prisoner. When independence of Bangladesh was proclaimed in the 26th of March, 1971, the struggle became a civil war. The final outcome of the war, which caused heavy material damage, was the break-up of Pakistan, terminating in victory in December 16, 1971, in which Indian military help was a decisive factor (Jahan, 1973b; Westergaard, 1985).

The new state proclaimed itself secular and parliamentary, and under Sheikh Mujib as Prime Minister, the Awami League Government pursued leftist policies, nationalizing industry, and allying itself, with communists at home, and showing some bias towards India and U.S.S.R. Democratic government, as had been known in the early years following partition of British India, proved elusive, and following a year of political troubles and disastrous floods in 1974, a new constitution was promulgated under which Sheikh Mujibur Rahman became President of a one-party state (Johnson, 1982).

In August 1975 the President and his family were assassinated in a coup led by a group of army officials, on the pretext that the leadership had become corrupt. A counter-coup in November 1975 led, eventually, to the emergence of General Ziaur Rahman (Zia), the Chief of Army Staff, as military dictator. The subsequent course of events has produced an amended 'Islamic' constitution, a retreat from the socialist policies of earlier days, and in 1978-79 a return to near normality and political legality. General Zia was confirmed President in 1978 and introduced a modified 'approved' multi-party political system leading to elections for the Jatia Sangsad (National Assembly), in February 1979 (Johnson, 1982).

On May 1981, President Zia was assassinated in an attempted coup led by an army General, who was himself subsequently killed. Pending a presidential election the vice-President leads the government. Before any constitutional provisions could be made, the army, under the leadership of Lt. General Hossain Mohammed Ersshad (present President), on 24 March 1982 took over the direct and complete control of the country. The bloodless transfer of power was not unexpected, as the civilian government's ability to stop corruption and manage the economy and the law and order situation had steadily deteriorated. We stop at this point since the political happenings after 1980 is beyond the scope of this study. But, it remains to examine the sequence of development policies that were applied during the period 1960-1980.

Residual Social Policy Model: Growth Pole Strategy

Capital intensive western growth models were the basis of national development in a labour intensive economic system like Bangladesh. Whether the emphasis was on industrial growth, import substitution, export diversification, or some other leading edge of urban growth, agriculture and the rural population played a secondary role in East Pakistan in 1960s (Faaland and Parkinson, 1976; Stepanek, 1979). It was assumed that agricultural production would grow to feed cities and that industrial growth would generate employment to absorb displaced agricultural labourers, as had been the case in developed countries. Spatial aspects of a comprehensive national development strategy were, therefore, overlooked during the Pakistani regime which resulted in increased spatial inequality across the national space of East Pakistan.

It has already been mentioned that the central government of Pakistan was essentially biased towards West Pakistan from the very inception of the country. As a result, economic growth particularly based on industrialization were emphasized in the western wing of the country. Development works that occured in East Pakistan during the period 1960-1970 were peripheral to the main focus of Pakistan, and, as such, were mainly concentrated in the primate cities, notably Dhaka, Narayanganj, Chittagong and Khulna (Figure 3.9). Districts representing these cities were more urbanized (Figure 3.10) compared to the rest of the country.

The nature of spatial disparity in Bangladesh is critically examined by Paul (1981) for the period just after independence. Using the percentage of urban population, literacy rate, family size, population growth rate, farm size, per capita cropland, intensity of crop, proportion of owner farmer and area under high yielding varieties (HYV) of rice (Table 3.2), Paul differentiated the four major Administrative Divisions of Bangladesh (Figure 3.1a).

Many of these indices were found positively associated with the income of individual According to Paul (1981) the Northern Administrative Division is less urbanized in the country ((Table 3.2), but agriculturally this Division is in better position (Ali, 1986) compared to the Southern Division. The Southern Division, on the other hand, is more urbanized compared to the Northern Division. But the region which includes the moribund and active delta plain is agriculturally less developed, the main reason being that the southern part in particular, is disturbed by the intrusion of saline water from the Bay of Bengal. The Central and Eastern Divisions are more advanced from urban and industrial points of views. Economically these regions are in better position, though (because of higher population density) average farm size and per capita cropland are lower than the initial two regoins

This spatial differentiation is partly a result of an uneven growth in East Pakistan during both 1950s and 1960s. It is to be noted that people of Chittagong Hill Tracts differ in race, religion, culture and language from the overwhelming majority of the people of Bangladesh. In contrast, there is no difference in these characteristics between the people of Northern Division and the rest of the country.

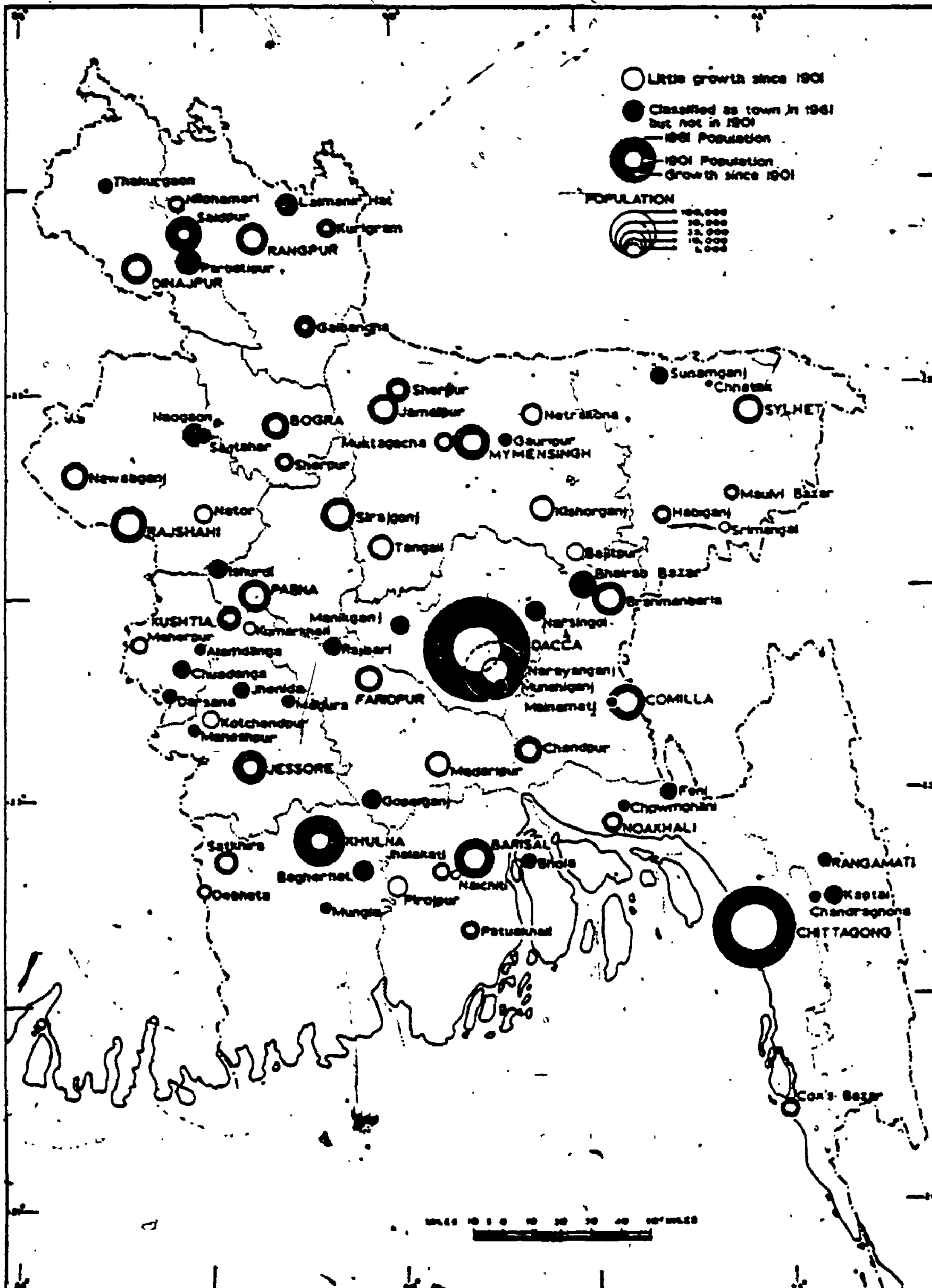


Figure 3.9 Growth of Towns: 1901-61
Source: Ahmad, 1968.

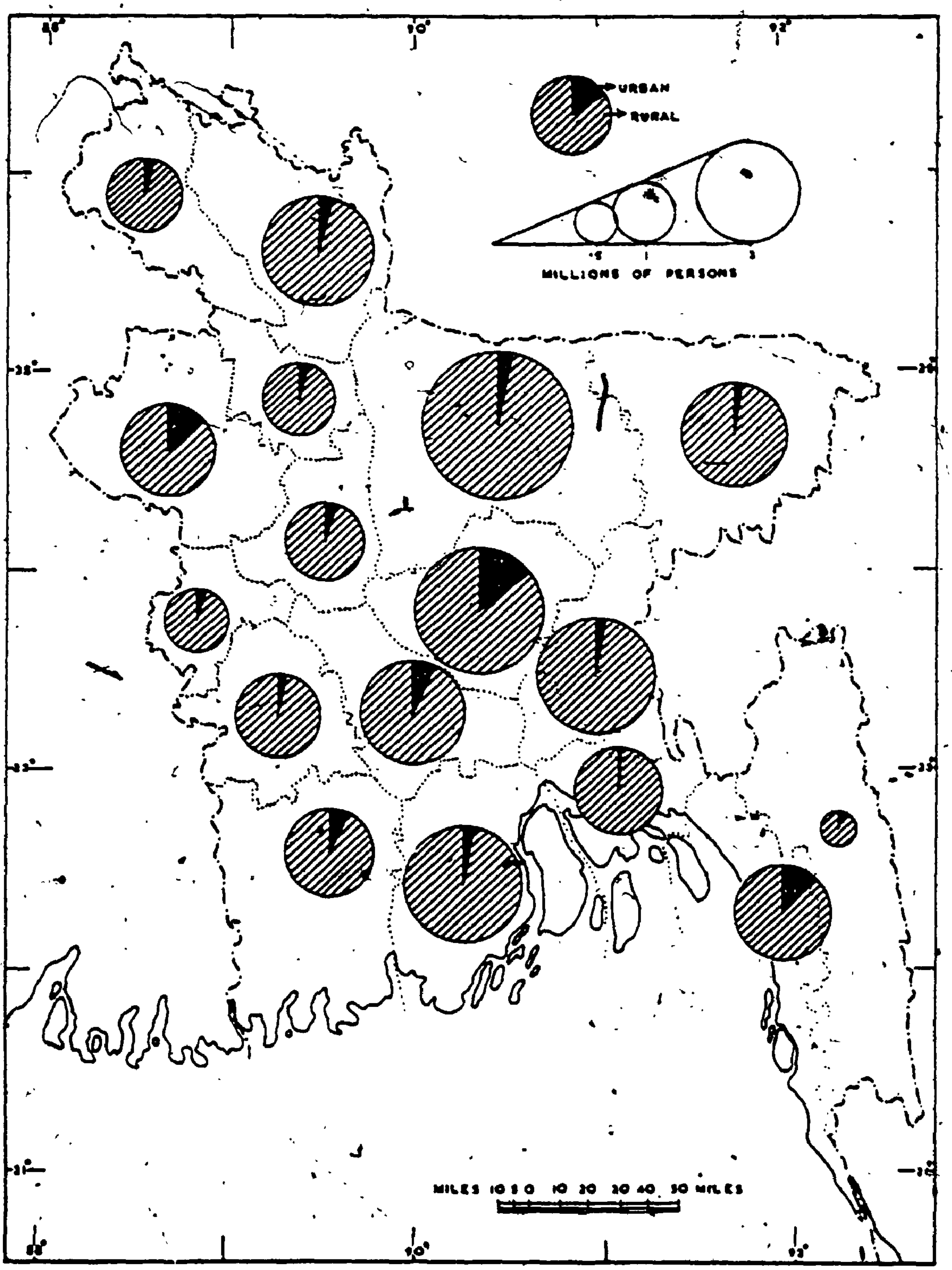


Figure 3.10 Urban and Rural Population (1961)
Source: Ahmad, 1968

Region	Division/ District	% of Urban Population (1974)	Literacy Rate (1974) (in %)	Family Size (1974)	Pop.Growth Rate (1961-74) (in %)	Av. Farm Size (1969–70) (in acre)	Per Cap. Crop Land (1975-76) (in acre)	Intensity of Crop (1975-76)	% of Owner Farmer (1969-1970)	Area Under HYV (1976-1977)
Central	Dacca Div.	10.8	20.0	5.8	3.2	3.1	.42	157.6	60	14.9
Eastern	Chittagong Division	8.2	23.6	5.2	3.1	3.4	.64	150.6	77	27.2
Northern	Rajshahi Division	5.2	19.1	5.6	3.6	4.4	.68	151.8	50	6.5
Southern	Khulna Div.	7.0	25.2	5.7	3.2	4.3	.44	131.3	55	7.2
	Dacca Dist.	29.6	26.3	5.8	3.8	2.3	.23	145.7	63	18.1
	Chittagong District	20.1	29.7	5.6	3.4	2.9	.42	146.8	63	52.4
	Khulna Dist.	14.6	28.5	5.7	3.5	3.6	.33	123.3	61	5.2
	Chittagong Hill Tract	10.2	18.2	5.3	2.5	4.2	2.15	157.1	90	47.0
	BANGLADESH	7.8	22.0	5.6	3.3	3.8	.55	148.5	60.6	13.5

Table 3.2 Regional Comparison of Selected Socio-Economic Indices
Source: Paul, 1981.

The regional dissatisfaction that evolved particularly in the Chittagong Hill-Tracts is a current threat to the national solidarity and is likely to become an urgent political issue.

Rural Development Policies: 1947-1980

There never was a comprehensive national policy for the rural sector in East Pakistan (Hossain and Jones, 1983) The Pakistan government started a community development programme known as V-AID (Village Agricultural and Industrial Development) soon after the partition of British India in 1947. But this was on a rather limited scale. During the Pakistan First Five-Year Plan period (1955-1960) only very limited efforts were made. (Hossain, 1977). The Pakistan government's attempts to specifically foster rural development in East Pakistan date back to only the early 1960s, particularly, the Pakistan Second Five Year Plan period (1960-1965) This was a period of planning and experimentation, the East Pakistan Water and Power Development Authority (WAPDA), the East Pakistan Agricultural Development Corporation (EPADC) and the Integrated Rural Development Programme (IRDP) were established.

The 1970s (post independence period) saw the rapid expansion of these programmes and increasing attempts by the government of Bangladesh, normally with the support of international donors, to develop new programmes addressed to the varied agro-ecological and socio-economic problems of the country (Dumont, 1973a; 1973b) Since the emergence of Bangladesh in 1971, the successive governments have been taking initiatives towards more uniform economic growth throughout the country As prescriptive policy models, the new government of Bangladesh introduced several approaches, in succession, in order to reduce the profound initial structural imbalance at the national scale. Among these, the rural growth centre approach (promotion of rural service centres) was of prime importance. The establishment of rural growth centres to make optimum provision of economic and social services to people at the regional level was increasingly advocated in the early 1970s. In the late 1970s, the growth centre, however, was not seen as a substitute for a strategy which tries to identify investment and policy priorities, but ~~a framework~~ for realizing these priorities (Stepanek; 1979).

Capital and technology transfers through the mechanization of agriculture was another policy options in the later phase of First Five Year Plan period (1973-1978). The high-yielding varieties (HYV) of seed (associated with pesticides, chemical fertilizer, irrigation equipments, drainage, credit facilities, institutional reforms etc.) and the emphasis on population control became twin elements of a new theory of "equitable growth" for Bangladesh. As a result of the thrust, there were "target-group" and "basic need" oriented approaches under the slogan of "Self-Reliance Movement", "Green Revolution" and "Grow More Food Program". These were primarily initiated by the Integrated Rural Development Programme (IRDP) and "Food for Works Programme" undertaken by the World Food Programme during the mid-1970s. These were introduced to create a situation in which the basic needs of a poverty striken people could be met within the shortest possible time. However, due to a defect in the institutional base (IRDP) the unified objective of growth and equity were not fully realized (Faaland and Parkinson, 1976; Islam, 1978; Alamgir, 1980; Hossain and Jones, 1983).

Rural development policy in both East Pakistan and Bangladesh has been characterized by a plethora of overlapping and frequently contradictory programmes run by different government ministries and departments often under the patronage of different international aid agencies. Today there are two co-operative systems, three different sources of institutional agricultural credit for farmers, two agricultural extension systems, as well as specialized services for individual crops such as jute and sugar, three different organizations for rural public works and a constant confusion over whether the government is backing private or co-operative sectors as the main vehicle for rural development (Islam, 1977, 1978, DeVyalder and Asplund, 1979; Hossain and Jones, 1983)

However, those efforts have had a considerable impact on both the use of new agricultural technology and on production For example, foodgrain production increased from 8 8 million tons per year in the early 1960s to an average of 14.3 million tons in the late 1970s. The area irrigated by modern methods (deep tubewells, lowlift pumps from rivers and canals) increased from zero to nearly 1.8 million acres out of a net cropped area of 22 2 million acres The use of chemical fertilizers rose from nothing to an average of 102 3 lb per acre (Hossain and Jones, 1983)

Policies on the Development of Water Resources:

Water resource development in Bangladesh is the responsibility of both the Bangladesh Water Development Board (BWDB) and the Bangladesh Agricultural Development Corporation (BADC). These institutions are the modified names (after 1971) of East Pakistan WAPDA (water wing only) and EPADC respectively. BWDB has been concerned mainly with large-scale flood control, drainage and irrigation schemes, BADC with minor irrigation- low lift pumps, deep tubewells, shallow tubewells and hand tubewells. However, by the end of the 1960s none of the BWDB schemes was fully operational, whereas BADC were renting out over 20,000 low lift pumps (of 13.3 Gallons per second capacity) each dry season to farmers groups and had installed about 1000 deep tubewells. In total BADC were irrigating about 741,300 acres compared to about 148,260 acres by BWDB by the end of 1960s (GOB/World Bank, 1979).

Soon after the independence of Bangladesh in 1971, the World Bank carried out a comprehensive "Land and Water Sector Study" (World Bank, 1972). This study was based on the experience gained in the 1960s and on new hydrological and agro-ecological data that had become available. The recommendations of the study, which have formed the basis of government policy since then, called for a significantly different pattern of development from the existing master plan. A rapid increase in food production rather than flood protection became the main aim of government water resources policy. The implementation of small, quick-yielding projects, such as minor irrigation and small-scale flood control and drainage schemes was to become the major thrust of water development programmes. BWDB was encouraged to move along this line. Despite this apparent change in policy, BWDB continued to allocate most of its annual development budget to flood protection and drainage (World Bank, 1972).

Thus, through the 1970s while BWBD continued to emphasize long term, medium and large scale projects, BADC and, to a lesser extent IRDP rapidly expanded the area covered by minor irrigation schemes. During 1970-80 the area irrigated by low-lift pumps were more than doubled and that covered by deep tubewells increased six fold. Over the twenty years or so since the organizations were formed BWDB has received about 53 per cent of government funds allocated for water resource development and BADC the remainder The programme of BADC, however, has been far more successful. By 1980, about 4 million acres were irrigated in Bangladesh- 2,223,900 acres by low-lift pumps and tubewells, 1,680,280 acres by traditional swing-baskets and water scoops, and only about 172,972 acres by BWDB large schemes (World Bank, 1972; DeVylder and Asplund, 1979, GOB/World Bank, 1979; Hossain and Jones, 1983).

Policies for the Development of Rural Institutions: IRDP

Parallel to the development of water resources the governments of both East Pakistan and Bangladesh made a major effort to develop rural institutions The effort started in the early 1960s at the East Pakistan (later Bangladesh) Academy for Rural Development in Kotbari, Comilla district, and became known a the Comilla model. It was gradually extended to other districts in by 1968 and officially adopted as a national programme in East Pakistan in 1970. After the independence of Bangladesh in 1971 it became widely known to the other parts of the country as IRDP (Abdullah et al, 1974; 1976).

The programme developed in Comilla comparised five related components. These were, first, a two-tier co-operative system of farmers co-operatives (Krishi Shamaby Samities or KSSs) federated in 'Thana'-level (sub-district now known as Upazilla) central co-operative societies (Thana Central Co-operative Associations or TCCAs); second, in each Thana Training and Development Centres (TTDCs) for the training of model farmers, managers and chairmen of the KSSs, and to serve as centres for the diffusion of new technologies to the local farmers; third, a Rural Works Programme (RWP) designed to build rural infrastructure in order to promote risk-free agriculture, improve communication and provide employment for the rural poor during the normally slack dry season; fourth, a Thana Irrigation Programme (TIP) to ensure efficient use of irrigation equipment such as LLPs by informal farmers groups (pre co-operatives); and fifth, a system of landless co-operatives organized to undertake non-agricultural activities and federated into a Special Co-operative Societies Federation (SCSF) which was itself federated to the TCCA (Raper, 1970; Dumont 1973b; Abdullah et al., 1974; Štepanek, 1979; Hossain and Jones, 1983).

The Comilla approach was largely successful in the district of Comilla. It led to increased agricultural production and employment, the development of agricultural skills and stimulated the local accumulation of capital (Khan, 1979). In 1972, IRDP covered thirty three Thanas. By 1980 there has been a rapid expansion to 267 out of the total of 475 Upazillas. The number of KSSs jumped from 6,000 to 40, 000 and the number of members from 136,000 to 1.3 million. The shares and savings of KSS members increased from 11.6 million Taka to 92.5 million (about US $4.5 million/ 1980) and by 1980 IRDP was providing institutional agricultural credit to one-third of all households taking such loans. Moreover, KSS groups were found to use irrigation equipment more effectively than non--KSS groups. In a study of twenty-five Upazillas (sub-district) it was observed that DTWs and STWs operated by KSSs irrigated 25.5. hectares and 4.5 hectares respectively, compared with 17.8 hectares and 2.8 hectares for non-KSS groups ((Raper, 1970; Abdullah et al., 1974; GOB/World Bank, 1981). The apparent potential of IRDP as a way of promoting rapid economic growth even attracted some donors to support intensive area development projects (i.e., World Bank's RD-1 project) However, there were certain drawbacks in the original ideas of IRDP, particularly, in the lack of agricultural growth linkages to the marginal farmers (Islam, 1978; World Bank, 1979).

Failures of IRDP: Marginal Groups Remained Untouched

By the end of 1970s, IRDP was not seen as a real "integrated" programme The programme neither successfully integrated the activities of the different government departments at the Upazilla level, nor were the rural poor involved in its activities The IRDP was in essence just the two-tier co-operative system of the Comilla model- an organization of farmers groups for the provision of the short-term agricultural credit and training. Sometimes KSSs also rented minor irrigation equipment from BADC but by the end of 1980 less than about 45 per cent of DTWs and LLPs were operated by such co-operatives. This was mainly because there was no clear government directive that such equipment should be preferentially given to KSS as had been the case in the original Comilla model. The TIP, TTDC and RWP components of the original Comilla approach had all been adopted as part of national programmes in the 1960s and while links were maintaineded between the different programmes at the local level this was done by the Thana/Upazilla development committee of the Thana/Upazilla Parishad (council), not as part of an integrated programme. Similarly, the landless and the marginal farmers were excluded from the TCCA-KSS system of the IRDP, membership of which, until very recently was restricted to those with land. No attempt was made to expand the highly innovative and succesful system of landless co-operatives developed originally in Kotwali Thana, Comilla (Reaper, 1970; Abdullah et al., 1974; Rahman, 1974; 1979; 1981; DeVylder and Asplund, 1979; Stepanek, 1979; World Bank, 1979; Hossain and Jones, 1983).

Impact of Production Oriented Development Strategy

Although the rapid spread of minor irrigation equipment and of IRDP co-operatives over the past two decades (1960-1980) has led to significant growth in agricultural production, it was far less than had been planned and was associated with both regional and socio-economic inequality in the rural economy. Agricultural growth was the main concern during 1960s and the question of distributional equity remain untouched or by passed until the late 1970s (Hossain and Jones, 1983).

The high growth regions of the past two decades (1960-1980) are those where surface or ground water irrigation is easily available and are generally the more shallowly flooded areas where HYVs can be cultivated without risk. Comilla, Chittagong, Dhaka, Mymensingh, Tangail and Bogra districts all experienced rapid development (Figure 3.3c).. By 1978-79 about 13.5 per cent of the crops in these districts was irrigated by modern methods and fertilizer use (158 lb per acre) was over 50 per cent higher than the national average. Even within each of these districts there are internal spatial variations (Hossain and Jones, 1983).

The low growth districts, on the other hand, tend to be the lower lying more deeply flooded areas such as Fridpur and Rangpur, saline water affected regions such as Pautakhali and Khulna and areas with lower irrigation potential such as Jessore and Chittagong Hill-Tracts (Figure 3.3c). In these districts only 3.7 per cent of cropped land is irrigated by modern methods and fertilizer use averages only 57 lb per acre. The rest of the country comprises what may be called medium growth districts in which, on average, 6.8 per cent of the cropped land is irrigated by modern methods and fertilizer use is slightly less than the national average at 87 lb acre (Hossain and Jones, 1983).

Socio-economically it is those with land who have benefited most from the production oriented strategy of the last twenty years Often, indeed, the "richer" of them have managed to control the pattern of development in their own interest. On the other hand, the real wages of poor declined by 16 per cent over the 1970s and their nutritional condition deteriorated. The distribution of land ownership is uneven enough to ensure that the benefits of a production oriented rural development strategy are going to be shared unevenly. For example, the latest national-level survey of land ownership recorded that in 1978 about 50 per cent of households were effectively landless (owning less than 0.50 acre), while the top 5 per cent of rural households (those owning 6.2 acres or more of land) owned about 40 per cent of the total agricultural land in the country. This indicates that most of the benefits of increased agricultural production are captured by the rich and trickle down to the poor is either through tenancy or through the expansion of labour markets (Blair, 1974; Khan, 1977; Islam, 1978; Hossain, 1980; Alamgir, 1980).

In the 1970s the agrarian structure became even more polarized as a result of distress sales by poor peasants after disasters such as the 1974-75 famine. The rapidly rising population and the resulting subdivision of holdings together associated with the tendency of the rich and middle peasants to use their agricultural surplus to buy land, mostly favoured the rural elites versus the poor and marginal farmers (Haq, 1976c; Rahman, 1981). This polarization of the agrarian structure was fuelled in part by the disproportionate share of the growth in agricultural incomes which the rich and the middle peasantry were able to capture through their control of government channels for the distribution of agricultural support services. Large landowners controlled fertilizer and pesticide dealerships and so, at times of shortage, were least affected and able to charge a higher price to other cultivators (Haq, 1977). They dominate the irrigation groups formed for obtaining government supplied power pumps or deep tubewells and influence the selection of sites so as to get maximum benefits for themselves (Jones, 1979).

They also, through their local influence, get preferential access to cheap institutional credit and, as such, are the largest beneficiaries of the government credit programmes (Hossain, 1981).

Distributive Justice: A Major Policy Reorientation

During the late 1970s increasing attention was paid by the government to the distributive aspects of rural policy as a response to the impact of production oriented strategy. Policy statements of the government in the recent past reflected the increased concern for the decentralization of administration and development programs (Islam, 1977; 1978). In a major policy statement, "the Rural Development Expansion Programme", a rural development strategy for the country was outlined with three main objectives 1) to increase agricultural production, 2) to create new employment opportunities for the rural poor through rural works and rural industrialization, and 3) to strengthen rural institutions for the effective delivery of development services to all socio-economic groups (GOB, 1977). In this light, it is not surprising to find one of the main objectives of the Second Five-Year Plan (1980-1985) to be comprehensive rural development, by which is meant, the reduction of poverty, provision of basic needs, expansion of gainful employment opportunities and in short- to improve the quality of life of common people (GOB, 1980, Chapter VII).

In the First Five Year Plan period (1973-1978), there were a few projects- the aim of what was to promote regional development. One of the basic objectives of the Plan was to achieve a more equitable distribution of income, partly through redirecting public expenditures towards the poorest sections of the population and partly through the diffusion of employment throughout Bangladesh. An important step in respect of the expansion of employment opportunities throughout the country, was evident from the government's policy which imposed regional or district quotas for employment in the public sector agencies (GOB, 1977; Islam, 1978; Alamgir, 1980).

The most significant project for the development of the Northern and Southern Administrative Divisions (west part of the country) was the construction of a bridge over the Jamuna river to link the region with the Central and Eastern parts. The bridge was considered important specially for development of the North and South Bengal and to serve as a mechanism for the diffusion of the effects of development in the Central and Eastern Divisions towards the Northern and Southern Divisions. Presumably, it will help in increasing inter-regional trade and factor movements. But unfortunately, due to some technical problems the project is still in an immature stage (Gob, 1976; Paul, 1981).

Unlike other parts of Bangladesh, the coastal districts of the South-western deltaic region have been subjected to frequent cyclonic storms and tidal surges from times immemorial. These cause loss of lives and damage to property. These factors have a profound bearing on the economic development of the region. To promote the development of the region and minimize the loss, the First Five Year Plan has undertaken some measures which included construction of coastal embankments and cyclone shelters in the area. Its aim was also to develop warning system so that the people could be alerted to the natural hazards. Afforrestation programs along embankments were envisaged to counter erosion problems. The Plan proposed construction of a road-network connecting the coastal areas with the interior parts of the country. This is important for quick evacuation when severe disasters are foreseen (GOB, 1976; Paul, 1981).

To improve the rural health condition, the Plan formulated a scheme to construct 150 Rural Health Centres in different parts of Bangladesh. Similarly the plan recognized the importance of IRDP which was planned to promote the stagnant rural economy and for generating employment (GOB, 1976).

Apart from the above, there were other programs which include i) Regional Planning Scheme, ii) Urban Planning Scheme and iii) National Physical Planning Projects, etc. The National Physical Planning Project has some fundamental objectives, which include i) to begin the preparation of a comprehensive national plan with the preparation of 10 special area development plans of the most populous and dynamic urban centres, other than Dhaka, Chittagong and Khulna and ii) to establish physical planning as a national strategy of developing human settlements through the enactment of appropriate planning legislation (GOB, 1976; World Bank, 1979; Paul, 1981)

It has been mentioned earlier that the present government is more concerned for balanced regional development. Certain major steps have already been taken to this direction. Divisional Development Boards have been established for all four divisions (e.g. Dhaka, Chittagong, Khulna and Rajshahi) with the responsibility for overall development for their respective region. The objectives of the regional Boards are to prepare guidelines for the development of their respective region considering its resources, problems, needs and potentialities. They present their guidelines to the National Planning Commission for inclusion in the national plan. This is a high powered macro planning organization responsible also for the implementation of development programmes (GOB, 1976; 1980).

With the same objectives, City Development Authorities have been set up in Khulna and Rajshahi, like those of the Dhaka Improvement Trust (DIT) and the Chittagong Development Authority (CDA). The Urban Development Directorate, on the other hand, is the authority for formulating plans for all large regions or the country as a whole.

Thus, a number of regional and local organizations and institutions at different levels were developed prior to the preparation of Second Five Year Plan (1980-1985). Therefore, it is reasonable to expect a narrowing of spatial disparity among Bangladesh districts in the later phase of the study period (1974-1981).

The emphasis on the spatial aspect of the development has increased tremendously in recent years. Economists, planners and geographers in Bangladesh have been continuously stressing spatial planning, based on "social justice". Based upon the existing government's statements, commitments and certain programs that have been taken already, it is assumed that the regional approach to rural development planning in Bangladesh will get more emphasis in the future plans. However, there is a need for appropriate methodology as to how to approach the problem of developmental change within a spatio-temporal framework. The appropriate analytic techniques and methodological issues are therefore, discussed in greater detail in Chapter 4.

CHAPTER 4

The Methodology for Assessing Rural Development

Introduction

This chapter discusses the methods used in this study to examine the characteristics of and the means to evaluate the changes taking place in rural Bangladesh between 1960 and 1980 The discussion includes the development of the spatial base of observation, i.e the 71 Districts, and its use as the basis for information collected for the three census years, 1961, 1974 and 1981 For those three years a specific choice of data items was made in relation to the objective of identifying rural and regional change The choice of data items and their sources is discussed The heart of the investigation is the analysis of the information on a spatio-temporal basis. The analysis, the results of which are presented in Chapters 5, 6 and 7, follows a sequence of analytic techniques which are discussed below. The sequence includes the analysis of individual variables (univariate analysis) in Chapter 5, multivariate dimensional analysis using the technique of factor analysis in Chapter 6, and finally, composite regionalization based on cluster analysis in Chapter 7 However, before dealing with the elements of information collection and methods of analysis, the chapter reviews first the methodological aspects of an approach based on social justice and the criteria of well-being in a Third World context

The Question of Social Well-Being

The conceptual overview adopted for this study is that, in the attempt to describe and evaluate development in a country so poor as Bangladesh, it is necessary (and appropriate) to concentrate on the overall condition of the mass of the people, and in terms that stress social rather than purely economic characteristics. This approach has been identified as one based on the concept of 'social justice', with the criteria being those of 'social well-being' (Chapter 2). In this methodological context, it is necessary to make these terms more explicit

In emphasizing social justice, and trying to determine evidence of development based on increased social well-being, one is implicitly in line with stated policy objectives put forward by the Bangladesh government. Its most commonly stated goal is "that the greatest prosperity can be achieved by the rural mass" (GOB, 1976). However, it is explicit, in this context, that the starting place is a condition of widespread poverty and disadvantage in the broadest sense, and that economic prosperity in terms of wages etc. is not the immediate goal. Rather, prosperity or poverty are seen as existing in relation to the most basic terms of access to basic needs, such as food, shelter and social amenities such as health care and education. Consequently, the concept of social well-being attempts to establish a composite information base that represents a common denominator situation.

There is never available an ideal set of information, but the attempt here has been to assemble an array of basic data in which both the individual variables and, especially, their composite assessment establish a base-level from which social well-being can be measured. This information can be looked at in relation to change in individual variables, on the overall assumption that positive change (in terms of the variable characteristics) indicates an improvement, however, minor, in terms of the well-being of the mass. However, the key is that development in terms of overall well-being is in fact a composite condition. Therefore, through the use of multivariate analysis, the study seeks to develop a composite measure, with, once again, positive change being interpretable as an improvement against the base level. The employment of univariate and multivariate analyses reflects the fact that each one of a number of variables has something to say about overall condition, and it may be expected that there will be a mixture of positive and negative changes in relation to specific variables, whereas on a composite basis it is the primary objective to see whether an overall measure of positive change, i.e. development or improvement in social well-being may be discerned.

The information is assembled and analysed on a spatial base. Unfortunately, this spatial base does not, of itself, nor in detail, differentiate precisely between rural and urban areas, and therefore allow a precise definition of rural development. Rather, an examination of the spatial base will distinguish in broad terms between the more and less rural Districts. Thus, the portrayal of change over time on the spatial base will allow some commentry on the changing levels of well-being, i.e. the widening or the narrowing gap between rural and urban, with the former generally considered as being the most disadvantaged area.

The spatial base will not, in this study, be looked at in terms of normative distributions, either on an individual or composite variable basis. Rather, change in spatial terms will, firstly, be descriptive of the range of conditions pertaining, and second, provide a potential basis for the assessment of the impact of further change.

in both absolute and relative terms. In terms of policy and planning, the identification of individual and compositely defined regions is deemed of particular importance, with the level of persistence of individually defined and composite levels of disadvantage and/or development being most significant.

In summary, the methodology here used is designed to reflect the basic concept of the need to recognize development in terms of positive improvement in the basic measures/characteristics of social well-being. Whereas individual variables will provide key insights into the nature of the 'development' process and its direction, only composite analysis of the array of variables that together represent social well-being, will provide the significant measure of change, both in overall terms and with respect to the urban-rural and regional framework.

Units of Spatial Observation

The general weakness of the regional development process in Bangladesh is, in part, evidenced by the absence of a systematic division of the country into any detailed framework of planning and/or development regions. Likewise, there is no precisely developed distinction between urban and rural areas above the very local unit (Thana, presently Upazilla) level. Unfortunately, the latter division of several hundred units is too detailed for comprehensive data collection and analysis. Consequently, this study has had to resort to the use of administrative units of observation. This has come to mean the division of Bangladesh into 71 Districts (both administrative and statistical), but the derivation of this set, and its relationship to urban/rural distinctions and to the planning process requires some explanation.

At the time of initial independence (1947), East Pakistan was divided into 17 administrative Districts. These, in turn, each contained several Sub-Divisions for a total of 64 in number (Figure 3.1b). Of the 64 Sub-Divisions, 17, one in each District, contained the main urban centre and gave its name to the District. Between 1947 and 1971 (Bangladesh independence) the Districts developed into identifiable local regions, with the central (Sub-Division) urban centres functioning as the administrative centre and the focus of what local development took place. Not all centres were of equal importance in terms of size etc. but an urban-rural division could be observed, such that there were 17 (Sub-Division) 'urban cores' and 47 (Sub-Division) 'rural peripheries'.

After the independence of Bangladesh in 1971, the situation changed somewhat, as 4 new Districts were created by breaking up Barisal (i.e. Patuakhali) and Mymensingh (i.e. Jamalpur, Tangail and Kishoreganj), which in turn enlarged the total number of initial Districts (i.e. 17 + 4 = 21). In the late 1970s, almost all administrative Sub-Divisions were converted into District status, with only minor exceptions (for decentralized administration), for example, the north/south Sub-Divisions of few major Districts (i.e. Dhaka, Chittagong, Comilla, Mymensingh and Barisal) are considered as representing single large Districts. At present, there are 64 administrative Districts in Bangladesh, to which have been added for this study, the 3 new statistical Districts in the Chittagong Hill-Tracts (Rangamati, Ramgarh and Bandarban Districts are sub-divided to

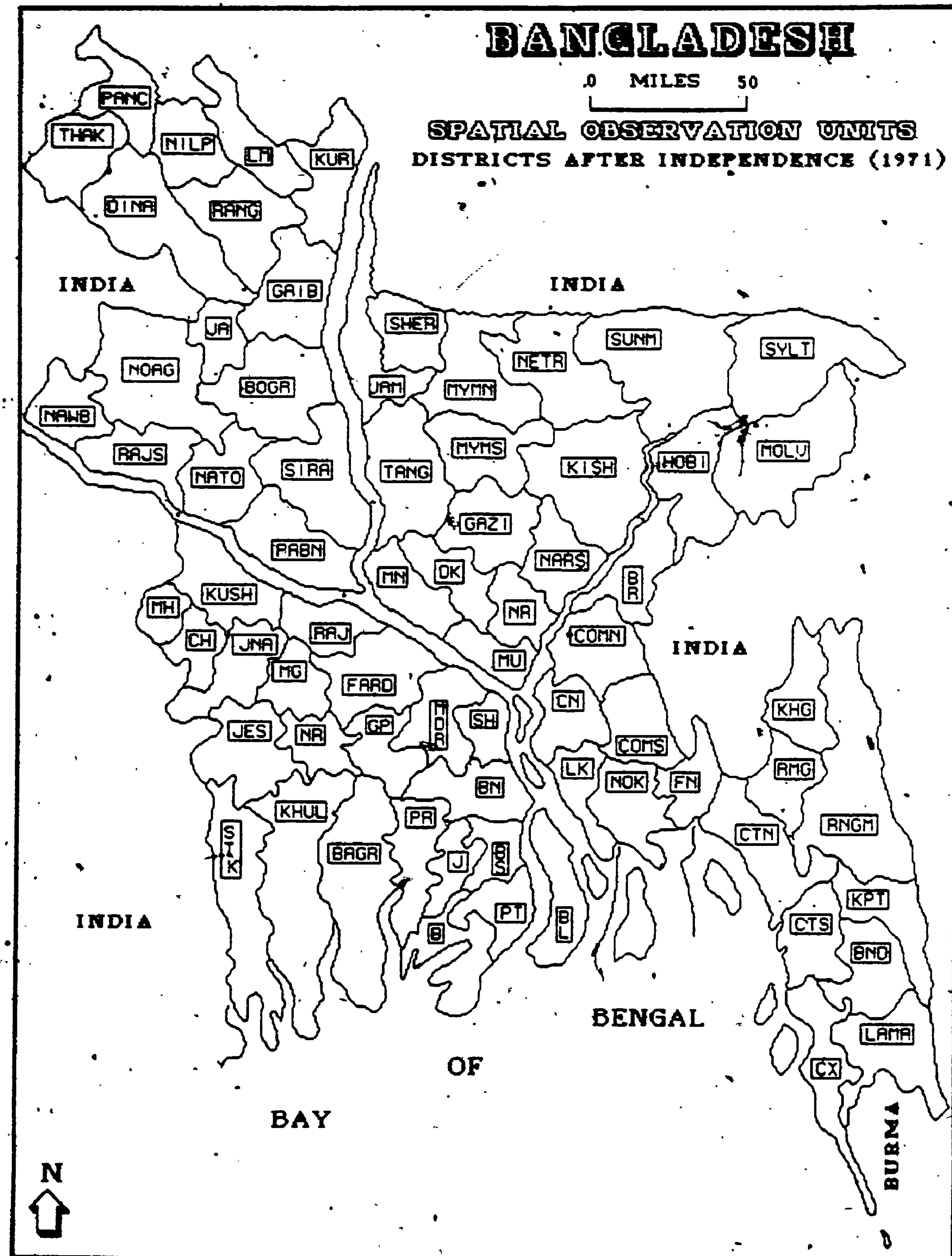

BANGLADESH
0 MILES 50
SPATIAL OBSERVATION UNITS
DISTRICTS AFTER INDEPENDENCE (1971)
INDIA
INDIA
INDIA
INDIA
BENGAL
OF
BAY
BURMA
N
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
MOLV
RAJS
MYMS
KISH
HOBI
NATO
SIRA
TANG
GAZI
PABN
MN
DK
NARS
BR
KUSH
MH
NR
CH
JNA
RAJ
COMN
MU
MG
FARD
KHG
CN
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
S T K
BAGR
J
BS
KPT
PT
CTS
B
BL
BND
LAMA
CX

Figure 4.1

TABLE 4.1

LIST OF DISTRICTS

Identification Number	Name of the Districts	Abbreviation/code
01	Chittagong Sadar North	CTN
02	Chittagong Sadar South	CTS
03	Cox's Bazar	CX
04	Bandarban	BND
05	Kapti	KPT
06	Khagrachari	KHG
07	Lama	LAMA
08	Ramgarh	RMG
09	Rangamati	RNGM
10	Brahman Baria	BR
11	Chandpur	CN
12	Comilla Sadar North	COMN
13	Comilla Sadar South	COMS
14	Feni	FN
15	Lakshmipur	LK
16	Noakhali Sadar	NOK
17	Hobiganj	HOBI
18	Moulvi Bazar	MOLV
19	Sunamganj	SUNM
20	Sylhet Sadar	SYLT
21	Gazipur	GAZI
22	Manikganj	MN
23	Munshiganj	MU
24	Narayanganj	NR
25	Narsingdi	NARS
26	Dhaka	DK
27	Faridpur Sadar	FARD
28	Rajbari	RAJ
29	Gopalganj	GP
30	Madaripur	MDR
31	Sariatpur	SH
32	Jamalpur	JAM
33	Sherpur	SHER
34	Kishoreganj	KISH
35	Mymensingh Sadar North	MYMN
36	Mymensingh Sadar South	MYMS

37	Netrokona	NETR
38	Tangail	TANG
39	Barisal Sadar North	BN
40	Barisal Sadar South	BS
41	Bhola	BL
42	Jhalokati	J
43	Perojpur	PR
44	Patuakhali Sadar	PT
45	Barguna	B
46	Jessore	JES
47	Jhenaidah	JNA
48	Magura	MG
49	Narail	NR
50	Bagerhat	BAGR
51	Khulna Sadar	KHUL
52	Satkhira	STK
53	Chuadanga	CH
54	Kushtia Sadar	KUSH
55	Meherpur	MH
56	Bagura Sadar	BOGR
57	Jaipurhat	JA
58	Dinajpur Sadar	DINA
59	Panchagarh	PANC
60	Thakurgaon	THAK
61	Pabna Sadar	PABN
62	Serajganj	SIRA
63	Noagaon	NOAG
64	Natore	NATO
65	Nawabganj	NAWB
66	Rajshahi Sadar	RAJS
67	Gaibandha	GAIB
68	Kurigram	KUR
69	Lalmonirhat	LM
70	Nilphamari	NILP
71	Rangpur Sadar	RANG

create Districts of Kapti, Khagrachari and Lama) and the 4 further statistical Sub-Divisions (North/South) of selected Districts (i.e. Chittagong North/South, Comilla North/South, Mymensingh North/South, Barisal North/South) for a grand total of 71 Districts. Figure 4.1 lists the 71 Districts using an abbreviation for which a full listing is given in Table 4.1. This 71 unit division of the country is the basis for spatial observation

It is important to note that in 1951, East Pakistan held 42 million people, 4.4 per cent of them in urban areas By 1981 the total was about 90 million, about 10.8 per cent in urban areas Between 1951 aand 1981, the urban sector increased by 412 per cent compared with 114 per cent overall Yet with only about 10 8 per cent of the population in urban areas, Bangladesh still ranks among the least urbanized countries (Johnson, 1982). In a country experiencing rapid urbanization from a base level of a generally dense rural population, it is often difficult to distinguish incipient urban nuclei from the agglomerations of rural settlements The proportion of the urban population living in the larger cities has been increasing while that in towns of below 50,000 has been decreasing. In 1981, about 74 per cent of urban dwellers were in 14 cities exceeding 100,000

In terms of an urban-rural pattern, on Figure 4 2 it may be noted that a distinction can be made on the basis of the size of the urban centres contained in the Districts Two Districts, Dhaka and Chittagong, contain cities of over 1,000,000, Khulna has a city centre of over 500,000, of the 11 other centres with over 100,000, 9 are the initial District headquarter towns of Narayanganj, Rajshahi, Sylhet, Barisal, Rangpur, Jessore, Comilla, Mymensingh and Pabna, plus the

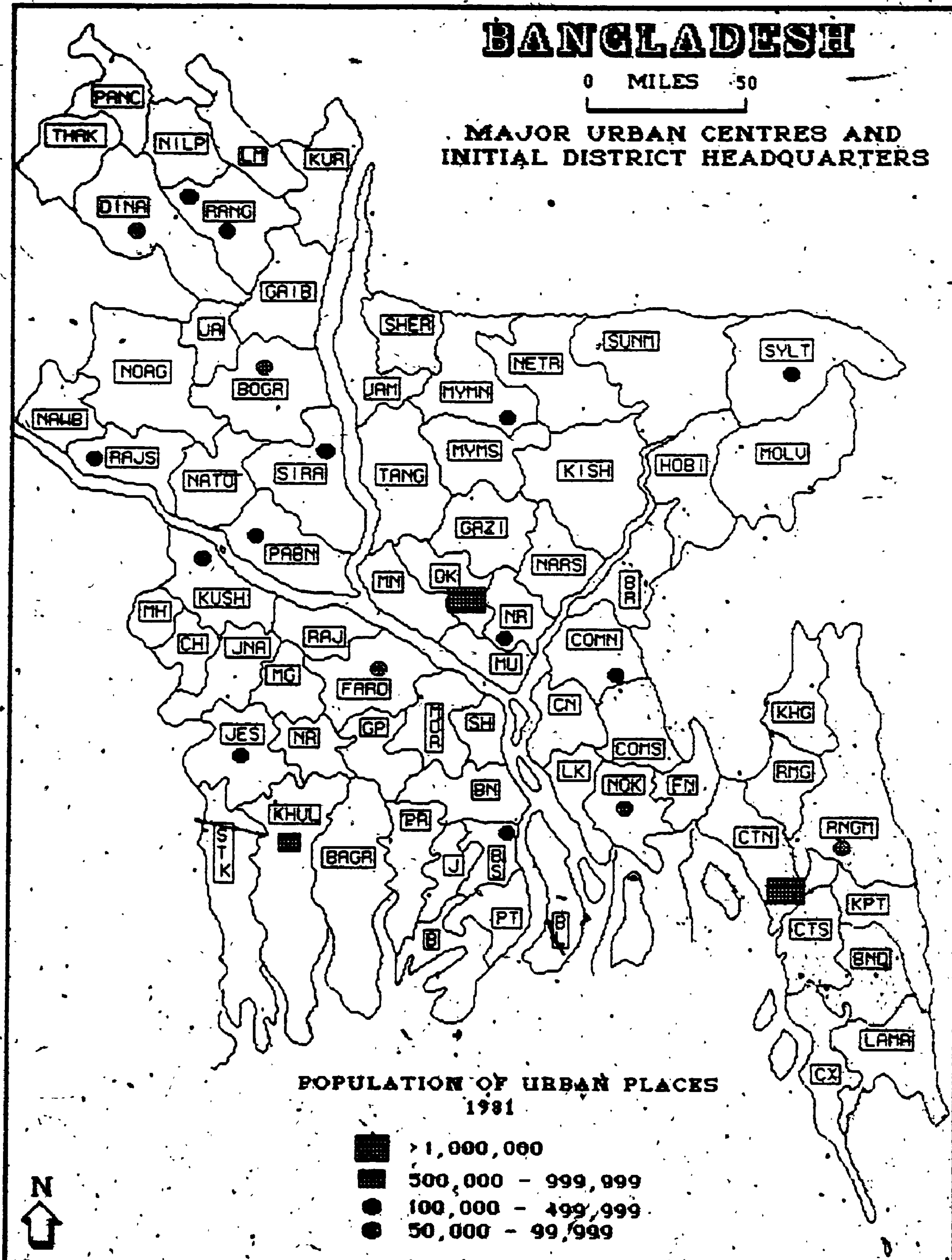

BANGLADESH
0 MILES 50
MAJOR URBAN CENTRES AND INITIAL DISTRICT HEADQUARTERS
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
UA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
BR
KUSH
MH
NR
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
PT
BL
B
KPT
CTS
BND
LAMA
CX
POPULATION OF URBAN PLACES 1981
> 1,000,000
500,000 - 999,999
100,000 - 499,999
50,000 - 99,999
N

Figure 4.2

jute centre of Serajganj (in District of same name) and the railway town of Saidpur (in Rangpur District). Of the 17 centres between 50,000 and 99,999 although five are District headquarter towns, the majority have simply local administrative and market functions including the collecting and processing of agricultural products for internal or overseas trade.

In broad terms, the urban centres with populations of above 100,000 are associated with 13 administrative Districts (Figure 4.3) and function as the "urban" units of observation for spatial analysis purposes although they may have rural populations and rural land uses within them. Likewise, the other 58 Districts (both administrative and statistical) function as the rural units, although many of them also contain urban places. Because, factories processing commodities such as sugar cane, tea or raw jute, are not always associated with district headquarter towns, and there exist, in effect, large semi-industrial rural units. Therefore, there is no absolute urban-rural distinction in Bangladesh. The distinction here is a relative one made in order to facilitate the discussion of the surface configuration of an underdeveloped economy. The distinction is justified in terms of the attempt to determine core-periphery relationships and the degree to which broad distinctions exist, or are growing or narrowing between rural and urban, and a primary focus will be placed upon the two groups of Districts indicated in Figure 4.3.

Two other aspects of the base should be noted. First, the resultant set of 71 Districts does provide a fairly uniform spatial grid in terms of size of spatial unit and, it is believed, an adequate and

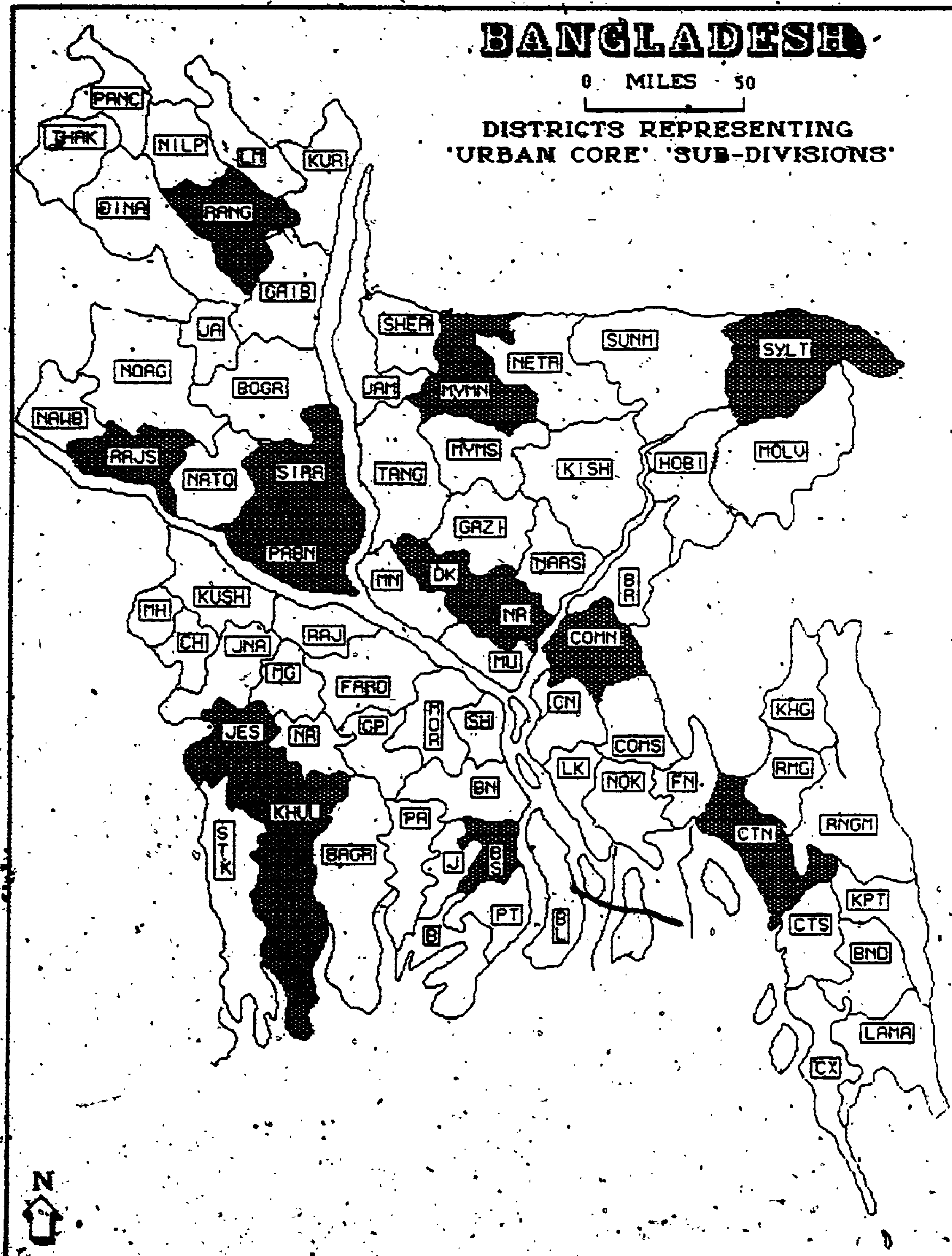

BANGLADESH
0 MILES 50
DISTRICTS REPRESENTING
'URBAN CORE' 'SUB-DIVISIONS'
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
JAM
NETR
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
NR
MH
KUSH
RAJ
COMN
CH
JNA
MU
MG
FARD
CN
KHG
JES
NR
GP
MOR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
RNGM
STK
BAGR
J
BS
CTN
PT
BL
KPT
B
CTS
BND
LAMA
CX
N

Figure 4.3

logical base for the measurement of spatial change in this essentially meso-scale study. Secondly, the grid has been used because it has been possible to assemble data items for the 1961, 1974 and 1981 censuses within its framework on a consistent basis (see below).

The 71 District spatial base (Figure 4.1) is used in all subsequent mapping in Chapters 5, 6 and 7 as the framework for the depiction of the results of individual and multivariate analysis and the dimensions and regions of change in Bangladesh

The Census Temporal Base

There have been four censuses in East Pakistan/Bangladesh since 1947. The censuses provide the necessary range of data collected for the whole country and aggregated at the Sub-Division/District level. On examination it was found that the data collected for the initial census in 1951 was not comprehensive or detailed enough and could not be utilized alongside the other three counts. Consequently, the availability of consistent information for the last three censuses, 1961, 1974 and 1981, determined both the specific temporal observations and the time periods for which change could be comprehensively analysed

Of the three censuses, that in 1961 was undertaken for East Pakistan, and reflects both the overall development occuring after 1947, but also the degree to which East Pakistan remained basically the less developed 'wing' of the country The next census should have been in 1971 but did not take place because of the civil war, which led to the secession and independence of Bangladesh It was, consequently, postponed until 1974. Unfortunately, this not only breaks the time sequence into unequal parts, it also makes interpretation of the period 1961-1974 a little difficult. The reasons are that, between 1960 and 1970 there occured the so called 'Decade of Reforms' which did see some measure of growth in East Pakistan. This, however, was not sufficient to offset the growing disatisfaction and prevent the ensuing conflict. The civil war (1971) was a disastrous occurance and disrupted many aspects of development. In addition, it was followed in the early 1970s by a series of natural disasters which were a further set-back. Consequently, the census of 1974 presents a somewhat confused picture, involving both some growth or positive changes that persisted from the 1960s, as well as the measure of decline in well-being attendant on the disturbed conditions between 1970 and 1974. In turn, the 1981 census, which resumed the decennial sequence, records change over a shorter period (7 years) and covers only the first years of independence. Unfortunately, there has not yet been a fifth accounting; the next census is scheduled for 1991.

Nevertheless, despite the problems with the temporal sequence and the actual dates of the census "cross-sections", there is the continuity of data, which is discussed below, and in the analytic approach an attempt is made to smooth the sequence as well to interpret the nature of change in relation to the sequence of events.

Sources of Data

As noted, the main source of data was the series of three censuses and, as such, the main location of data was the Bangladesh Bureau of Statistics, which is the primary national statistical office and which contains the population census, and the agricultural census, and is also responsible for agricultural statistics in general. The Bureau was the source of much data at the District level for the

TABLE 4.2

Sources of Data

Demographic	Ministry of Population and Family Planning Bangladesh Bureau of Statistics Statistics Division, Ministry of Planning Population Census
Housing	Directorate of Housing and Settlement Bangladesh Bureau of Statistics
Household Amenity	Bangladesh Bureau of Statatistics Ministry for Rural Development Integrated Rural Development Programme Bangladesh Academy for Rural Development Directorate of Public Health Engineering Bangladesh Institute of Development Studies Bangladesh Power Development Board Bangladesh Rural Electrification Board
Employment & Income	Ministry of Finance Ministry of Manpower Development Statistics Division, Ministry of Planning
Health & Medical Care	Directorate of Health Services Bangladesh Medical Association
Education	Directorate of Education Bangladesh Bureau of Statistics
Central Service	Bangladesh Bank Bangladesh Telephone & Telegraph Board General Post Office
Agriculture	Agricultural Census Bangladesh Bureau of Statistics Ministry of Agriculture Bangladesh Agricultural Development Corporation Bangladesh Agricultural Bank

1981 census. However, the Bureau was not able to supply data on some key areas, notably employment, income, health and central services, nor was a full range of information available through the Bureau for previous censuses at the District level.

Consequently, a number of other central and regional sources had to be utilized and the data collected had to be then re-assembled on the 1980-81 District base to provide a spatially and temporally consistent record. Among the sources of information which are detailed by category in Table 4.2, there should be noted the Statistics Division of the Ministry of Planning. In many cases a number of different sources, including widespread regional offices had to be consulted. Data was collected by the researcher and local assistants over the period of four months (May to August 1985). Time was taken to cross-check data with officials and with aggregates in published sources, notably the Bangladesh Statistical Yearbook.

As indicated in Table 4.2; the sources of data are related to a range of types. This range has already been discussed in part in Chapter 3 but is outlined below in terms of the nature of data. Overall, the sources were adequate to allow collection of a range of data deemed suitable for the study at the District level. There were, however, some data lacks which are reflected in the actual choice that was made.

The Selection of Variables

As noted in Chapter 2, the investigation is conceptualized to incorporate a wide array of types of information that, collectively over time and space, provide the basis for the assessment of development in terms of social well-being in Bangladesh. The major categories of data are indicated on Table 4.2. While in Bangladesh, actual data was collected and assembled for a large set of variables, namely 69 items, (listed in full Appendix I) under the same set of major categories. This data set was collected for each of the three census years (1961, 1974 and 1981) and assembled for each of the 71 District units. Initial data collection had the objectives of being as comprehensive as available data would allow. Although the list is long, it lacks items that were sought but not able to be obtained at the District level, for example per capita food consumption. On the other hand, the collection process resulted in a list that was both too expansive, and in which some raw data items required conversion. Consequently, the initial stage was the selection of data items for detailed analysis.

The selection process involved the omission of certain data items which were obviously redundant, and then the development of a correlation matrix which provided the basis for further selection-out on the basis of high correlations between variables within the same major categories. At the same time, 'new' variables were created in terms of average occurances per 50,000 population for hospital beds, doctors, school levels and banking services. On the basis of examination of the data in both objective and subjective terms, the initial set of 69 variables was converted and reduced to a total of 31 as the basis of multivariate analysis (Table 4.3). The choice reflected the maintainance of the basic categories and a rather strict selection of what were held to be independently significant variables in each category.

Table 4.3

Selected Variables for Univariate and Multivariate Analysis

Types of Data/Variables name	Computer Code
Demographic	
01) Old and Youth Age Dependency Ratio	(DPNDR)
02) Crude Birth Rate	(BIRTH)
Housing	
03) Percentage of House Walls by Cement & Bricks	(HWBRK)
04) Percentage of House Roofs by Cement & Bricks	(HRBRK)
Household Amenity	
05) Percentage of Dwellings Reporting Electricity	(HYDRO)
06) Percentage of Dwellings Reporting Bath Facilities	(DBATH)
07) Percentage of Dwellings Reporting Toilet Facilities	(TOILT)
08) Percentage of Dwellings Reporting Radio Set	(RADIO)
Employment & Income	
09) Percentage of Employment by Administrative Service	(MANGR)
10) Percentage of Employment by Service Sector	(SERVE)
11) Percentage of Employment by Manufacturing Group	(MANUF)
12) Percentage of Employment by Agricultural Sector	(AGRIC)
13) Percentage of People Having Job	(DOJOB)
14) Per Capita Income	(INCOM)
Health & Medical Care	
15) Per Capita Public Expenditure on Health Care Services	(PEHCS)
16) Average Number of Hospital Beds Per 50,000 Population	(AVHBD)
17) Average Number of Physicians Per 50,000 Population	(AVDOC)
18) Average Number of Registered Nurses Per 50,000 Popn.	(AVNRS)
19) Infant Mortality Rate	(INFNT)

Education

20) Per Capita Public Expenditure on Education-------------- * (PEXED)
21) Percentage of Students Attending Secondary School-------(PCSST)
22) Percentage of Students Attending College-----------------(PCCST)
23) Percentage of Students Attending School-----------------(SATND)
24) Average Number of Secondary School Per 50,000 Popn.--(AVSCH)
25) Adult Literacy Rate-- * (LITER)

Central Service

26) Average Number of Banks Per 50,000 Population------ * (AVBNK)

Agriculture

27) Average Farm Size-- * (FRMSZ)
28) Per Capita Agricultural Land-----------------------------(ALAND)
29) Percentage of Irrigated Area---------------------------- * (PIRIG)
30) Percentage of Multiple Cropping Area-------------------(PMULT)
31) Average Yield Rate of Rice------------------------------ * (RICEY)

* Selected variables for univariate analysis (total = 18 + 1 ** = 19)

** Density of Population (DNSTY) is not employed in multivariate analysis, however, taken into consideration for univariate analysis as a background variable.

The analytic process, which is discussed below, was a sequential one. Although the main emphasis is on multivariate dimensional and regionalizing approaches to a composite assessment of change (i.e. factor and cluster analysis), the interpretation of composite data required the initial analysis of the temporal and spatial change in individual variables. Consequently, all 31 variables were analyzed on an individual basis using standardized data. Presentation of detailed results for all 31 items, however, was deemed to be too extensive for inclusion in this thesis. Consequently, a smaller selection of the variables of particular significance, whose individual interpretation is seen as of particular utility in the interpretation of the composite data, have been selected for presentation in Chapter 5 (the 18 varaibles are indicated on Table 4.3). Chapter 5 also includes a discussion of the significance of each of the groups of variables and all those included in the composite analysis.

Analysis of Data

The remainder of this methodological chapter discusses the nature and sequence of the analyses employed in this study, and includes a fairly extensive review of major multivariate techniques of factor analysis. The initial stage in the sequence, however, is that of univariate analysis.

Univariate Analysis

As noted above (Selection of Variables) while the primary analytic objective is to develop a composite measure of development of social well-being over time and space, this composite analysis is based on a selection of individual variables, which themselves need to be understood, in order to aid in the interpretation of composite findings. Consequently, a stage of individual (univariate) analysis was undertaken, of which a selection is presented in Chapter 5.

Initial overall comparision of the 69 raw variables (Appendix I) revealed both certain redundancies and the need to construct new (derived) variables. The revised set of variables was then computed as a series of means and standard deviations (z scores) for Bangladesh as a whole and for each District for each of the 3 census periods, and an initial correlation matrix was computed. The aggregate means and standard deviations, for each time point and the change between censuses (1961-1974 and 1974-1981, plus 1961-1981) provide the basis for determining the gross direction of change and whether the variable should be interpreted in either a negative or positive manner. For example, positive changes in availability of employment, amenities and services should be interpreted positively, while positive change in birth rate or dependency is interpreted in a negative manner for development purposes. Alternative directions are therefore interpreted in opposite fashion if they occur. (An array of 32 variables including 3 additional are portrayed in aggregate fashion in Table 5.1).

The original correlation matrix was used to further eliminate variables on the basis of high levels of inter-correlation within constituent variable groups (demographic, housing etc.) and led to a reduced final set of some 32 variables. Of these, Population Density was dropped and a matrix of z scores of just 31 variables became the basis of multivariate analysis, below. This 31 x 31 correlation matrix (Table 5.2)) is also used in conjunction with the presentation of data on a univariate basis.

In addition to the use of univariate analysis to develop a set of independent variables for multivariate analysis, it was deemed important to look in greater detail at the spatial and temporal patterns of at least some selected individual variables. The objectives here were to, first, illustrate the individually significant but often divergent directions of change that are illustrated by individual variables, and second, in so doing provide specific evidence on which to base the interpretation of the composite analysis.

Ideally, a detailed examination of full set of 31 variables might be appropriate. But the analysis of each variable generated a series of five maps, i.e. a z score analysis for 1961, 1974 and 1981 (by District), and maps of change between 1961 and 1974 and between 1974 and 1981. Consequently, as a compromise, the univariate analysis looks at the variables by group, noting the relationship of each variable to overall change and to the correlation matrix, but making detailed reference to the mapped patterns for only a smaller selection of some 18 variables, as noted on Table 4.4.

The set of 18 x 5 maps included in Chapter 5 has a common format. Each of the Z score maps for the three census periods present a plot about the national mean for the variable, and reference may be made to both the actual range of values and the statistical variation by District. The unit variance about the national mean, which is zero, is differentiated by selecting suitable class intervals. A five group solution is sought for extra differentiation of relative spatial patterns. The five distinct groups show both qualitative and quantitative ordering from high to low (i.e. high/upper, upper medium, medium/average, lower medium and low). Z scores with values +1.50 and above indicate relatively high level of development, provided that the direction of a particular indicator is positive. Z score ranging from +0.50 t0 +1.49 represent the upper medium level of development. Z scores ranging between -0.49 to + 0.49 reflect medium or national average condition. On the other hand, the lower medium level is a range of Z scores between -0.50 to -1.49. Z scores falling -1.50 and below represent the low level of development.

The District mapping allows reference to other District divisions, i.e. 'urban' and 'rural' District sets, and to certain broad physical divisions noted in Chapter 3 (Figures 3.3b, 3.3c). Comparision of the three time series maps presents one basis for assessing an evolving spatial pattern. Another basis is represented by the two maps of inter-censal change. The changes recorded between 1961-1974 and 1974-1981 represent changes of Z score in either positive or negative terms in relation to the change in the national mean, which describes the zero value. A District reporting positive change has in fact experienced positive change, even though its absolute value may still be below one that has not experienced any change. Variations in the overall patterns and in relative position of individual and groups of Districts facilitate the spatio-temporal interpretation insofar as composite assessment identifies the contribution of individual variables to the composite finding, then the univariate analysis is vital to the interpretation of the latter

Multivariate Analysis: Factor

Factor analysis is a suitable technique for the examination of areal variations and relationships in a multidimensional phenomena such as development (Berry, 1965a). The technique is helpful primarily in organizing, reducing and simplifying complex statistical data set by creating a number of hypothetical factors or dimensions. The application of factor analysis as a scientific tool can be justified on the ground that a major objective of scientific activities is to observe events so that the empirical relationships among those events can be efficiently summarized by theoretical formulations. An observation is a particular variable score of a specified individual (i.e. spatial observation units in this case) under the designated conditions (Gorsuch, 1974). Scientists analyze the relationships among a set of variables where these relationships are evaluated across a set of individuals (i.e. Districts in this case) under special conditions. The variables are the characteristics being measured and could be anything that can be objectively identified or scored. Conditions can include locations in both time and space, variations in the methods of scoring variables, treatments after which the variables are measured, or, even, the degree of latitude at which the observation is made.

Factors represent concise descriptions of patterns of associations of attributes across observations. If this view is adopted, then factor analysis is seen to be an exploratory technique on the descriptive level. Exploratory uses denote the exploration and detection of patterning of variables with a view to the discovery of concepts and a possible reduction of data. Therefore, factor analysis in the context of this study can be regarded as an empirical means of index construction.

The principal concern of factor analysis is, thus, the resolution of a large set of variables into small numbers. This resolution is accomplished by correlation analysis and the aim is to summarize the interrelationship among the variables in a concise but accurate manner as an aid in conceptualization (Harman, 1976). Given an array of correlation coefficients for a set of variables, factor analytic techniques enable us to see whether some underlying pattern of relationships exists such that the data may be "rearranged" or "reduced" to a smaller set of factors or components that may be taken as source variables accounting for the observed interrelations in the data (King, 1969). Quantitative accounting is sought for differences between the objects (cases) by identifying common characteristics resulting from their variable intercorrelation. It is often assumed that common factors are present within the data, and it is the isolation of these that is of interest.

In this study, we have collapsed the set of 31 selected variables into a smaller number of recognizable basic dimensions (7) of development. These data are manipulated (i.e. standardized) in order to satisfy the assumptions and requirements of the technique. The underlying variables are transformed mathematically by the "varimax rotation" process so as to have the maximum intrinsic meaning. Rotation is, therefore, a terminal solution or the search for a simple structure. Further details are discussed in Chapter 6.

Cluster Analysis

When socio-economic attributes are arrayed spatially, it is often desired to group the data into regions or areas that exhibit some kind of unity (internal inherent characteristics). Cluster analysis was selected as the technique by which to classify all Districts of Bangladesh in a single sequence. Clustering technique is a method for helping to solve such grouping/classification problems. It is a tool of discovery that can be used to reveal associations and structure in data which, though not previously conceived, are nevertheless sensible and useful when found. It reduces objects (cases) into a small number of groups, while factor analysis reduces attributes (variables) into a small number of factors for an easy interpretation. Its use is appropriate when little is known about category structure in a body of data.

Therefore, the object of cluster analysis is to organize data in such a way as to bring out broad structure or to impose structure according to a given list of specifications to formulate hypotheses, describe the sample population in terms of a typology and predict the future behaviour of population types (Wishart, 1978). The major aim is to uncover inherent order by partitioning an observed sample population (i.e. cases) into disjoint or overlapping homogeneous classes.

Examples of Cluster analysis applications in regional studies are found in rural poverty patterns in Ontario townships, Asian nations by peaceful interaction links, national voting patterns at the United Nations, urban regions by census, industry and facility data and so on (Wishart, 1978).

The purpose of applying cluster analysis in this study is to segregate 'N' individuals into 'G' groups termed clusters. Naturally, part of the intention is that individuals within any cluster are more closely related than are individuals in different clusters. (Wishart, 1978). This indicates that the degree of association is high for members of the same group and low between members of the different groups. The result can, therefore, contribute to the development of a classification scheme.

Groupings are, therefore, based on similarity between observations (i.e. Districts). Inputs can be an initial raw data matrix. However, the most common base uses the results of previous analyses yielding a reduced matrix (e.g. factor scores). These are grouped using a Euclidean distance measure method. Such method was developed in Botany for use in taxonomic studies. It defines objects/cases in terms of both their variable characteristics, and their position in the sum-total of compared object-variable characteristics. for the group analyzed. Each object is defined by one composite score, which places it along a scale of correlation, relative to all others in the group, but specifically part of a sub-group or 'cluster'. The individual clusters are only partial associations within an eventual total array. They indicate significant association. Plotting the manner in which the clusters build, allows one to place each object, and at the same time to define groupings of objects on a single composite basis.

There are, however, several linkage methods on which clusters are formed. These are briefly outlined below to justify the relative merits.

1) Single Linkage- the similarity between clusters P and Q is defined as the highest single similarity coefficient between two individuals. Single linkage will identify 'struggling' clusters, and often fails to partition large populations due to chaining.

2) Complete Linkage- S (P, Q) is the smallest single similarity coefficient between two individuals, one from each cluster. Complete linkage finds spherical clusters, but is liable to produce irrigular results because the similarity criterion is determined by only two individuals and does not measure group structure.

3) Average Linkage- S (P, Q) is the average of all the similarity coefficients for pairs of individuals, one from each cluster and represents one of the earliest attempts to take account of group structure. Average linkage tends to find spherical clusters.

4). Centroid Sorting- this option produces a standard centroid sorting analysis when use with distance coefficients. S (P, Q) is the value of the similarity coefficient obtained using the centroid or mean vectors of clusters P and Q. The results which are obtained with centroid sorting often exhibit the chaining effect to somewhat lesser extent than single linkage.

5) Median Sorting- the distance S (R, P+Q) between any cluster R and the cluster which results from the fusion of P and Q is defined as the distance from the centroid of R to the mid-point of the line joining the centroids of P and Q.

6) Ward's Method- possibly the best of the hierarchy options is valid analytically with distance coefficients. The error sum of squares is the basis of linkage and is defined as the sum of distances from each individual to centroid of its parent clusters. This method combines those two clusters P and Q whose fusion yields the least increase in the error sum of squares. This method finds minimum variance spherical clusters. In this study, Ward's method of clustering is used as an important hierarchy option.

The following is a section noting the use of factor and cluster analysis in regional development studies and social area analysis. The section also includes the methodology of spatio-temporal change by factorial means.

Review of Use of Factor and Cluster Analysis

A variety of social scientists have used factor analysis followed by cluster analysis in ecological or area-based studies on a world scale Research into international similarities and differences, interaction, cooperation and conflict has been of particular concern to social scientists. The spread of nations in terms of their economic development and associated social and political conditions has been the concern of economists (Adelman and Morris, 1967) geographers (Berry, 1960, Ginsburg, 1961) and sociologists (Schnore, 1961) They have provided a useful picture of the major structural dimensions of cross-national variation and of the principal clusters of nations on both structural and relational criteria. For example, 43 proposed indicators to the level of economic development of 95 countries had been assembled as a part of a larger project at the University of Chicago in 1961. Berry was able to show by means of factor analysis that the proposed indicators represented only four distinct dimensions along which the countries were differentiated (Ginsburg, 1961).

National studies have been made at a variety of observational scales. For example, Smith (1972) studied "Social Well-Being: An Inter-State Variation in the United States". Among variables used were income, wealth, employment, mobility, living environment, health, education, social disorganization, participation and recreation. Among other relevant studies at the regional-local scale, a rigorous examination of factors associated with rural poverty in Canada was conducted by Berry (1965a) for 555 municipalities in Ontario. The title of the study was "Identification of Declining Regions: An Empirical Study of the Dimension of Rural Poverty". Using factor analysis, he examined forty-seven variables, including levels of income and education, farm capital, household amenities and facilities.

The analysis was replicated by Bell and Stevenson (1964) in a study of Ontario, using counties as the units of observation. Berry's approach was also used by Gould (1970) in the study of the spread of indices of "modernization" across the national space in Tanzania at successive intervals from 1920s to the early 1960s. Using Berry's approach Chowdhury (1984) made an investigation on "Disadvantage and Development in Rural Canada: A Three-Phase Study of the Dimensions from 1961-1971". Among studies using factor and cluster analysis in developing countries, Abdullah (1979) made a doctoral dissertation on " Socio-Economic Regionalization and Its Implication for Development Planning in Peninsular Malaysia" at the District level. Ali (1986) made a contribution on "Agricultural Typology of Bangladesh" employing similar method. Ali used Districts as the unit of observation including physical, demographic, social operational, production and structural attributes. As a methodological deviee factor analysis followed by cluster analysis generated satisfactory results in agricultural typology studies (Troughton, 1982).

One of the principal issues addressed by the national level studies of geographers, economists and planners is the regional distribution of welfare, or national development. The questions raised are many: How does welfare differ from one part of the country to another? Why does welfare so differ? How do the rates of change in welfare differ from one area to another? Why do these rates of change vary? What, in fact, have factor analytic studies to say about the questions (Thompson, 1965)?

In the studies employing areal units that divide the whole national territory (into Counties/Districts), a factorial dimension emerged that indexes the differences between urban and rural Counties/Districts in income, occupational mix and educational attainment (Ray and Berry, 1967; Berry, 1968, Ray, 1969). Berry (1969), for example, has demonstrated in other ways the influence gradients of metropolitan centres on their rural hinterlands. The further away a rural county is from a metropolitan centre, the poorer and less developed it is.

Haynes (1971) introduced an approach to ecological dynamics through the measuring of spatial change in urban structure. His work confirmed that spatial change can be measured in terms of factorial ecology. The major sources of data for his study were the 1951 and 1961 Canadian Census reports for Montreal. The attributes for 292 areal units were also comparable for the two temporal base points. A measure of spatial change was produced by subtracting the factor score in 1951 for a given areal unit on a given factor, from the factor score in 1961 for the same areal unit and same factor. Since the areal units were the same for both periods, variables were introduced at one of two levels. One was change in the attribute composition of the factor. The other was change in the spatial configuration of attributes that produce the factor score for the areal unit. The former is compositional change and the latter is spatial change.

However, compositional change or stability must be examined before the locational characteristics of spatial change can be evaluated. The basic problems can be stated directly. Were the factors in 1951 and 1961 made up of the same attribute groups and were these attribute groups at the same level (loading) in both periods?

As noted previously, the same attributes for the same areal units were available for both points in time, but in fact did the same attribute which covaried and hence grouped together in 1951 also group together (covary) in 1961? To answer this question a factor invariance test was performed. This was a measure of factor similarity. Once the stability of factors has been established through invariance analysis, compositional change was assumed to occur at random throughout the factor. In this way any variation in weight of an areal unit on a factor was considered a function of spatial change of that factor. It was then reasonable to subtract the factor scores in 1951 from 1961 to determine the change in spatial distribution of a given factor.

Our study corresponds to that of Haynes in nature (measuring spatio-temporal change), but with slight modifications. This is simply because of the question of probable instability of factors in a dynamic spatial system. Haynes did not say anything about the possibility of an unstable factor pattern over time. In other word, there was no indication of an alternative approach once the stability of factors has not been established through invariance analysis. Factor invariance test can test the degree of appropriateness of factors extracted in each time period, but not a guarentee of their stability if such stability does not exist in empirical world. This particular and fundamental question remain untouched in his contribution.

As an alternative used in this study the spatial observation units (71 Districts of Bangladesh) and temporal base points (1961, 1974 & 1981) are integrated for analysis in a single sequence. Instead of performing three independent factor analysis for measuring spatial change over a twenty year period, one can simply run a single analysis by creating (71 X 3) = 213 space-time units. This is done by adding and merging three seperate SPSS system files for the same 71 spatial observation units and 31 selected variables. The results of such an analysis yields in a general factor structure matrix for the twenty year period. Instead of having three independent factor pattern matrix for three distinct time periods one will have only a single factor pattern matrix over the study period. In this respect, extracted factors are viewed as stable over the years, since stability is conditioned by the average factor patterns. This method allows us to find a defined and stable factor solution.

To resolve this factor stability problem for comparative purposes, we performed a single analysis using space-time units. Generated factor scores for each set of 71 cases (Districts) allowed us to produce successive dimensional maps for three distinct time periods. These maps provide composite picture of spatial patterns at the relative level.

To measure developmental change, factor scores of 71 Districts of Bangladesh for 1961 are subtracted from the sub-file 1974 and the same process is repeated for 1981. This allows measurement ~~of~~ spatial change over the years. The results of temporal change are mapped against each prime factor between 1961-1974 and 1974-1981. This is done both in positive and negative manner, like the changes measured in individual variables. Districts reporting actual change above the national mean for a specific period are treated as positive and while reporting below the national mean are considered negative. All these measures are performed on a standardized scale. Particular interpretation of the composite change occures at District level is understood by examining the changing character of Z scores for individual variables at the same level

Taylor and Parkes (1975) developed such an approach for a hypothetical British city to explore an experimental design of factorial ecology based on the use of factor analysis. Values were assigned to twenty four variables for each of 10 geographical areas at 8 separate times for a typical work day. Each geographical unit was treated as 8 separate observations, yielding a total of 10 x 8 = 80 space-time units. The variables included social and demographic characteristics of the population in each space time unit, and information on their dominant activity and travels. Common factor analysis reduced the data set into few factors, each represented by maps of factor scores for space-time units. As a result, distinct temporal variations in the spatial patterns were recognized.

This method was replicated by Goodchild and Janelle (1983) in their study of space-time patterns of urban ecological structure in Halifax. As this method so far has been found satisfactory in measuring spatio-temporal change, we feel comfortable in applying the method in regional-rural development studies and social area analysis. The major difference found between the Halifax and this study is the scale variation. The context of one is intra-urban in nature while the other one is intra-national in scale. This scale variation is justified by Rees, (1971) who provided an extended definition of factorial ecology and social area analysis. This has the advantage of emphasizing that the results in any study are restricted to the scale at which it is performed.

CHAPTER 5

Univariate Analysis of Development Variables

Introduction

In this chapter is presented the first phase of the analysis of variables indicative of change and/or development in Bangladesh. As indicated previously (Chapters 2 and 4) the variables have been collected on the premise that they contribute to a composite model of change in terms of social justice, but that in order to proceed logically to their composite analysis and to be able to interpret the results of that analysis, the variables need to be examined first on an individual basis. Consequently, in this chapter the results presented are those of univariate analysis. As noted in Chapter 4, the variables were collected and assembled according to a broad set of eight categories (Table 4.1) and the initial array reduced to a set of 32 variables (Table 4.2). It is this set of 32 variables in their groupings which are here reviewed. The format of the univariate analysis is as follows:

1) Introduction to the broad variable category (Demographic, Housing etc.).

2) Discussion of the range of variables selected and the broad trends exhibited by these variables (reference to summary table, Table 5.1).

3) Relationships between variables within the selected category and with other variables (reference to correlation matrix, Table 5.2).

4) Presentation of findings of variables selected for more detailed analytic exemplification. This latter presentation includes the

TABLE 5.1

MEAN AND STANDARD DEVIATION OF INDIVIDUAL VARIABLES TOGETHER WITH THEIR TEMPORAL CHANGE

				1961	1974	1981	1961-1974	1974-1981	1961-1981
POPULATION DENSITY (DNSTY)	PER SQ. MILE	MEAN	DNSTY	998	1404	1710	406	306	712
		S.D.		490	732	972			
DEPENDENCY RATIO (DPNDR)	PER 100	MEAN	DPNDR	103	114	110	11	-4	7
		S.D.		2.7	2.3	2.3			
CRUDE BIRTH RATE (BIRTH)	PER 1000	MEAN	BIRTH	43.1	41.7	37.6	-3.4	-4.7	-7.5
		S.D.		3.1	3.2	3.8			
HOUSE ROOF BY BRICK (HRBRK)	PERCENT	MEAN	HRBRK	2.3	3.2	2.6	0.9	-0.6	0.3
		S.D.		2.6	2.5	2.7			
HOUSE ROOF BY WOOD (HRWOD)	PERCENT	MEAN	HRWOD	31.3	35.8	30.9	4	-4.9	-0.4
		S.D.		12.7	16.4	16.7			
HOUSE WALL BY BRICK (HWBRK)	PERCENT	MEAN	HWBRK	4.3	[illegible]	4.6	1.5	-1.4	0.1
		S.D.		4	4.5	4.1			
HOUSE WALL BY WOOD (HWWOD)	PERCENT	MEAN	HWWOD	11.4	10.9	14.7	-0.5	3.8	3.3
		S.D.		10.4	9.6	16.9			
HOUSE WALL BY MUD (HWMUD)	PERCENT	MEAN	HWMUD	14.6	14.8	18.1	0.2	3.3	3.5
		S.D.		16.2	47.2	21.2			
HOUSE WALL BY BAMBOO (HWBMB)	PERCENT	MEAN	HWBMB	69.8	66.9	61.7	-2.9	-4.2	-7.1
		S.D.		18.3	18.1	21.5			
DWELLINGS WITH ELECTRICITY (HYDRO)	PERCENT	MEAN	HYDRO	6.4	18.3	32	11.9	14	25.6
		S.D.		3.6	8	10			
DWELLINGS WITH BATH FACILITIES (DBATH)	PERCENT	MEAN	DBATH	4.7	8.2	14	3.5	5.8	9.3
		S.D.		5.3	8.6	10			
DWELLINGS WITH TOILET FACILITIES (TOILT)	PERCENT	MEAN	TOILT	3.8	7	12	3.2	5	8.2
		S.D.		3.7	7	10			
DWELLINGS REPORTING RADIO (RADIO)	PERCENT	MEAN	RADIO	17.2	35	56	17.8	21	38.8
		S.D.		12.7	8.7	10			
ADMINISTRATIVE EMPLOYMENT (MANGR)	PERCENT	MEAN	MANGR	1.6	2.3	2.4	0.7	0.1	0.8
		S.D.		0.8	1.2	1.4			
SERVICE SECTOR EMPLOYMENT (SERVE)	PERCENT	MEAN	SERVE	5.4	10.1	11.4	4.7	1.3	6
		S.D.		1.3	2.8	2			
MANUFACTURING EMPLOYMENT (MANUF)	PERCENT	MEAN	MANUF	8.4	14.3	17.8	5.9	3.5	9.4
		S.D.		1.8	3	4.8			
AGRICULTURAL EMPLOYMENT (AGRIC)	PERCENT	MEAN	AGRIC	80.1	67	61	-13.1	-6	-19.1
		S.D.		5.2	8	11			
PER CAPITA INCOME (INCOM)	TAKA	MEAN	INCOM	526	728	769	202	41	243
		S.D.		3.2	2.2	3.7			
PER CAPITA EXPENDITURE ON HEALTH (PEHCS)	TAKA	MEAN	PEHCS	4.3	13	16.5	8.7	3.5	12.2
		S.D.		0.7	1.2	0.9			
AVERAGE NUMBER OF HOSPITAL BEDS (AVHBD)	PER 50,000 POP.	MEAN	AVHBD	5.7	9.6	10.7	3.9	1.1	5
		S.D.		13.5	20	18.4			
AVERAGE NUMBER OF DOCTORS (AVDOC)	PER 50,000 POP.	MEAN	AVDOC	2.7	3.9	5.3	1.2	1.4	2.6
		S.D.		4.8	5	5.7			
AVERAGE NUMBER OF NURSES (AVNRS)	PER 50,000 POP.	MEAN	AVNRS	0.7	0.9	1.7	0.2	0.8	1
		S.D.		1.1	1.2	2.1			

MEAN AND STANDARD DEVIATION OF INDIVIDUAL VARIABLES TOGETHER WITH THEIR TEMPORAL CHANGE

INFANT MORTALITY RATE (INFNT)	PER 1000	MEAN	INFNT	148	150	123	2	-27	-25
		S.D.		32.9	3.4	6.6			
PER CAPITA EXPENDITURE ON EDUCATION (PEXED)	TAKA	MEAN	PEXED	16	20	41.6	13	12.6	25.6
		S.D.		0.9	1.4	1.1			
SECONDARY SCHOOL STUDENTS (PCSST)	PERCENT	MEAN	PCSST	1.8	3	3.3	1.2	0.2	1.5
		S.D.		1.1	1.2	2.1			
STUDENTS ATTENDING COLLEGE (PCCST)	PERCENT	MEAN	PCCST	0.18	0.26	0.27	0.08	0.01	0.09
		S.D.		0.17	0.18	0.15			
AVERAGE NUMBER OF HIGH SCHOOLS (AVSCH)	PER 50,000 POP.	MEAN	AVSCH	2.7	4.7	7.5	2	2.8	4.8
		S.D.		2.3	1.9	5.7			
STUDENTS ATTENDENCE RATE IN SCHOOSL (SATND)	PERCENT	MEAN	SATND	15	44	21	29	20	6
		S.D.		4	7	4.3			
ADULT LITERACY RATE (LITER)	PERCENT	MEAN	LITER	19	21	28.6	2	7.6	9.6
		S.D.		5.2	6.3	7.5			
AVERAGE NUMBER OF BANKS (AVBNK)	PER 50,000 POP.	MEAN	AVBNK	0.9	1.5	2.6	0.6	1.1	1.7
		S.D.		0.8	1.3	1.7			
IRRIGATED AREA (PIRIG)	PERCENT	MEAN	PIRIG	7	10.4	12.4	3.4	2	5.4
		S.D.		6	8	9			
MULTIPLE CROPPING AREA (PMULT)	PERCENT	MEAN	PMULT	16	23.5	31.6	7.5	8.1	15.6
		S.D.		12	15	27.3			
AVERAGE FARM SIZE (FRMSZ)	ACRE	MEAN	FRMSZ	2.5	2.5	2.5	0	0	0
		S.D.		1.2	1.2	1.1			
AVERAGE RICE YIELD (RICEY)	TON PER ACRE	MEAN	RICEY	0.4	0.5	0.5	0.1	0	0.1
		S.D.		0.08	0.09	0.1			
PER CAPITA AGRICULTURAL LAND (ALAND)	ACRE	MEAN	ALAND	0.47	0.44	0.43	-0.03	-0.01	-0.04
		S.D.		0.23	0.21	0.02			

TABLE. 5,2

CORRELATION COEFFICIENTS BETWEEN THE VARIABLES USED IN THE INTER-DISTRICT ANALYSIS

	HWBRK	HYDRO	DEATH	TOILT	RADIO	MANGR	SERVE	AGRIC	MANUF	INCOM	PENCS	PEXED	LITER	RICEY	SATHO	DPNDR	BIRTH	INFNT	DOJOB	AVHDO	AVHRS	AVBHR	AVSCH	PCSST	PCCST	PIRNG	PMULT	ALAND	FRYSZ	URBNK	AVDOC
HWBRK	1																														
HYDRO	0.25	1																													
DEATH	0.52	0.55	1																												
TOILT	0.46	0.51	0.96	1																											
RADIO	0.27	0.39	0.6	0.57	1																										
MANGR	0.41	0.52	0.67	0.67	0.44	1																									
SERVE	0.29	0.78	0.51	0.47	0.73	0.59	1																								
AGRIC	-0.24	-0.7	-0.54	-0.5	-0.71	-0.46	-0.77	1																							
MANUF	0.22	0.76	0.51	0.51	0.79	0.6	0.77	-0.8	1																						
INCOM	0.00	0.75	0.39	0.36	0.77	0.29	0.70	-0.60	0.74	1																					
PENCS	0.11	0.81	0.46	0.41	0.02	0.36	0.03	-0.23	0.79	0.90	1																				
PEXED	0.03	0.81	0.45	0.41	0.65	0.29	0.76	-0.67	0.76	0.94	0.97	1																			
LITER	0.16	0.53	0.47	0.42	0.54	0.30	0.43	-0.42	0.63	0.44	0.51	0.52	1																		
RICEY	0.17	0.39	0.49	0.49	0.4	0.27	0.29	-0.33	0.22	0.24	0.20	0.31	0.10	1																	
SATHO	0.16	0.11	0.03	0.04	0.13	0.17	0.35	-0.23	0.27	0.40	0.37	0.2	0.12	-0.06	1																
DPNDR	-0.14	0.16	-0.11	0.11	0.21	-0.17	0.31	-0.17	0.19	0.65	0.52	0.43	0.01	-0.07	0.00	1															
BIRTH	-0.39	-0.7	-0.50	-0.5	-0.75	-0.50	-0.7	0.66	-0.77	-0.82	-0.71	-0.69	-0.55	-0.34	-0.15	0.04	1														
INFNT	-0.00	-0.4	-0.3	-0.3	-0.49	-0.16	-0.20	0.28	-0.34	-0.31	-0.37	-0.43	-0.20	-0.23	0.19	0.11	0.61	1													
DOJOB	0.12	-0.3	0.09	0.11	-0.13	-0.06	-0.32	0.23	-0.32	-0.42	-0.43	-0.30	-0.10	0.26	-0.24	-0.24	0.32	0.20	1												
AVHDO	0.27	0.10	0.56	0.56	0.21	0.36	0.20	-0.24	0.15	0.17	0.13	0.12	0.12	0.24	0.01	0.02	-0.00	-0.07	0.70	1											
AVHRS	0.20	0.39	0.51	0.5	0.37	0.06	0.35	-0.37	0.31	0.22	0.27	0.20	0.20	0.23	-0.03	-0.11	-0.35	-0.14	0.12	0.5	1										
AVBHR	0.20	0.56	0.59	0.56	0.54	0.51	0.45	-0.46	0.49	0.41	0.46	0.40	0.40	0.25	0.04	-0.01	-0.52	-0.70	0.03	0.30	0.56	1									
AVSCH	-0.05	0.32	0.36	0.32	0.34	0.06	0.26	-0.26	0.10	0.41	0.41	0.45	0.29	0.21	0.03	0.21	-0.10	-0.11	-0.13	0.33	0.24	0.37	1								
PCSST	0.00	0.41	0.37	0.27	0.32	0.24	0.34	-0.26	0.34	0.37	0.37	0.35	0.34	0.04	0.23	0.13	-0.34	-0.09	0.10	0.09	0.12	0.35	0.53	1							
PCCST	0.32	0.37	0.42	0.46	0.3	0.44	0.38	-0.32	0.32	0.23	0.27	0.22	0.2	0.31	0.11	-0.08	-0.41	-0.12	0.01	0.30	0.46	0.35	0.22	0.31	1						
PIRNG	0.27	0.43	0.29	0.39	0.36	0.40	0.45	-0.45	0.45	0.28	0.31	0.20	0.16	0.31	0.06	0.02	-0.30	-0.17	-0.06	0.16	0.23	0.24	-0.1	0.01	0.24	1					
PMULT	-0.09	0.20	-0.01	-0.01	0.20	0.35	0.4	-0.34	0.30	0.3	0.35	0.32	0.09	0.01	0.06	0.06	-0.31	-0.17	-0.24	-0.07	0.01	0.00	-0.03	0.06	0.06	0.39	1				
ALAND	-0.05	-0.1	-0.22	-0.2	-0.10	-0.07	-0.04	0.09	-0.04	-0.00	-0.07	-0.00	-0.13	-0.2	-0.07	0.01	0.11	0.07	-0.21	0.07	-0.07	-0.04	0.09	0.09	0.20	-0.06	-0.07	1			
FRYSZ	-0.01	0	-0.2	-0.2	-0.08	-0.03	0.01	0.05	0.01	-0.03	-0.01	-0.02	-0.11	-0.21	-0.04	0.04	0.06	0.03	-0.25	0.05	-0.02	-0.02	0.11	0.11	0.27	-0.03	0.01	0.99	1		
URBNK	0.71	0.20	0.72	0.71	0.26	0.44	0.31	-0.36	0.31	0.07	0.42	0.03	0.24	0.19	0.11	-0.19	-0.30	-0.01	0.04	0.40	0.35	0.32	-0.02	0.09	0.20	0.31	-0.06	-0.12	-0.09	1	
AVDOC	0.32	0.36	0.64	0.63	0.3	0.55	0.39	-0.39	0.20	0.19	0.24	0.22	0.23	0.24	0.01	-0.07	-0.27	-0.02	0.16	0.79	0.79	0.46	0.37	0.23	0.49	0.26	-0.03	-0.03	-0.04	0.54	1

depiction of spatial and temporal patterns according to five maps on the District map base (i.e. Figure 4.1). The maps are based on Z scores and each set of maps is as follows:

a) spatial distribution 1961

b) spatial distribution 1974

c) spatial distribution 1981

d) spatial change 1961 to 1974

e) spatial change 1974 to 1981

The sequence of five maps for some 18 (see Chapter 4) selected variable depictions provides not only illustration of some individually critical dimensions of Bangladesh during the study period, but also substantiation of the need to synthesise these sometimes divergent measures.

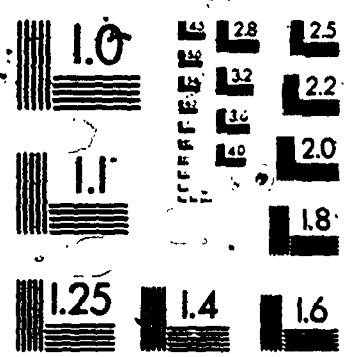
Demographic Variables

Demographic characteristics are of major importance to the development process. The absolute size, rate of growth and distribution of population are critical elements which determine both the nature of the demand for social justice and the degree to which it is satisfied. Bangladesh has been identified as one of the countries of the world in which population numbers are especially critical. The country is relatively small but has a very large and rapidly expanding population, the great majority of which is classified as rural. Whereas population may be regarded as a resource, especially as a primary source of energy in the mainly rural labour force, on the other hand the very large numbers constitute a demand for basic needs which puts extreme pressure on land and food as well as other goods and services. By the same token, the high rate of growth, associated with high natural increase and fertility levels, must be viewed in a negative sense with respect to development. The rate of natural increase is based on a very high birth rate and a high but falling death rate; the classic situation of the expanding stage of the well known Demographic Transition Model (Hagget, 1975). Signs of reduction in birth, fertility and natural increase rates may be viewed positively. Although the total population of Bangladesh is almost 90 percent rural, there are some distinctions between the sectors in demographic terms. Urban areas have the highest overall population densities and tend to have a somewhat lower dependency ratio.

The initial range of variables collected within the Demographic Category included Total Population (from which Density per Square Mile was calculated), Crude Birth and Crude Death Rates, Dependency Ratio and Average Family Size (Appendix I). From this initial array, three, namely Population Density (DNSTY), Crude Birth Rate (BIRTH) and Dependency Ratio (DPNDR) were selected for detailed analysis, although only the latter two are included in the composite variable analyses.

Population Density, derived from overall population totals and the size (in square miles) of the 71 Districts, is here regarded as a basic demographic situation against which development has or has not taken place. Over the study period, Population Density has increased very significantly for Bangladesh as a whole (Table 5.1). In 1961 the national mean was under 1000 per square mile, but rose to over 1400 in 1974 and to over 1700 per square mile in 1981. In each case these figures are amongst the highest of any country in the

3



world and, alongside the dominantly rural nature of the population (89 per cent), they represent a generally inhibiting base for development. The absolute numbers which increased by 50 million persons over the study period, to a 1981 total of 89 million, are placing tremendous pressure on all resources, including land; food, shelter and employment. Although the variation about the mean seems high, this is largely a function of lower densities in the mountainous and therefore sparsely populated and poorly endowed peripheral areas, especially the Chittagong Hill-Tracts.

The rate of population growth in Bangladesh during the period 1960 to 1981 was consistently above 2 per cent per annum. In fact the average rate for the 1970-1980 decade of 2.6 per cent was above that for the 1960-1970 period (2.4 per cent) (World Bank, 1982, Table 17), with a fertility rate of over 6.0. Although declines are forecast, these two rates will still be above 2.0 per cent and 5.0, respectively, to the end of the century, and estimates of Bangladesh's ultimate population place it was high as 320 million with stabilisation only by the year 2125. In this study, the variable Crude Birth Rate is used to represent the population growth characteristics. It remained high throughout the study period (Table 5.1), although some decline is noted and this may be regarded as a positive direction. However, the 1981 figure remained 37.5/1000 and over the study period the rate dropped at only half the rate of the Death Rate, thus contributing to the increased rate of overall growth. On the other hand there is a high rate of infant mortality (see below Health) and an average life expectancy at birth of only 46 years. The variation in the Birth Rate is relatively small accross the country, although some important spatial variations may be observed (below).

The third variable presented is that of Dependency Ratio, i.e. the numbers of people in the young and old categories (below 15 and over 65) per 100 persons of 'working age'. This variable is subject to some discussion. With a low life expectancy, the old age component is only a very small segment, although, with the absence of any old age welfare system (pensions etc.) elderly members may represent a considerable burden to the individual household. In contrast, the youth sector is very large, with perhaps half of all people in the country under 15 years. On the other hand, given the rural dominance, it may be that a proportion of that group is in fact part of the active labour force and contributing to family income by as early as 10 years old. This 'advantage' may apply to a much lesser degree, however, in an urban context. Overall, a decline in the Dependency Ratio is regarded as positive and therefore, the situation whereby the ratio rose considerably between 1961 and 1974, and in 1981 remained well above 1961 levels (Table 5.1) is problematic.

Relationships between Demographic variables were to be expected. The final limited choice of examples is, in fact, based on the very strong inter-correlations with other variables. The choice of Birth Rate (BIRTH) and Dependency Ratio (DPNDR) is made on the basis of their independence of one another in the correlation matrix (Table 5.2). On the other hand, each of the two variables exhibits some strong relationships within the set of 31 variables.

Birth Rate is positively correlated (.61) with Infant Mortality and with Percentage of Labour Force Engaged in Agriculture (AGRIC

.66) which suggests a strong rural linkage in terms of relative disadvantage. On the other hand, Birth Rate is negatively correlated with Non-Agricultural Employment (MANGR -.58, MANUF -.77), Per Capita Income (INCOM -.62), and several household amenities (DBATH -.58, RADIO -.75), Health (PEHCS -.71) and Education (PEXED -.69, LITER -.55). In contrast, the Dependency Ratio is positively correlated with Income (INCOM .65), Per Capita Expenditure on Health Care Services (PEHCS .52) and School Attendence (SATND .68). There is a strong suggestion that while Birth Rate reflects the negative 'drag' of large numbers in both rural and urban settings, that a Lower Dependency ratio, which tends to be an urban phenomena is indicative of a level of non-agricultural development.

Population Density- Spatial and Temporal Change

Density of Population (DNSTY) in 1961 (Figure 5.1a) depicts a pattern based on a national mean of 998 per square mile, and an absolute range of from 46 to 2,633 by district. The extreme low densities are found in the sparsely populated mountain areas of the southeast (Chittagong Hill-Tracts) with other moderately dense areas in the periphery, notably on the active and moribund delta and western boundary districts (Figure 3.3c). The highest densities concentrate about Dhaka, Narayanganj and Comilla, with an indication of an 'urban axis' linking Dhaka to Chittagong. This pattern remains broadly similar for both 1974 (Figure 5.1b) and 1981 (Figure 5.1c), however, if anything, the degree of concentration around Dhaka and along the Dhaka-Chittagong axis becomes more pronounced.

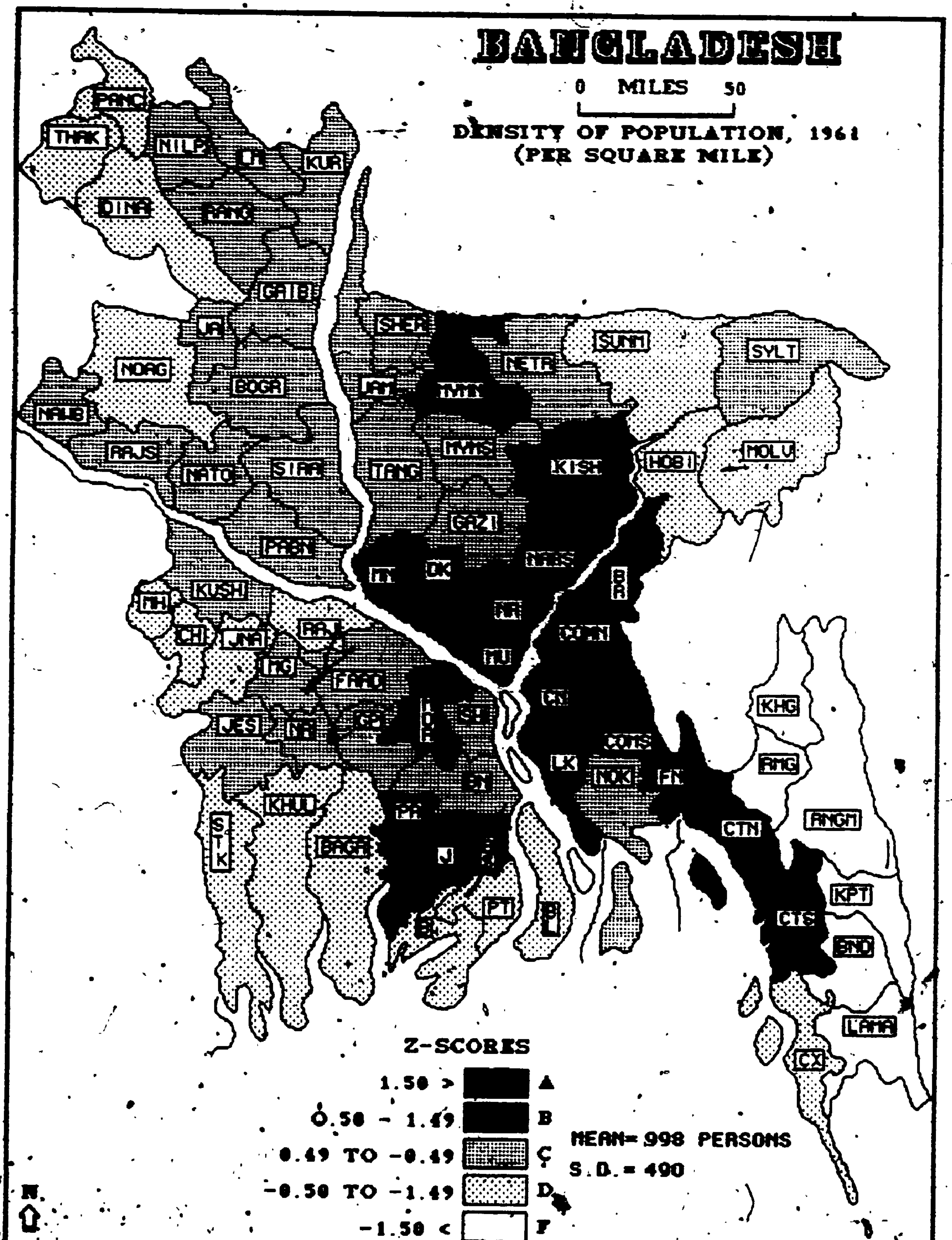

BANGLADESH
0 MILES 50
DENSITY OF POPULATION, 1961
(PER SQUARE MILE)
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
NOAG
BOGA
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
DK
NR
MU
BR
COMN
CN
KUSH
MH
CH
JNA
RAJ
MG
FARD
SB
JES
KHG
COMS
LK
NOK
FN
RMG
KHUL
PR
BAGH
STK
J
CTN
RNGM
PT
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 998 PERSONS
S.D. = 490
N.

Figure 5.1a

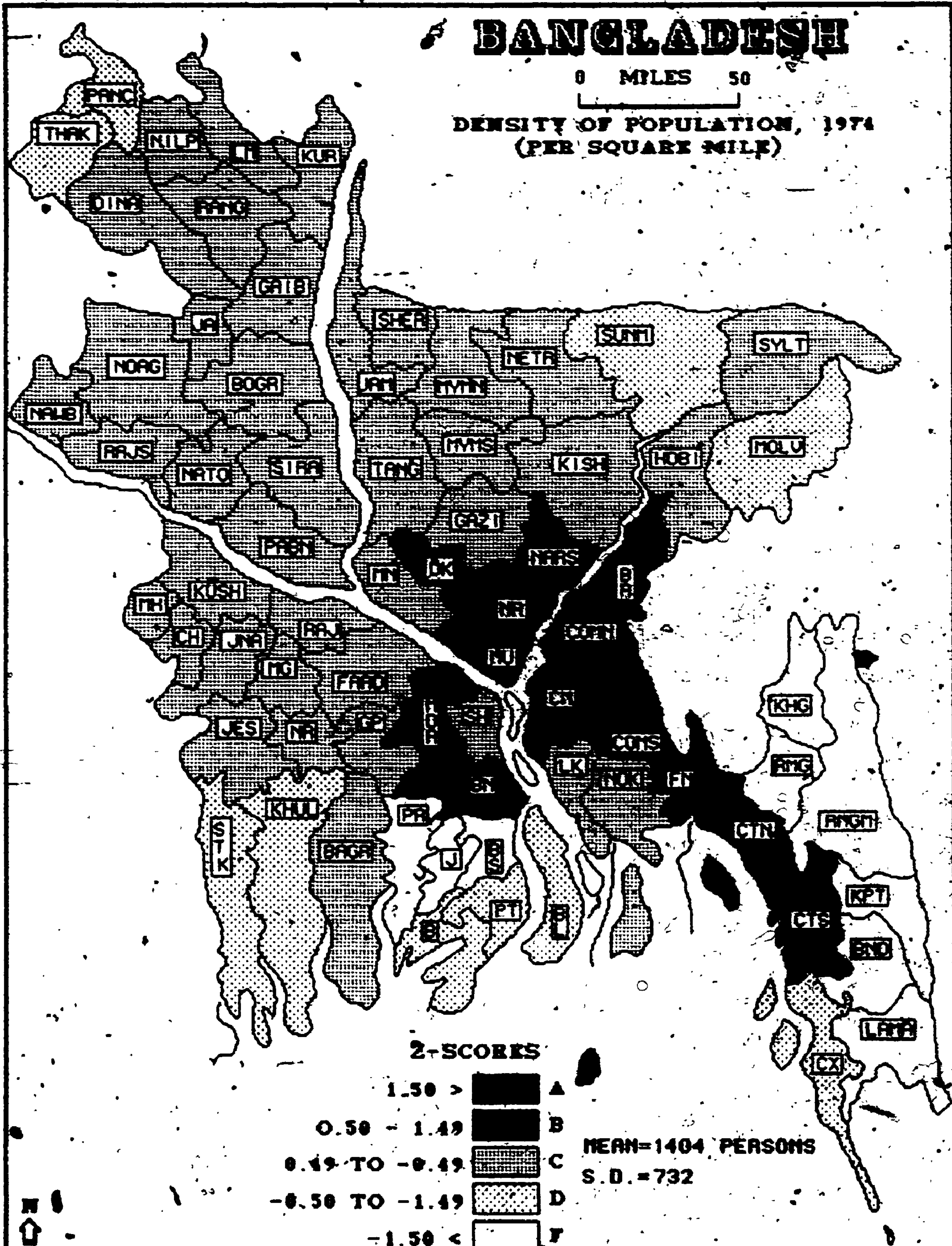

BANGLADESH
0 MILES 50
DENSITY OF POPULATION, 1974
(PER SQUARE MILE)
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
JAM
NETR
MYMN
NAUB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
DK
NARS
KUSH
NR
COMN
RAJ
JNA
MG
FARD
KHG
JES
CONS
RMG
LK
NOKH
KHUL
PR
CTN
RNGM
STK
BAGR
PT
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN=1404 PERSONS
S.D.=732

Figure 5.1b

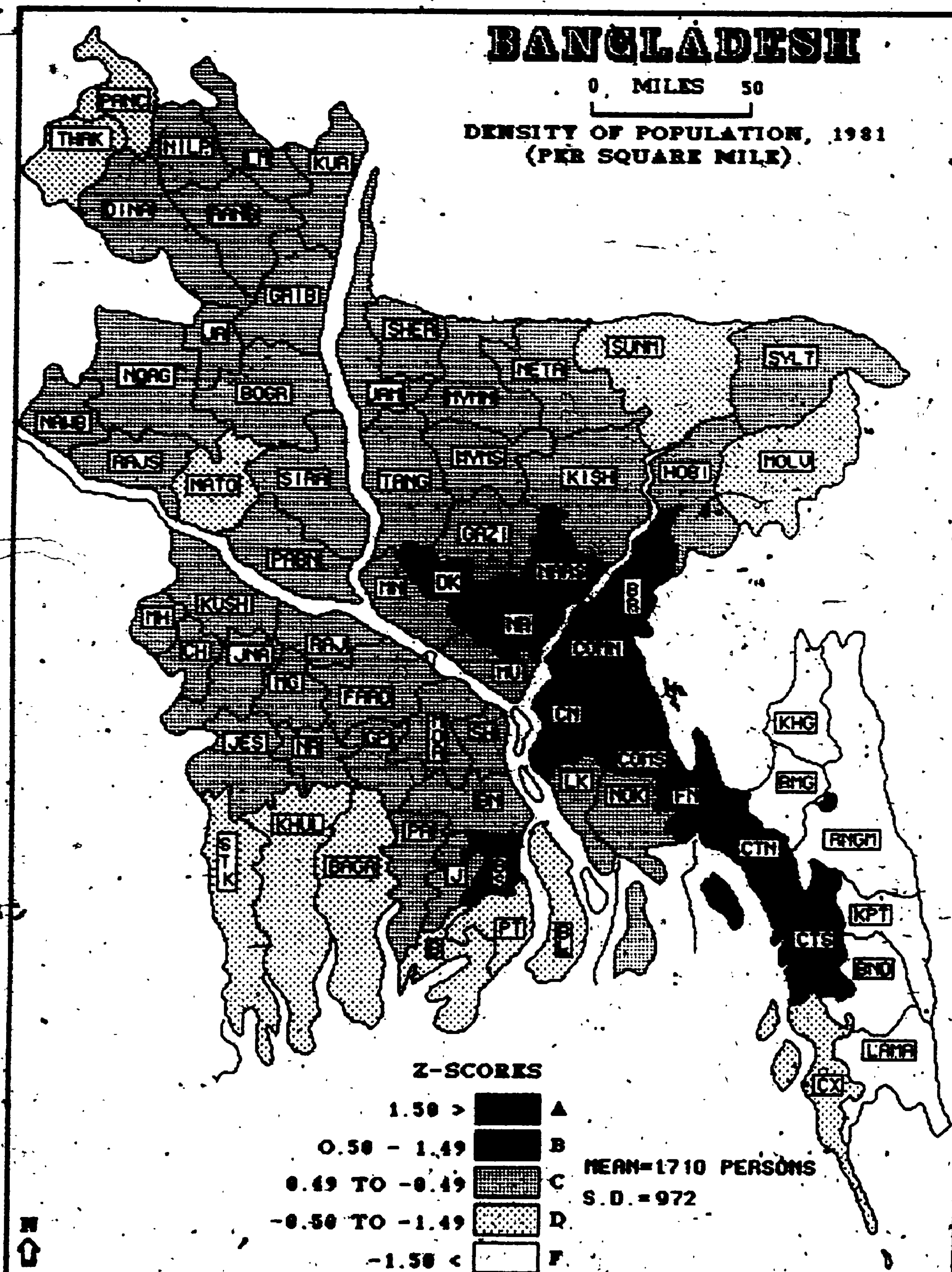

BANGLADESH
0 MILES 50
DENSITY OF POPULATION, 1981
(PER SQUARE MILE)
PANC
THAK
NILP
LL
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
HYMS
MOLV
RAJS
NATO
SIRA
TANG
KISH
HOBI
GAZI
PABN
MN
DK
NRSG
BR
NR
KUSH
MH
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
SH
JES
NR
GP
COTS
LK
NOK
FN
BMG
KHUL
PR
CTN
RNGM
STK
BAGR
J
PT
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN=1710 PERSONS
S.D.=972
N

Figure 5.1c

Nevertheless, there are some interesting variations. In 1974 the area of active delta suffered a net loss in population density as a result of the recent major flood disaster. Otherwise increases in density were apparent throughout the country. By 1981 the delta area had recovered, with Barisal South District recording one of the highest densities in the country. The new absolute range in 1981 of from 78 in the Hill Tracts to 6,875 per square mile in the Dhaka District reflects the fact that rates of increase varied considerably. These are indicated by district for the period 1961-1974 (Figure 5.1x) and for 1974-1981 (Figure 5.1y).

Between 1961 and 1974 increases in density above the mean value were experienced in the Dhaka region, along the Dhaka-Chittagong axis, and for a substantial number of districts in the northwest, except those on the border. Between 1974 and 1981 the pattern, while retaining the first two elements, was otherwise more broken. With some exceptions, the 1974-1981 growth was more concentrated in districts with large urban cores (Figure 4.3), whereas the majority of 'rural' districts grew at below the mean rate. This is therefore, a suggestion of increasing urban tendency in terms of population, beginning in the Dhaka region, spreading along the Dhaka-Chittagong axis and affecting other 'urban' districts. The overall trend in Population Density can be held to affect the type and level of development associated with other variables.

Birth Rate- Spatial and Temporal Change

The distribution of the Crude Birth Rate (BIRTH) for 1961 (Figure 5.2a), for 1974 (Figure 5.2b) and for 1981 (Figure 5.2c) remains a

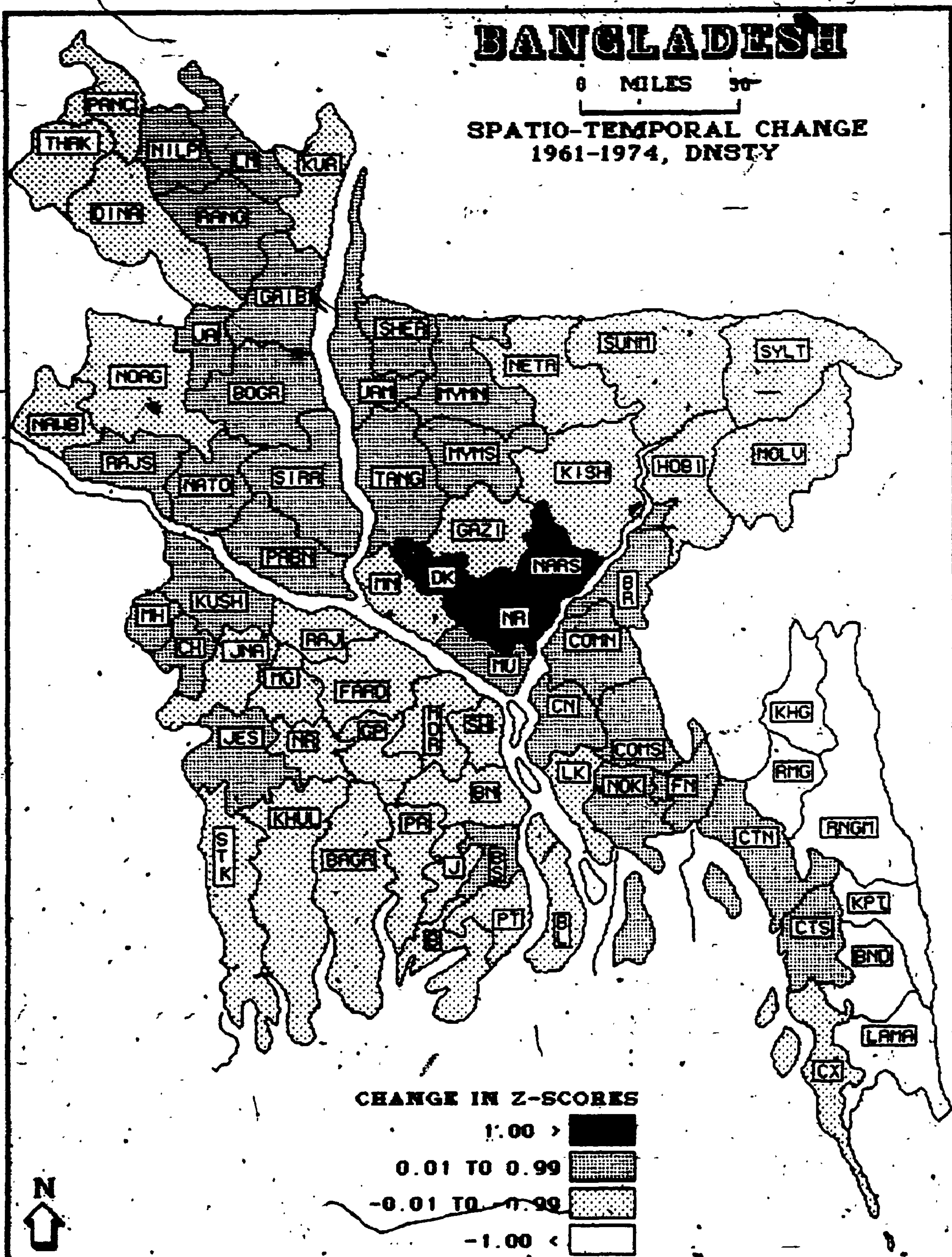

BANGLADESH
0 MILES 30
SPATIO-TEMPORAL CHANGE
1961-1974, DNSTY
PANC
THAK
NILP
LN
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETA
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
NARS
PABN
DK
MN
NR
BR
KUSH
MH
CH
JNA
RAJ
COMN
MU
MG
FARD
KHG
CN
JES
NR
GP
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
STK
BAGR
J
BS
CTN
RNGM
PT
BL
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.1x

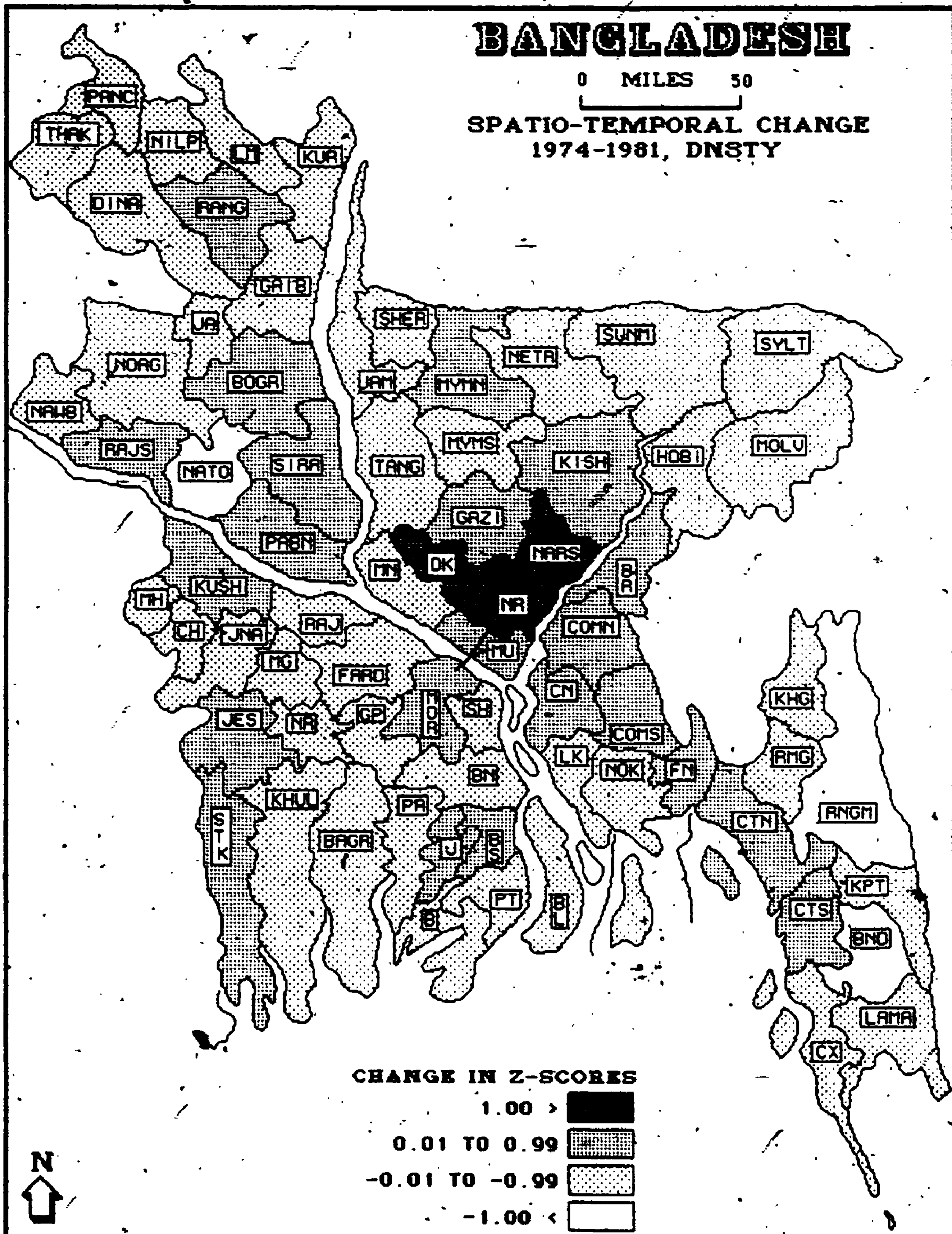

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, DNSTY
PANC
THAK
NILP
LT
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
NETR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
MYMS
TANG
KISH
HOBI
MOLV
GAZI
PABN
DK
NARS
MN
BA
KUSH
MH
NR
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
KHG
RMG
BN
KHUL
PR
STK
BAGR
J
BS
CTN
RNGM
PT
BL
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.1y

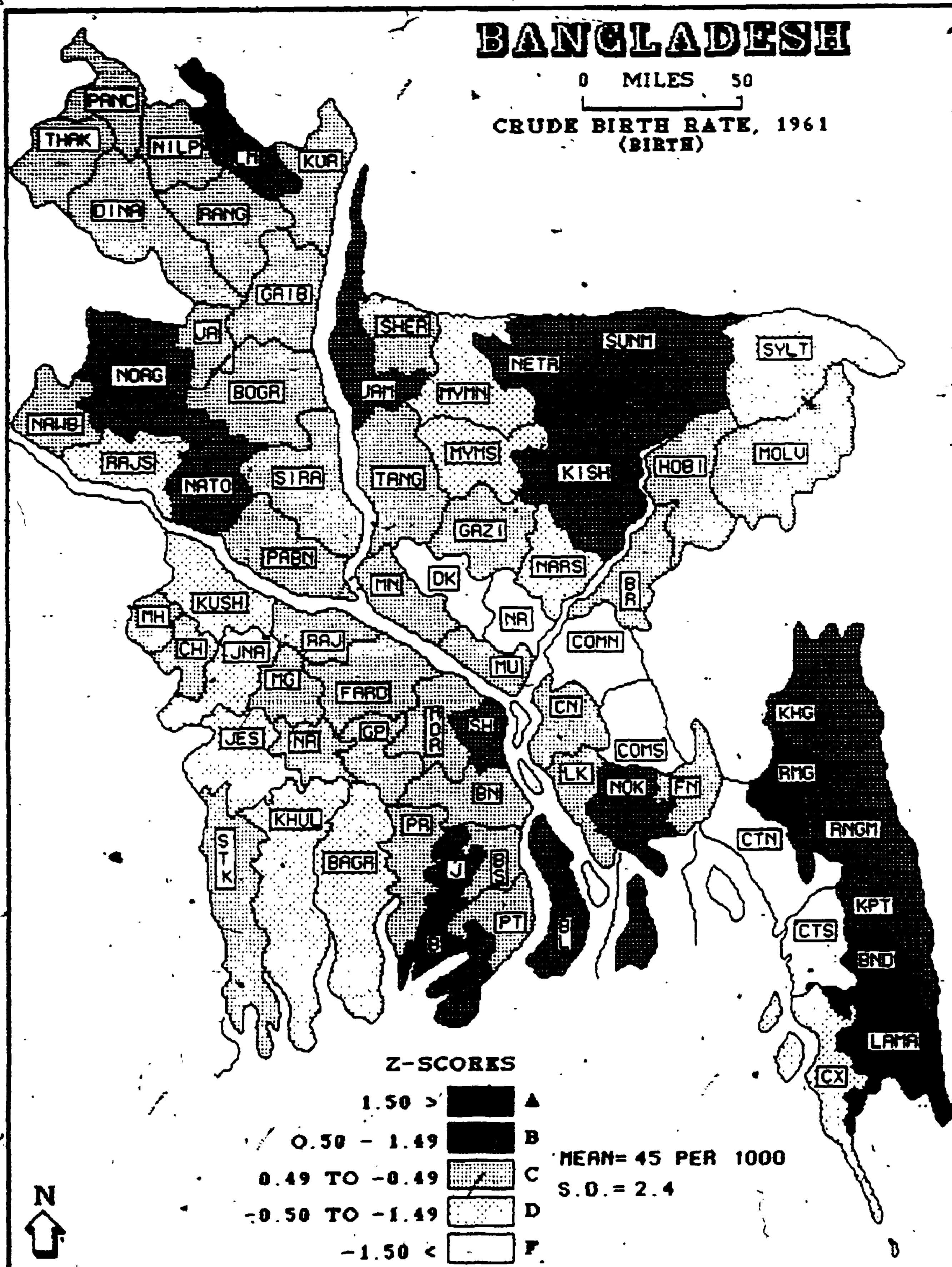

BANGLADESH
0 MILES 50
CRUDE BIRTH RATE, 1961
(BIRTH)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
SUNM
NETR
SYLT
MYMS
KISH
HOBI
MOLV
TANG
GAZI
NARS
MN
DK
NR
BR
KUSH
MH
CH
JNA
RAJ
MG
FARD
MU
COMN
CN
JES
NR
GP
GOR
SH
COMS
LK
NOK
FN
KHG
RMG
RNGM
KHUL
STK
BAGR
PR
BN
J
BS
PT
B
BL
CTN
CTS
KPT
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 45 PER 1000
S.D.= 2.4
N

Figure 5.2a

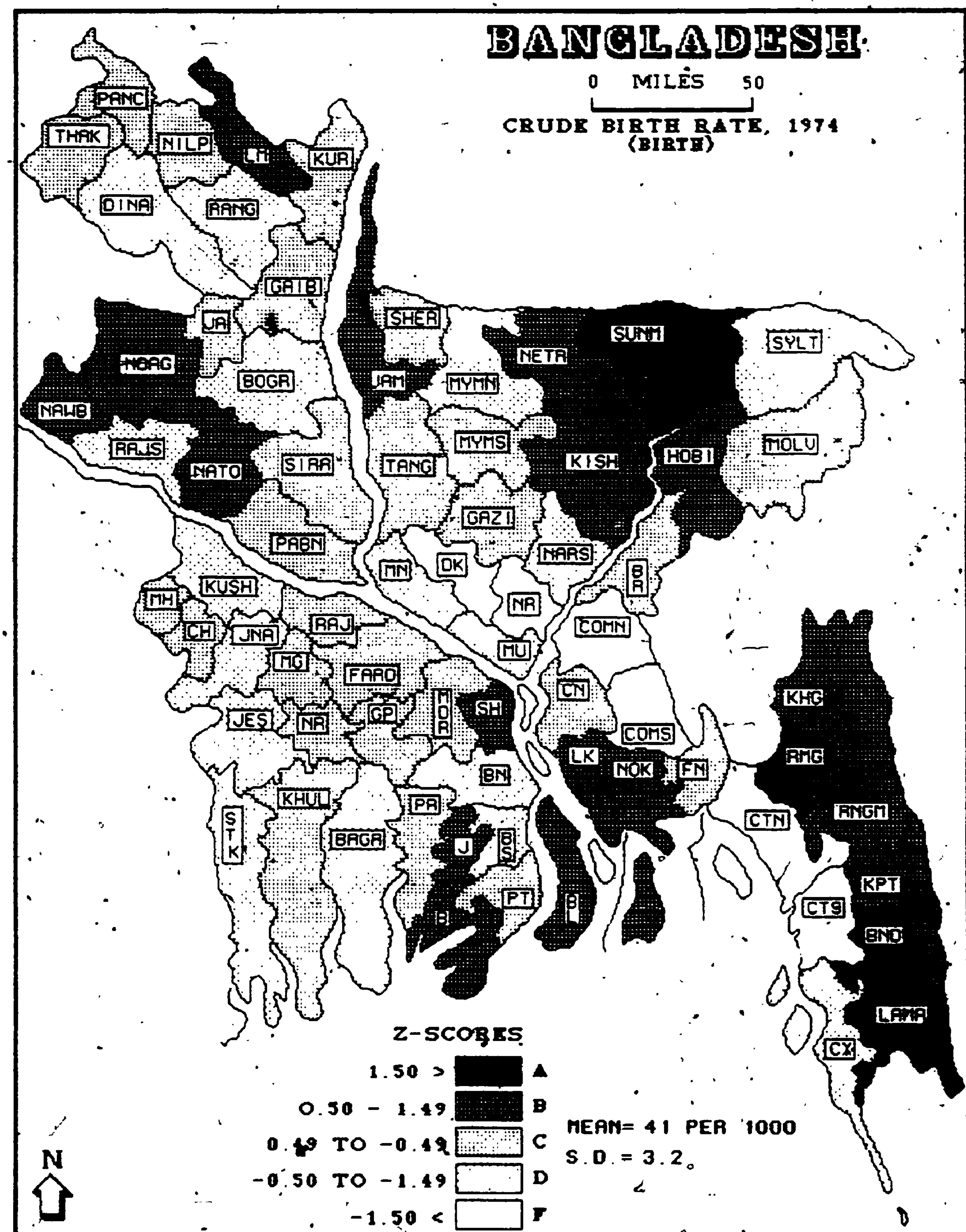
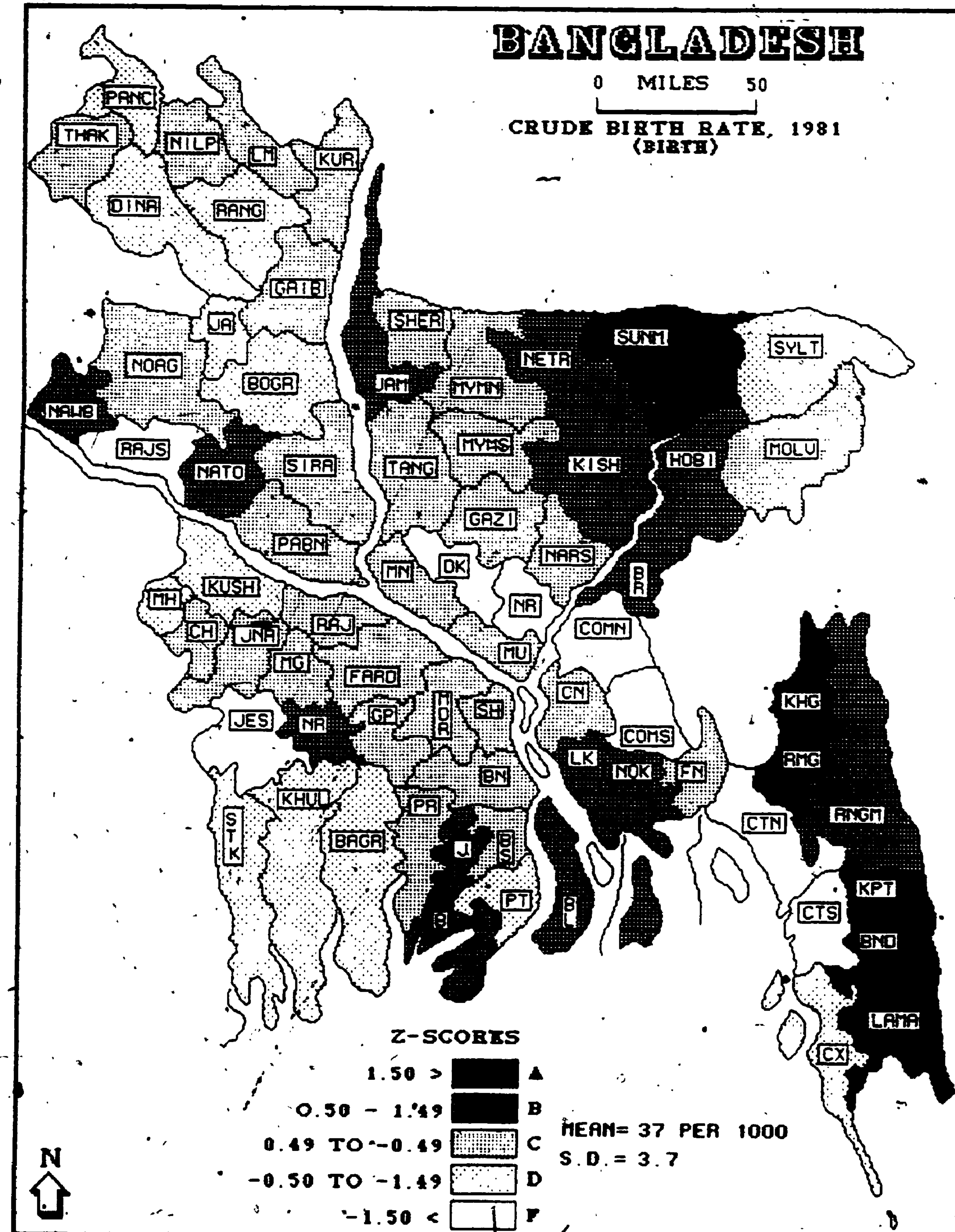

BANGLADESH
0 MILES 50
CRUDE BIRTH RATE, 1974
(BIRTH)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NBAG
NETR
BOGR
JAM
MYMN
NAWB
RAJS
MYMS
MOLU
NATO
SIRA
TANG
KISH
HOBI
GAZI
PABN
NARS
MN
DK
BR
KUSH
NR
MH
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
SH
JES
NR
GP
MDR
COMS
RMG
LK
NOK
FN
BN
KHUL
PA
CTN
RNGM
STK
BAGA
J
BS
KPT
PT
CTS
B
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 41 PER 1000
S.D = 3.2
N

Figure 5.2b


BANGLADESH
0 MILES 50
CRUDE BIRTH RATE, 1981
(BIRTH)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NORG
BOGR
JAM
NETR
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
MN
DK
NARS
NR
BR
MH
KUSH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
JES
NR
GP
MDR
SH
KHG
LK
NOK
FN
COMS
BN
RMG
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
PT
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 37 PER 1000
S.D.= 3.7
N
Figure 5.2c

consistent one. Birth Rates are highest at each time period in the Chittagong Hill-Tracts, and in other peripheral rural zones, notably the active delta, the depressed basins and in the far west (Figure 3.3c). Correspondingly, the rates are substantially below average along the Dhaka-Chittagong axis and for many of the other 'urban' Districts.

With a generally declining Birth Rate, the changes between 1961 and 1974 (Figure 5.2x) and between 1974 and 1981 (Figure 5.2y) are marked by a high incidence of negative scores Between 1961 and 1974 the only 'urban' districts scoring positive were Khulna and Mymensingh. In the 1974-1981 period Khulna's rate of growth declined markedly, but there were moderate positive changes for other 'Urban' districts.

Given the patterns and direction of increases in the Birth rate as being predominantly a rural phenomena, the increases in urban population must be attributable in large part to migration from 'rural' to 'urban' districts

Dependency Ratio- Spatial and Temporal Change

Given the migration alluded to above, and the likelihood of the older and younger segments of the population remaining in the rural districts, a 'core-periphery' or 'rural-urban' separation was expected with respect to the variable, Dependency Ratio. At the initial time period, 1961, (Figure 5.3a), the pattern appears somewhat indeterminate, although the lowest dependency ratios occur are along the Dhaka-Chgittagong axis.

By 1974 the overall mean had climbed from 105 to 114 which means that virtually all Districts have an absolute value in 1974

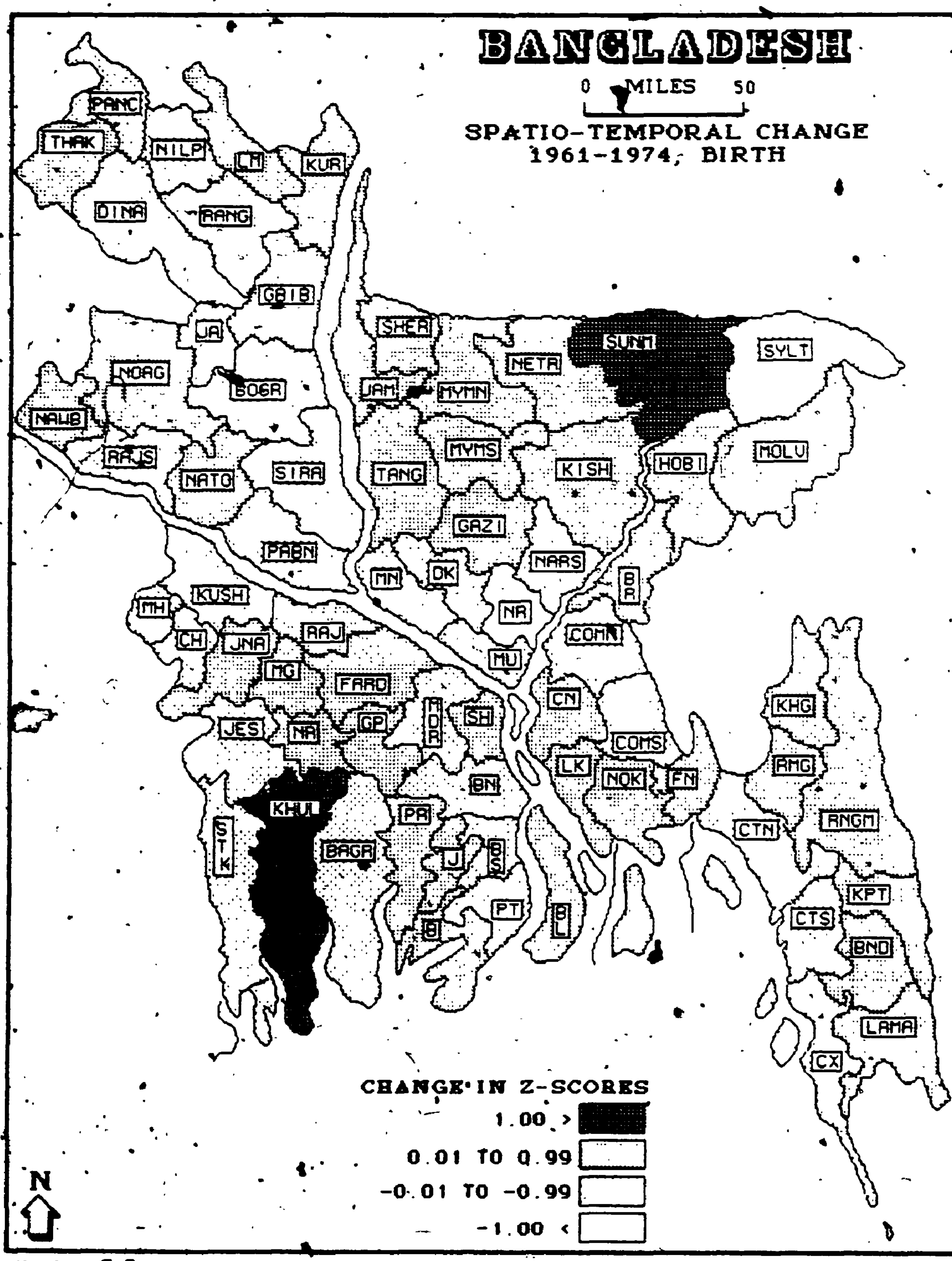

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, BIRTH
PANC
THAK
NILP
LM
KUR
DINA
RANG
GBIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
MYMS
MOLV
RAJS
NATO
SIRA
TANG
KISH
HOBI
GAZI
PABN
NARS
MN
DK
BR
KUSH
NR
MH
COMM
RAJ
CH
JNA
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
PT
BL
B
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.2x

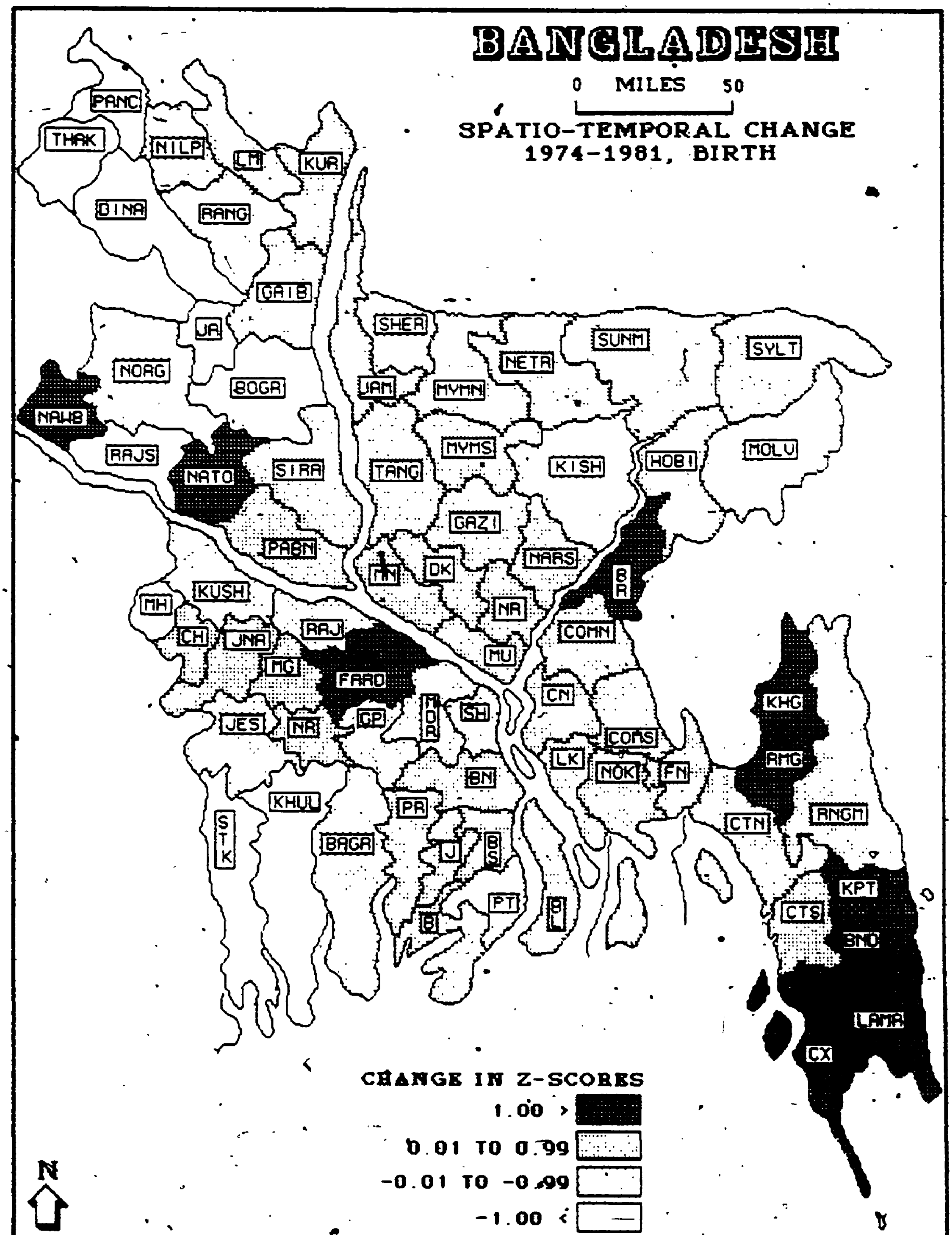

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, BIRTH
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NORG
NETR
NAWB
BOGR
JAM
MYMN
RAJS
NATO
SIRA
MYMS
TANG
KISH
HOBI
MOLU
GAZI
PABN
DK
NARS
BR
MH
KUSH
NR
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
JES
NR
GP
SH
COMS
LK
NOK
FN
KHG
RMG
RNGM
KHUL
BN
PR
CTN
STK
BAGR
J
BS
PT
BL
B
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.2y

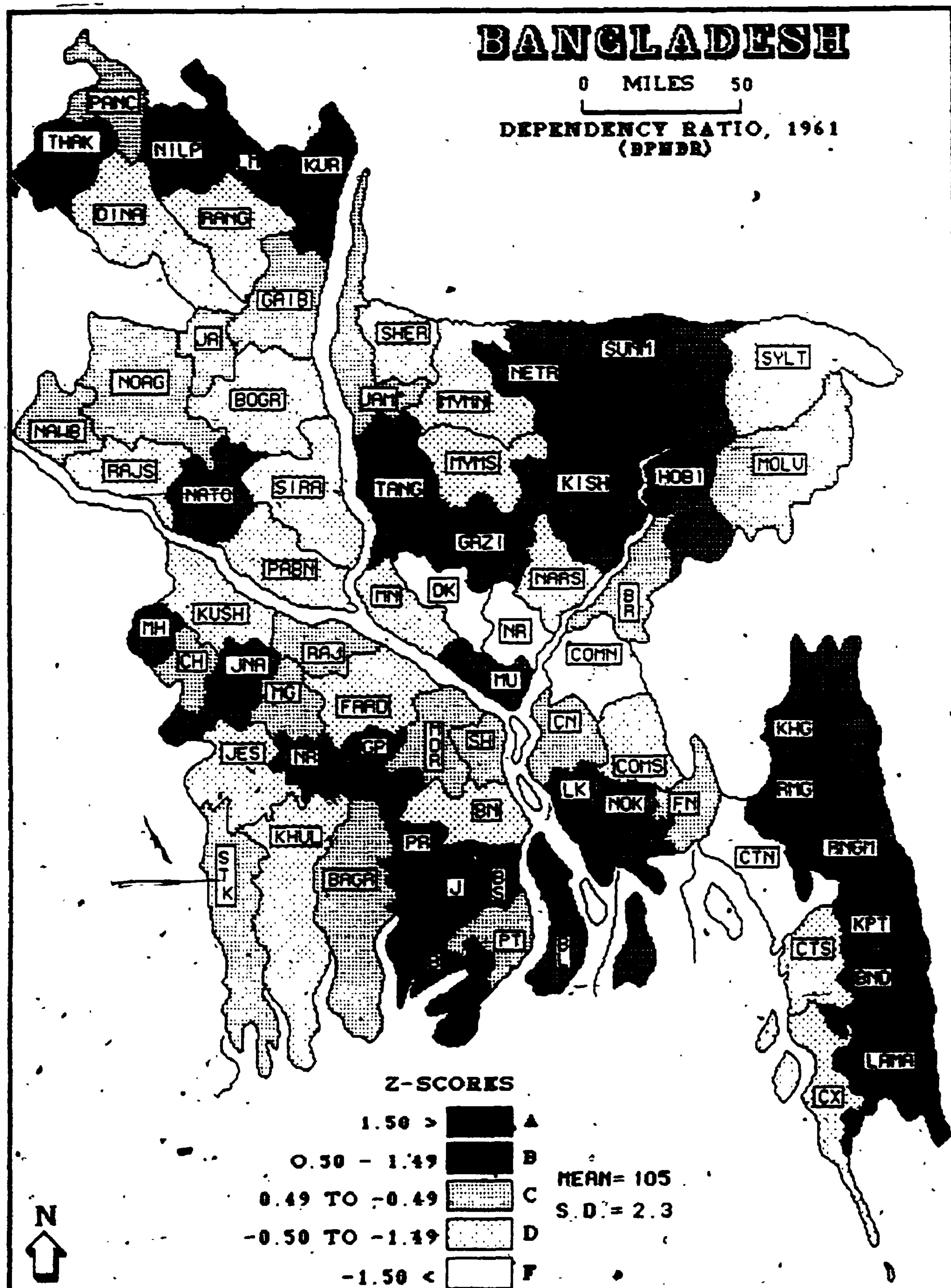

BANGLADESH
0 MILES 50
DEPENDENCY RATIO, 1961
(BPHDR)
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
MYMS
TANG
GAZI
NETR
SUNM
SYLT
KISH
HOBI
MOLU
NARS
MN
DK
NR
BR
COMN
KUSH
MH
CH
JNA
RAJ
MG
FARD
MU
CN
JES
NR
GP
SH
COMS
LK
NOK
FN
KHUL
BN
STK
PR
BAGR
J
BS
PT
CTN
KHG
RMG
RNGM
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 105
S.D.= 2.3
N

Figure 5.3a

higher than the 1961 mean. In 1974 (Figure 5.2b) the lowest Dependency Ratios are more clearly associated with 'urban' districts, and this distribution is confirmed in 1981 (Figure 5.3c). Throughout the study period the highest Dependency Ratios occur in the Hill-Tracts, the active delta, and in the depressed basin of the northeast, areas which are the major zones of high population increase and outmigration.

The patterns of change in Dependency Ratio between 1974 and 1981 (Figure 5.3x) and between 1974 and 1981 (Figure 5.3y) are quite distinct. In the initial period, against a sharply increasing overall dependency ratio, the major increases in z scores were most evident in a set of predominantly 'rural' districts in the central axis and in the far south east. Between 1974 and 1981 the pattern altered, in that the Hill-Tracts experienced a change below the average (i.e. a decline) and the greatest increases were found in the south and north east, albeit still mainly in 'rural districts'.

The three demographic variables each exhibit different patterns although there is some reinforcement of an 'urban' versus 'rural' district pattern, with the former having the highest densities, the lowest birth rates and lower dependency ratios. Rural districts are less homogeneous but generally the tendency is lower overall densities (although some rural districts are well over 3000 per square mile), higher birth rates which are also falling at a lower rate, and higher dependency ratios, although the latter measure is only weakly correlated with birth rates for the rural districts.

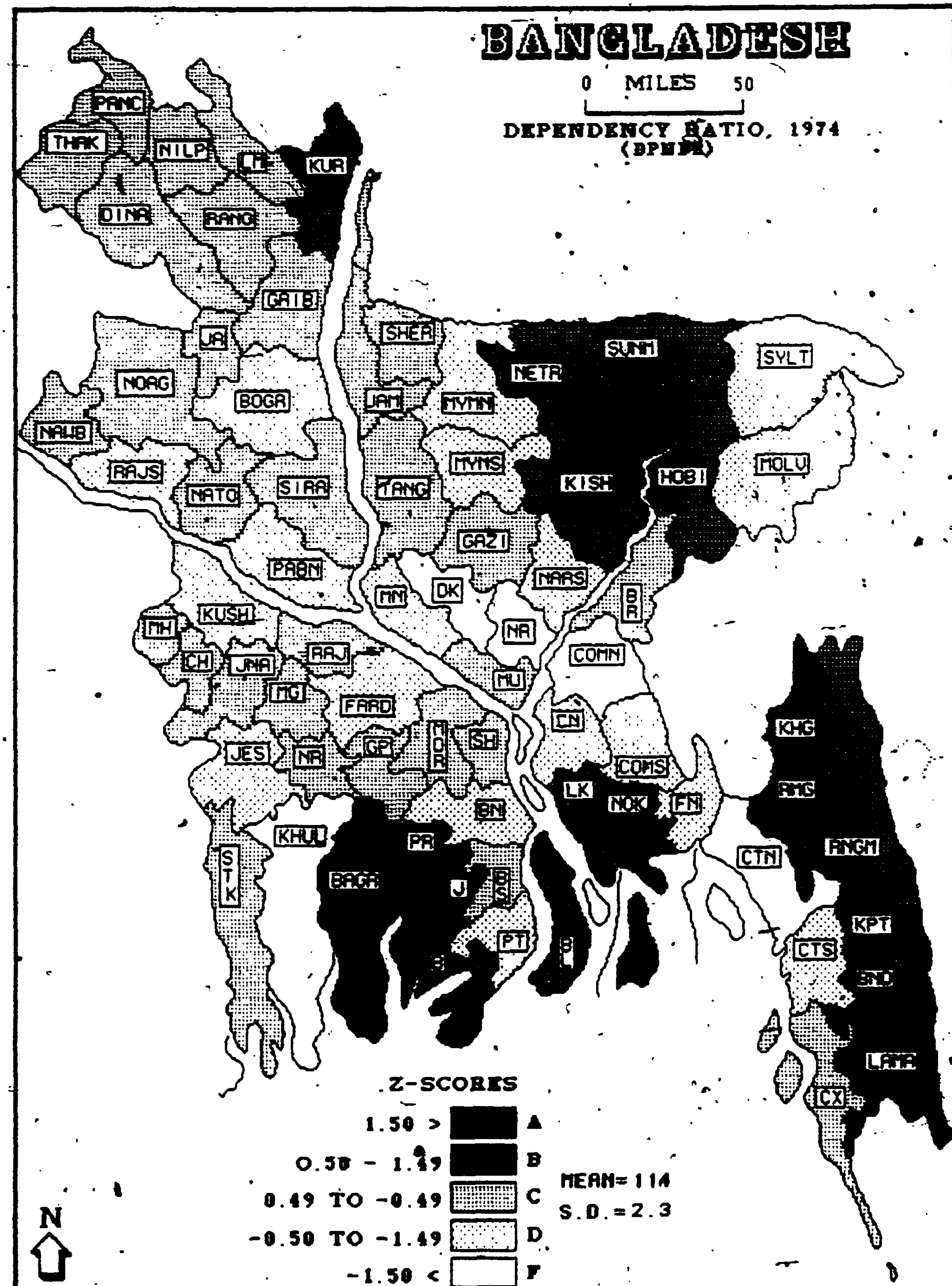

BANGLADESH
0 MILES 50
DEPENDENCY RATIO, 1974
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGA
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYNS
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
KUSH
MH
NA
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
JES
NR
GP
SH
COMS
LK
NOK
FN
KHG
KHUL
STK
PR
BN
CTN
BAGA
J
RNGM
PT
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 114
S.D.=2.3
N

Figure 5.3b

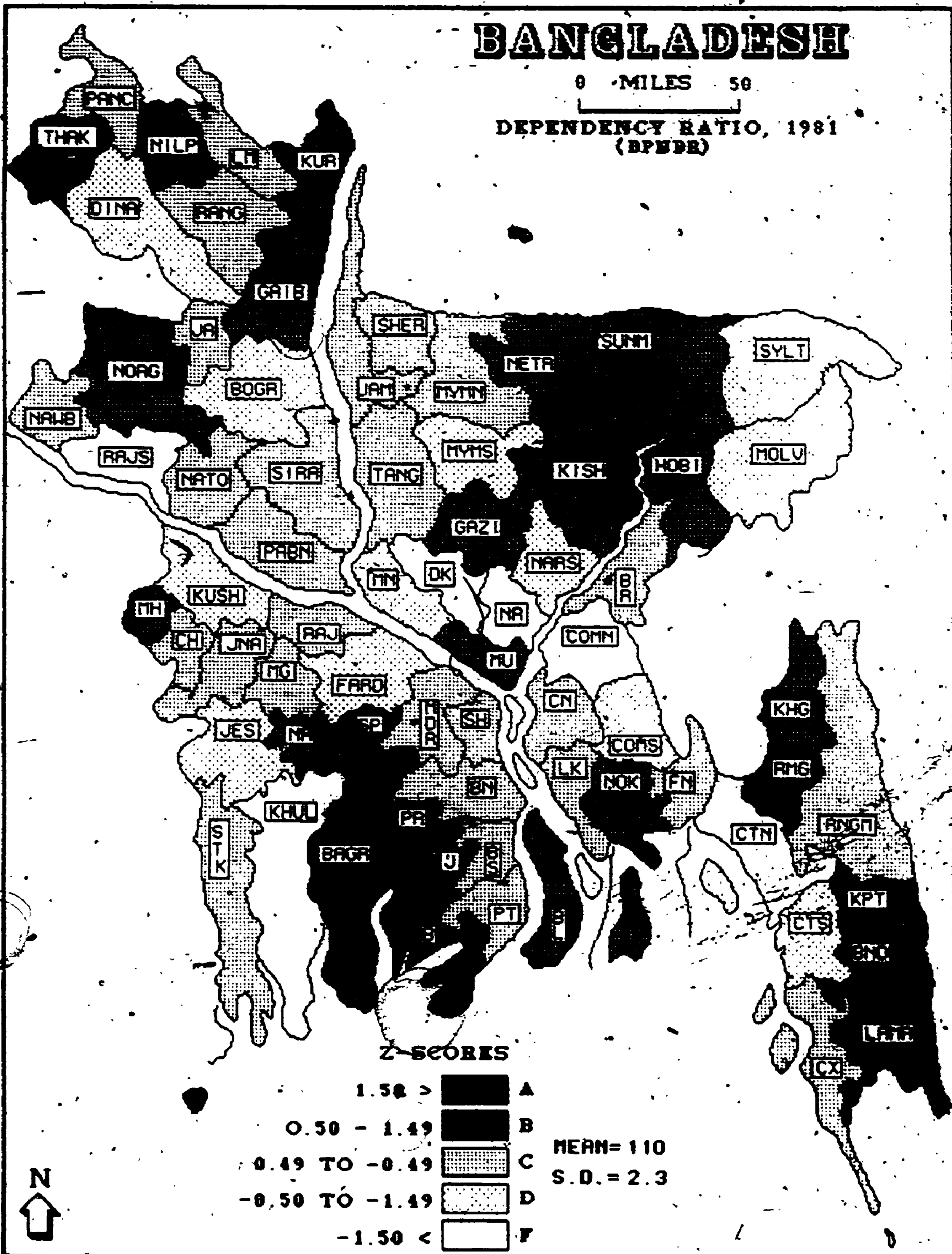

BANGLADESH
0 MILES 50
DEPENDENCY RATIO, 1981
(BPNDR)
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
NOAG
NAWB
BOGR
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
TANG
MYMS
NETR
SUNM
SYLT
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
NA
BR
COMN
MU
MH
KUSH
CH
JNA
RAJ
MG
FARD
JES
KHUL
STK
BAGR
PR
SH
BN
J
PT
CN
LK
NOK
FN
COMS
KHG
RMG
CTN
ANGM
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 110
S.D.= 2.3
N

Figure 5.3c

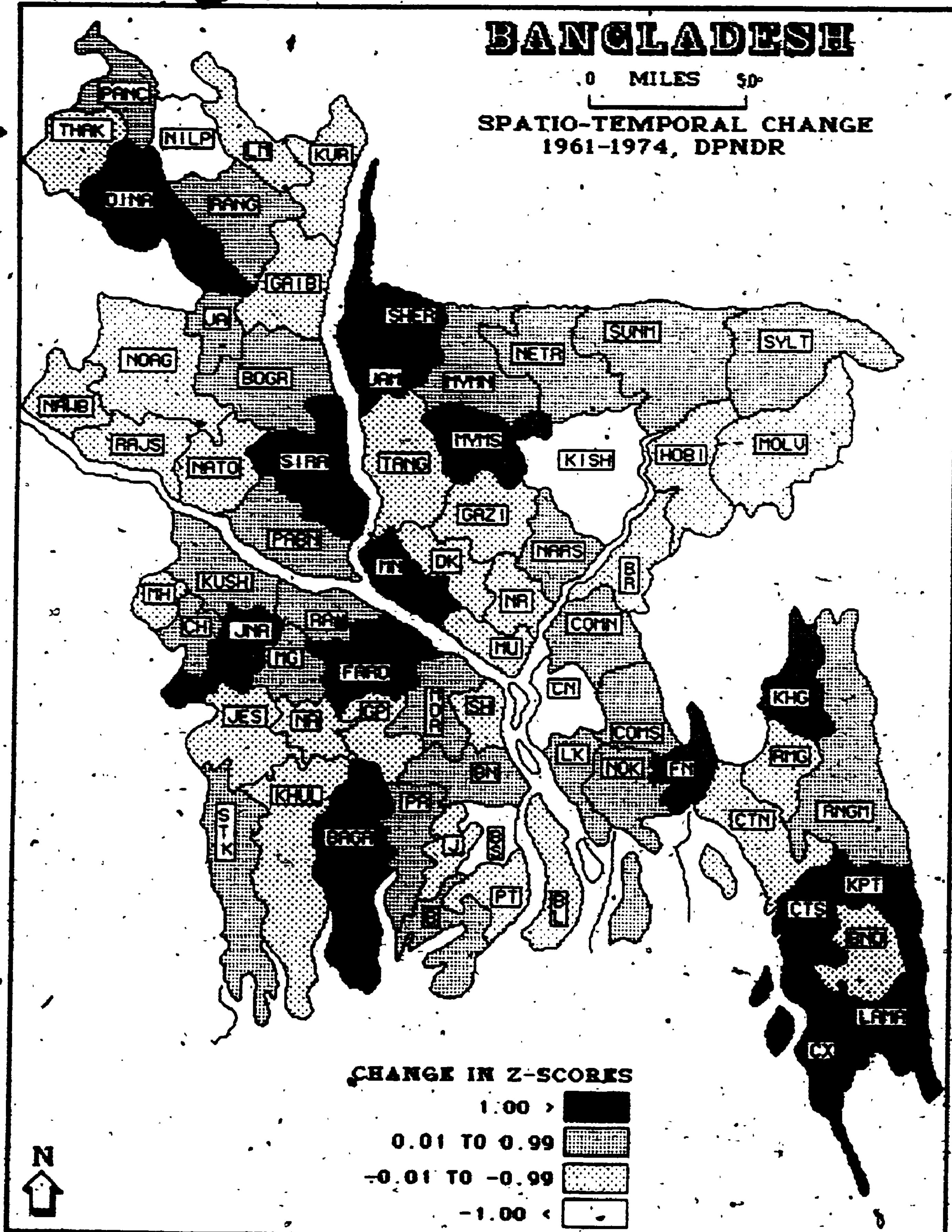

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, DPNDR
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
NETR
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
BR
MH
KUSH
NR
COMN
CH
JNA
RAJ
MU
MG
FARD
KHG
CN
JES
NA
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGH
J
BS
PT
BL
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.3x.

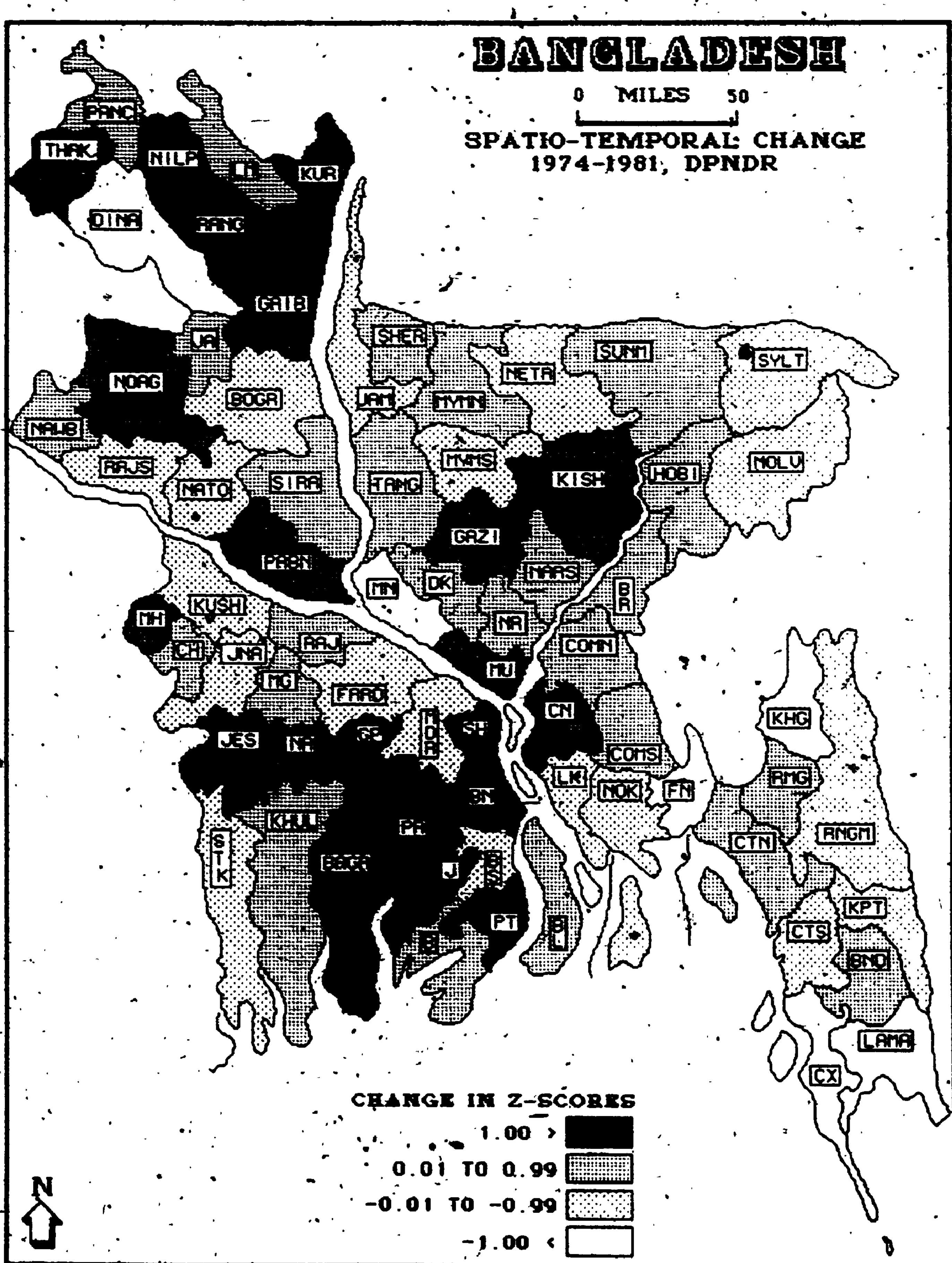

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, DPNDR
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
BR
NA
KUSH
MH
CH
JNA
RAJ
MG
FARD
MU
COMN
CN
JES
NA
GP
MDR
SH
COMS
KHG
LK
NOK
FN
RMG
BN
KHUL
STK
PR
BAGR
J
CTN
RNGM
PT
BL
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.3y

Housing Variables

Housing is regarded as one of the basic needs to mankind. Housing conditions are important to the development process and as major determinants of social conditions. Personal means, as well as individual preference, tempered by cultural norms, determines the types of dwellings in which people live. Good housing has important benefits not only for individuals and their families but for society as a whole. It affects the health, well-being and personal development of people, and housing policy has thus become an important field of social planning in LDCs.

Bangladesh has been identified as one of the countries in the world in which housing conditions are very poor. The majority of the population in Bangladesh are accomodated under a wide variety of disadvantageous housing conditions, predominantly structures made of grass, straw, leaves, bamboo, mud/unburnt brick, corrugated iron sheets, tiles, wood and combinations of those construction materials. These materials, however, do not reflect well-being for individuals as a basic societal goal. Although material well-being corresponds directly to good housing, quality in this case is a relative concept and is interpreted within the national context. Therefore, Percentage of Dwellings Reporting House Wall and Roof by Brick and Cement are jointly taken into consideration as a measure of material prosperity. It is expected that any increase in the percentage of dwellings reporting such materials for a given area at a given time must demonstrate material development for that area in that time. It is also assumed that a higher proportion of Dwellings Reporting House Wall by Brick and Cement (HWBRK) and House Roof by Brick and

Cement (HRBRK) is one of the major urban characteristics in LDCS. However, their low incidence in rural areas may be tempered by regional cultural norms and to some extent are relateable to local physiographic conditions. The influence gradiant from metropolitan centres may also taken into account as another causal factor in describing the surface patterns of good housing. In other words, the further an area is from metropolitan centres, the less promising will be its material development outlook. However, exceptions may be found in some initial 'urban core' 'Sub-Divisions' which emerge as pockets of relative prosperity

The initial range of variables collected within the Housing Category included Percentage of House Walls by Straw/Grass/Leaves and Bamboo, Mud/Unburnt Bricks, Corrugated Iron Sheets, and Wood, Cement and Bricks; Percentage of House Roofs by Straw/Grass/Leaves and Bamboo, Tiles, Corrugated Iron Sheets and Wood, Cement and Bricks, Asbestos/Cement/Lime (Appendix I). From this initial array, one, namely House Walls by Bricks and Cement (HWBRK) was selected for detailed analysis.

Majors trend in housing materials between 1960-1980 indicate that Bangladesh is still marked by widespread use of insubstantial building materials (i e. bamboo and mud). Very minor changes occured with respect to housing by structural types (Table 5.1). For example, House Walls by Bamboo, Grass, Straw and Leaves (HWBMB) declined very moderately (-7.1 per cent) over the years (from 68.9 per cent in 1961 to 61.7 per cent in 1981) However, this average decline in HWBMB at the national level seems to have been replaced by an almost equal increase in Mud (HWMUD) and Wood (HWWOD) built structures with increases of 3.5 and 3.3 per cent, respectively. Therefore, the basic national trend of housing has not changed very much over the years according to low quality indicators, and a situation of general disadvantage has been maintained. This is reflected in HWBRK which shows an insignificant change over the study period (Table 5.1). The average condition of HWBRK in Bangladesh remained consistent over time in percentage terms (4.6 per cent) Although the actual number of good dwellings have increased, they has only just been able to keep pace with the growing number of family units. Further, unstable factor prices of construction materials caused many to forego the good housing option, particularly, during the post civil war period (1974-1981) and this resulted in a decline in the average national situation (Table 5.1). A high standard deviation suggests that there is sharp contrast between districts with respect to good housing. However, the minimum level of such housing by district increased from .10 in 1961 to .20 per cent in 1981. In contrast, the maximum level declined from 20 per cent in 1961 to 14.7 per cent in 1981. In any case these figures are amongst the lowest of any country in the world and, represent a low general base of housing quality. Because of high cost of use brick and cement, the mass of rural people have been least benefited by this indicator.

The relationships between Housing and other variables are to be expected. The limited choice is in fact based on the very strong inter-correlations between household amenity variables (see below). There is a tendency that the majority of Dwellings Reporting House Walls by Brick and Cement (HWBRK) are also reporting House Roof by

Brick and Cement (HRBRK). This within-group relationship is evident by the positive association of HWBRK with HRBRK (.71). It is reasonable to expect that housing structure will be related to household amenity and occupational structure of the household and this is borne out. For example, Table 5.2 suggests that HRBRK is positively associated with the Percentage of Dwellings Reporting Bath Facilities (DBATH .72), Toilet Facilities (TOILT .71) and Percentage of Labour Force Engaged in Professional, Managerial, Technical and Administrative Employment (MANGR .66). In other words, good housing is associated with household amenity, and upper income groups with relatively higher education. Therefore, good housing condition as a measure of social situation is basically an indicator of urban lifestyle.

House Walls by Cement and Brick- Spatial and Temporal Change

House Walls by Cement and Brick (HWBRK) in 1961 (Figure 5.4a) depicts a pattern based on national mean of 4.6 per cent, an absolute range from 10 to 20 per cent by district. The high Z values are concentrated in districts centred on Dhaka including Narayanganj, Comilla North, Chittagong, Khulna, Satkhira, Magura, Chuadanga, Meherpur, Kushtia and Sylhet. Relatively low scores are found; namely, in the piedmont alluvial plain, active delta plain, the Brahmaputra flood plain, whole of Northern Division, southern Chittagong and the southern Chittagong Hill-Tracts; an indication of outlying areas. This pattern remains broadly similar for both 1974 (Figure 5.4b) and 1981 (Figure 5.4c).

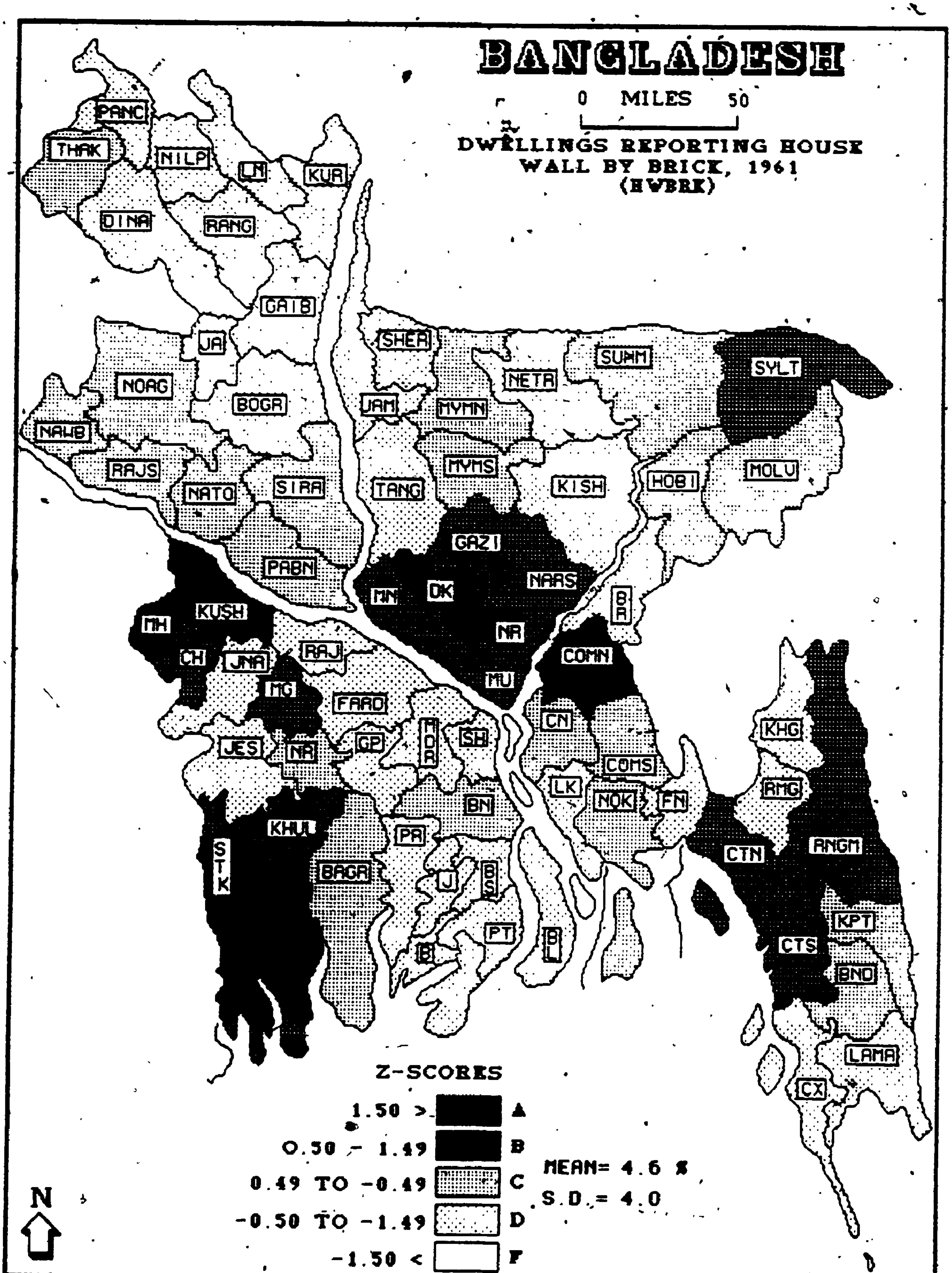

BANGLADESH
0 MILES 50
DWELLINGS REPORTING HOUSE WALL BY BRICK, 1961 (HWBRK)
PANC
THAK
NILP
LN
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
JAM
MYMN
NETR
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BA
MH
KUSH
NR
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
KHUL
BN
STK
PR
CTN
RNGM
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 4.6 %
S.D.= 4.0
N

Figure 5.4a

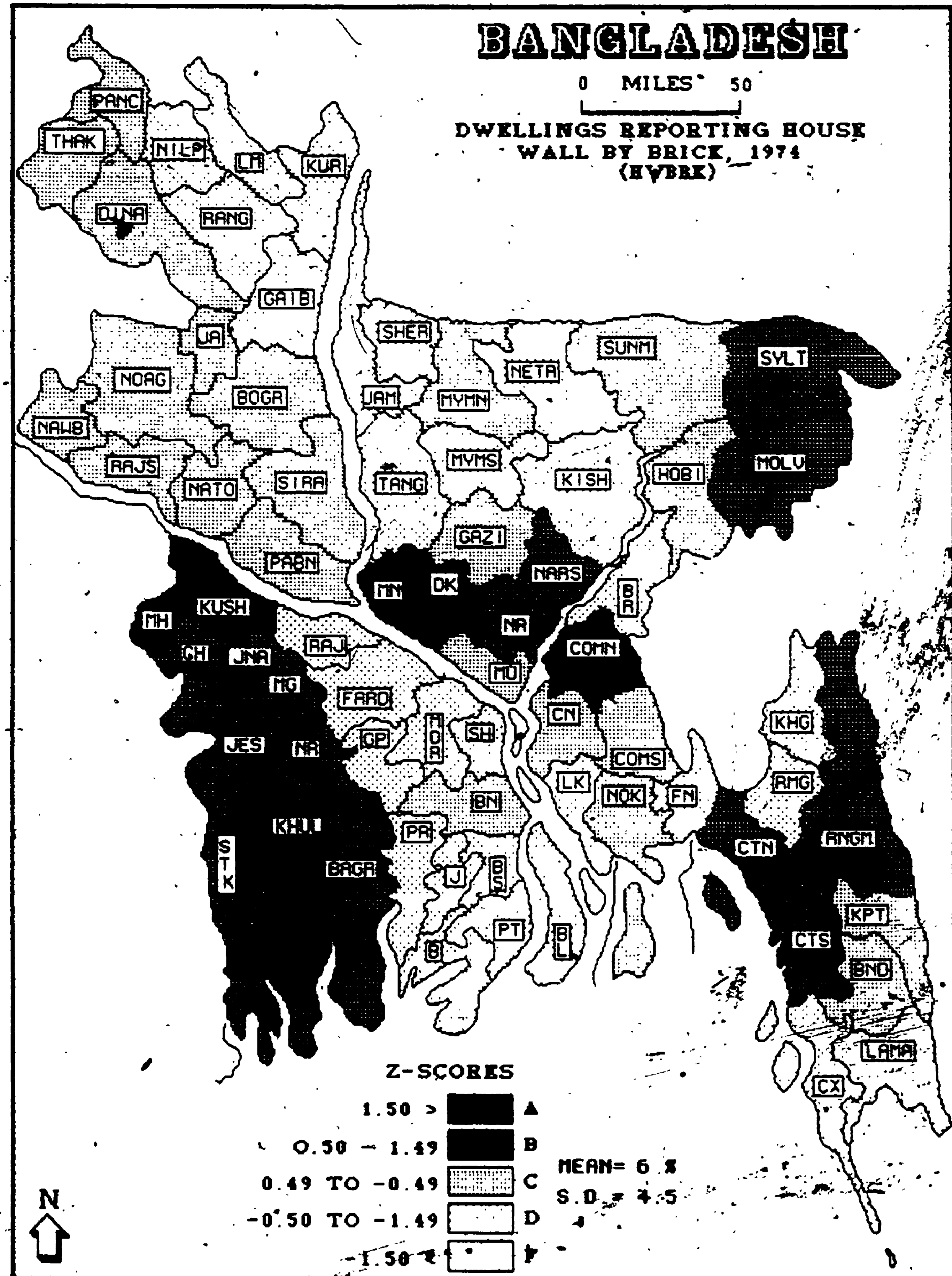
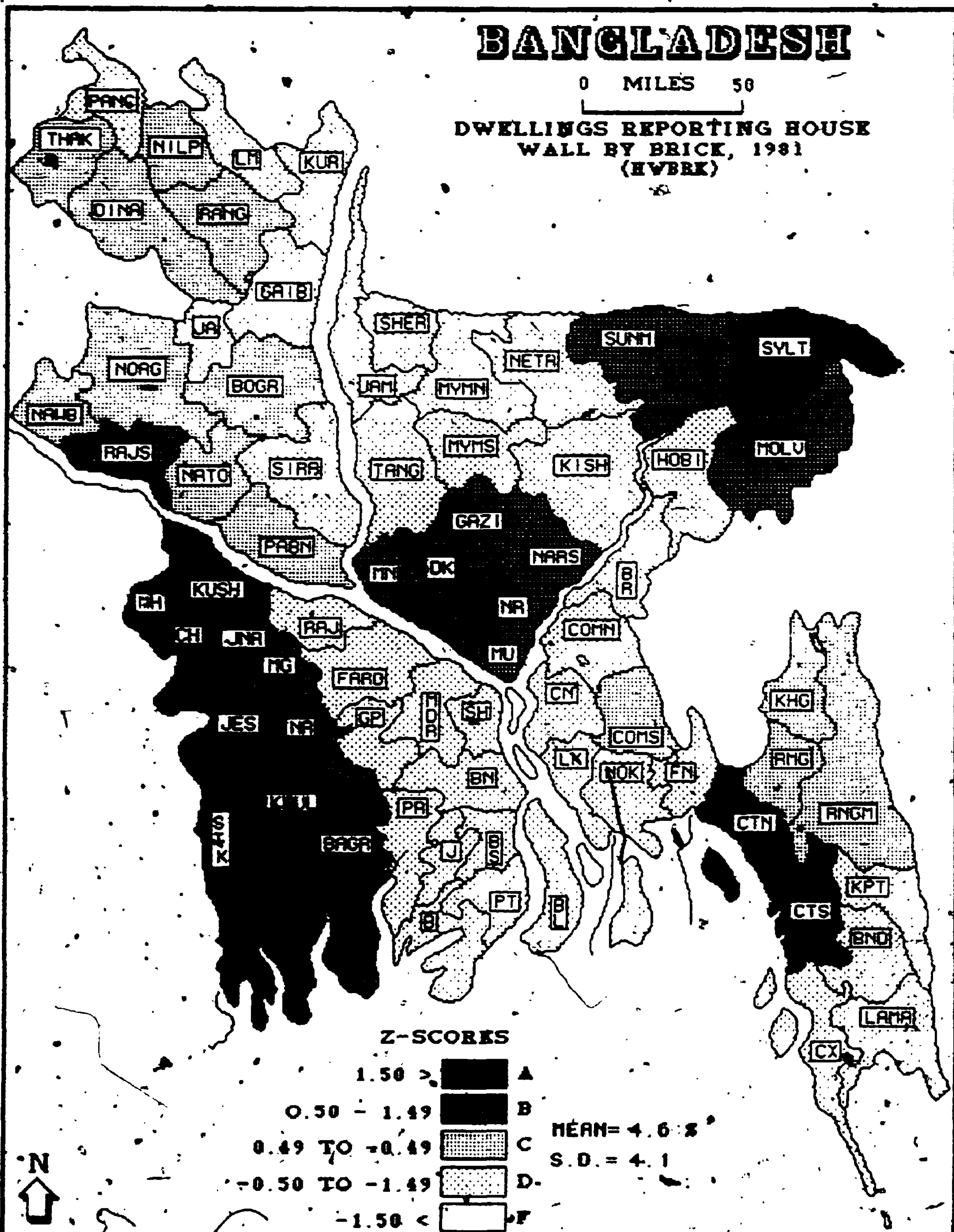

BANGLADESH
0 MILES 50
DWELLINGS REPORTING HOUSE WALL BY BRICK, 1974
(HVBRK)
PANC
THAK
NILP
LA
KUR
DJNA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGA
NETA
JAM
MYMN
NAWB
MYMS
RAJS
NATO
SIRA
TANG
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
BR
KUSH
MH
NA
RAJ
CH
JNA
COMN
MG
MU
FARO
CN
KHG
SH
MDR
GP
JES
NR
COMS
LK
NOK
FN
RMG
BN
KHU
PR
CTN
RNGM
STK
BAGA
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 – 1.49 B
0.49 TO –0.49 C
–0.50 TO –1.49 D
–1.50 < E
MEAN= 6 %
S.D = 4.5
N

Figure 5.4b



BANGLADESH
0 MILES 50
DWELLINGS REPORTING HOUSE WALL BY BRICK, 1981 (HWBRK)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NORG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
NR
MU
BR
KUSH
CH
JNA
MG
RAJ
FARD
GP
MDR
SH
JES
NR
COMN
CN
COMS
LK
NOK
FN
KHG
RNG
RNGM
CTN
BN
PR
BAGR
SAK
J
BS
PT
B
BL
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 4.6 %
S.D. = 4.1
N

Figure 5.4c

There are, however, some minor variations. In 1974 a few districts in both the Northern and Southern Divisions shifted from average to above average levels. These included Bogra, Jaipurhat, Panchagarh, Dinajpur (Northern), Jhenaidah and Jessore (Southern). On the other hand, some districts in the Central Division experienced relative decline. These are Gazipur, Munshiganj and Mymensingh South (Figure 5 4b). The broad initial patterns became more stablized in 1981. Rajshahi was the only district in the Northern Division experiencing a relative gain from an average to above average situation. In the Central Division, Gazipur and Munshiganj Districts had similar gains, whereas, Mymensingh North showed a relative decline In the East, Sunamganj showed relative improvement and Rangamati reported relative decline (Figure 5 4c) The new absolute range in 1981 of from 20 in the outlying areas to 14 7 per cent in the Districts of Dhaka, Chittagong, Sylhet and upper moribund delta reflect the facts that rates of increase varied considerably but were relatively low even in the developed areas.

Between 1961 and 1974 increases in the level of good housing above the mean value were experienced in the Northern Administrative Division, moribund delta, Dhaka-Chittagong axis and few Districts in the north-east corner of Bangladesh (Figure 5 4x) Between 1974 and 1981 the pattern was rather diffused with low level changes along the Dhaka-Chittagong axis and in the Northern boundary Districts (Figure 5 4y) The regional concentration of HWBRK may be explained partly by physiographic determinants and partly by urban influence, including foreign wage earnings In Dhaka and Chittagong regions HWBRK is largely seen as a characteristic of urban

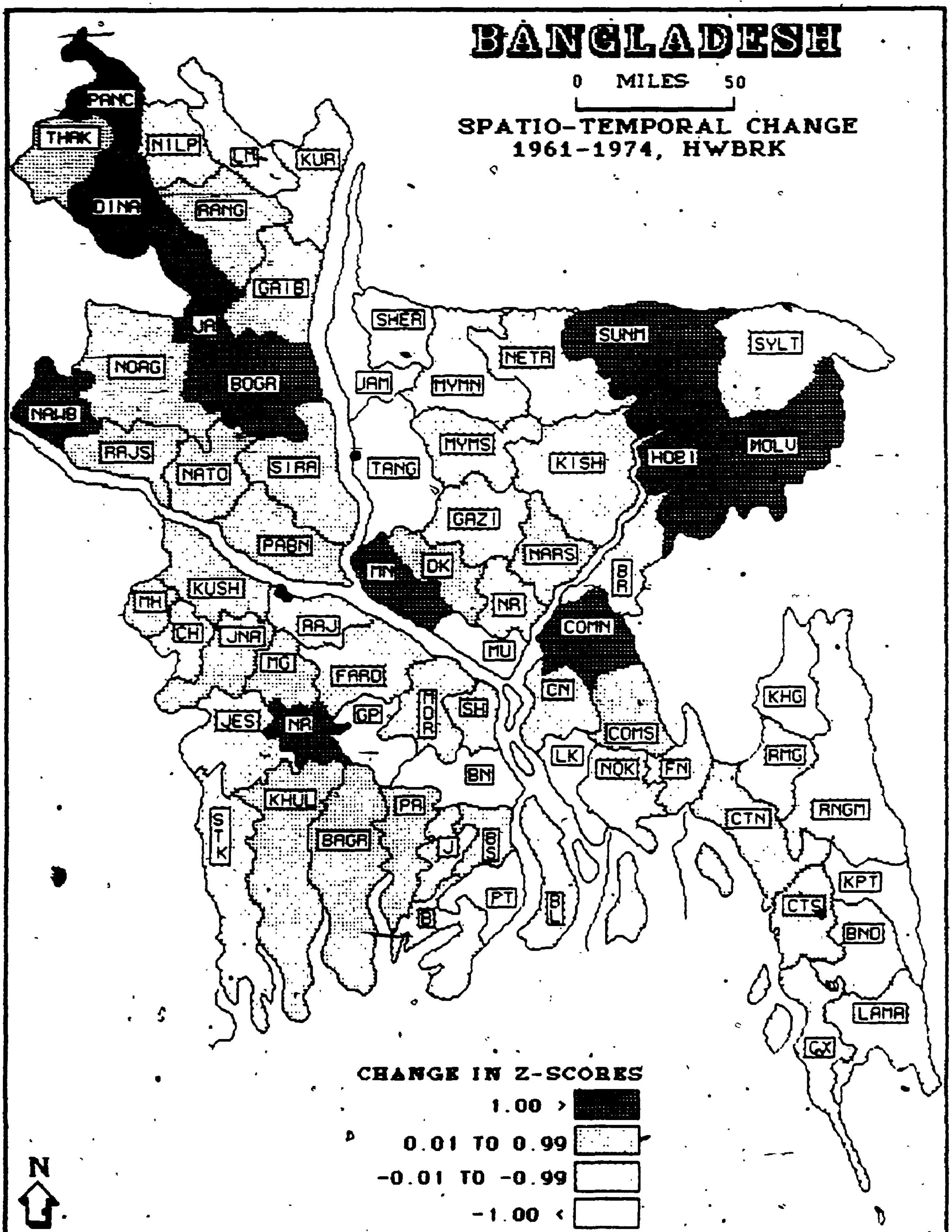

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, HWBRK
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGA
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
MH
KUSH
NR
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.4x

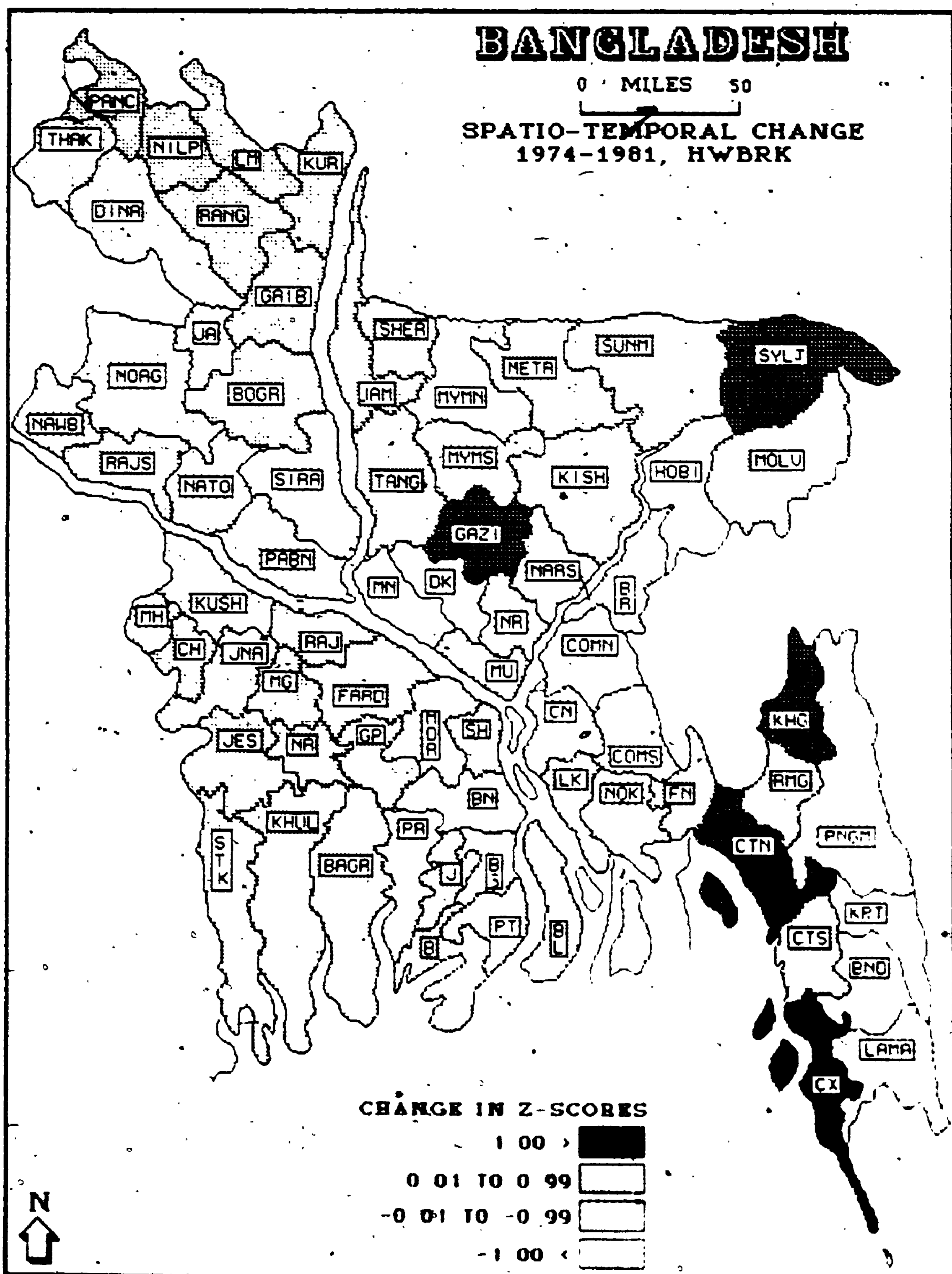

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, HWBRK
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLJ
NETA
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
MYMS
HOBI
MOLU
KISH
NATO
SIRA
TANG
GAZI
PABN
NARS
MN
DK
BR
KUSH
NR
MH
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
JES
NR
GP
GOR
SH
COMS
KHG
LK
NOK
FN
AMG
BN
KHUL
PR
CTN
STK
BAGR
J
BG
PT
BL
B
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.4y

lifestyle of the major metropolitan areas. In Sylhet region, it is more a function of foreign wage earnings, where a substantial number of population are presently employed in Britain. The concentration of HWBRK in the moribund delta plain is probably due to its unique flood free physiographic condition, and consequent higher local availability of construction materials (i.e. brick)

Amenity Variables

The provision of household amenities are important indicators with which to measure social well-being Amenity criteria are based on consideration of public health, and the level to which household facilities of a basic level are present There have been many studis of household amenities in the Third World which justify concern and state intervention, especially when the enormous inequalities are understood. Dwellings are not equally served with amenities and do not provide the same standard of health and sanitation, safety and protection. Although basic housing condition in Bangladesh did not change very much over the twenty year period, there are indications of the spread of household amenities including both bath and toilet facilities and of electricity and radio into rural areas. The spread of electricity and the possession of a radio represent the largest proportional individual variable changes recorded and those whose impact has broader significance (Table 5.1). Therefore, we must stress that an increase in the provision of amenities means an increment in the relative levels of living, and thereby, social well-being.

The initial range of variables collected within the Household Amenity Category included Percentage of Dwellings Reporting Tube-

Well, Electricity, Gas Supply, Bath Facilities, Toilet Facilities, Radio Set, Television, and Telephone Set. From this initial array, three, namely Percentage of Dwellings Reporting Electricity (HYDRO), Percentage of Dwellings Reporting Radio (RADIO) and Percentage of Dwellings Reporting Bath Facilities (DBATH), were selected.

It must be noted that the Percentage of Dwellings Reporting Tube Well is omitted from the analysis. This was initially considered as an important amenity in the absence of access to piped (drinking) water in rural areas. However, traditionally, people in rural Bangladesh have been using ponds as a source of drinking water. Therefore the validity of using tube well as a household amenity indicator cannot be fully justified, except in those cases where ground water tables are fairly low. Districts having fewer tube wells cannot be interpreted as disadvantaged, simply because those districts have alternative sources of drinking water. On the other hand, the importance of the use of natural gas in cooking carries great value in a fuelwood deficit country like Bangladesh. Unfortunately, although the country is rich in natural gas reserves, it is not yet widely used across the country due to the high costs involved in the construction of pipe lines. Only a few Districts are using the facility and spatial statistics are not available for the base year (1961) which preclude us from using the variable for analysis. Similarly, televisions and individual telephones are not yet representative of rural development and therefore, are excluded from the analysis.

In this study, the variable Percentage of Dwellings Reporting Electricity (HYDRO) is selected for analysis as a crucial energy index. Its provision plays a vital role in bringing changes in the traditional rural lifestyle, and therefore, a major contributing factor to the process of development (e.g domestic use, rural agro-based and cottage industries). Temporal changes indicate that average provision of HYDRO increased from 6.4 to 32 per cent between 1960-1980. An absolute increase in HYDRO (25.6 per cent) is thus quite significant, with variation indicating the comparative level of rural electrification (Table 5.1).

The second important criterion chosen for analysis within the amenity group is the Percentage of Dwellings Reporting Radio (RADIO). This variable is taken into consideration as a socio-cultural indicator, representing access to basic information news and as the basis of entertainment. An expectation is that RADIO will initially be spatially correlated with the major urban axis or initial district cores but will have spread significantly into rural districts over the study period. The changing trend indicates that the national mean of RADIO increased from about 17 to about 56 per cent over the study period. An absolute increase of about 39 per cent, is thus, quite significant (Table 5.1). While the national average increased considerably, the standard deviation declined, indicating a balancing trend over the years.

The third variable presented is that of the Percentage of Dwellings Reporting Bath Facilities (DBATH). In the absence of access to piped water in rural Bangladesh this is chosen as an index of public health and sanitation. It is important to note that a large proportion of rural households in Bangladesh are not provided with household bath facilities. Have-not groups most often share their necessities informally with others who do have such provisions. In urban areas, almost all dwellings in one way or the other are connected to these facilities. However, in rural Bangladesh, bath room does not exist in a strict manner. Males usually take their bath in nearby community ponds. For females this is unusual and not permissable by the social customs. In this context, all rural dwellings are taken into account which show an arrangement of female privacy for washing purposes, regardless whether it is in room form or as a small private pool (pond) in the backyard. The Percentage of Dwellings Reporting Bath Facilities (DBATH) increased from about 4.7 to 14 per cent, over the study period. Thus, an absolute change in the national mean value of DBATH is recorded about 9.3 per cent (Table 5.1).

The relationships between amenity and other variables are to be expected. Within-group relationships suggest that there is a major underlying dimension in the household amenities (Table 5.2). This is evident by the fact that The Percentage of Dwellings Reporting Bath Facilities (DBATH) is strongly and positively associated with the Percentage of Dwellings Reporting Toilet Facilities/TOILT (.96). On the other hand, the Percentage of Dwellings Reporting Electricity (HYDRO) is positively related to the Percentage of Dwellings Reporting/RADIO (.79). A moderate positive relationships also exist between HYDRO and DBATH (.55) and TOILT (.51).

Between-group relationships indicate that household amenities are linearly combined with Per Capita Income, Non-Agricultural Occupation, Educational and Health Care Investments (Table 5.2). To be precise, HYDRO is positively associated with Per Capita Income/INCOM (.75), the Percentage of Labour Force Engaged in Administrative and Managerial Employment/MANGR (.52), Service

Sector Employment/SERVE (.78), Manufacturing Employment/MANUF (.79), Per Capita Expenditure on General Education/PEXED (.81), Adult Literacy Rate/LITER (.53) and Per Capita Expenditure on Health Care Services/PEHCS (.81). Similar relationships are applied to RADIO as well. The positive relationships between RADIO and other variables are as INCOM (.77), SERVE (.73), MANUF (.79), PEXED (.85), LITER (.56) and PEHCS (.82).

The percentage of dwellings reporting bath and toilet facilities is chosen on the basis of public health and sanitary consideration. Therefore a linear relationship between these criteria and non-agricultural occupations and provisions of health care may be expected and such positive associations are revealed in the correlation matrix. DBATH is observed as a directly correlated variable with MANGR (.67), SERVE (.51), MANUF (.51), Average Number of Physicians per 50,000 Population/AVDOC (.64), Nurses per 50,000 Population/AVNRS (.51), and Hospital Beds per 50,000 Population (.56). A similar relationship is also valid for TOILT (Table 5.2).

However, it must be noted that both DBATH and RADIO are negatively associated with the Percentage of Labour Force Engaged in Agriculture/AGRIC and BIRTH (Table 5.2). This further underlines the notion of relative rural deprivation because agricultural employment and high birth rates are predominantly rural characteristics. It may be expected that provision of household amenities will be more pronounced in relatively urbanized Districts.

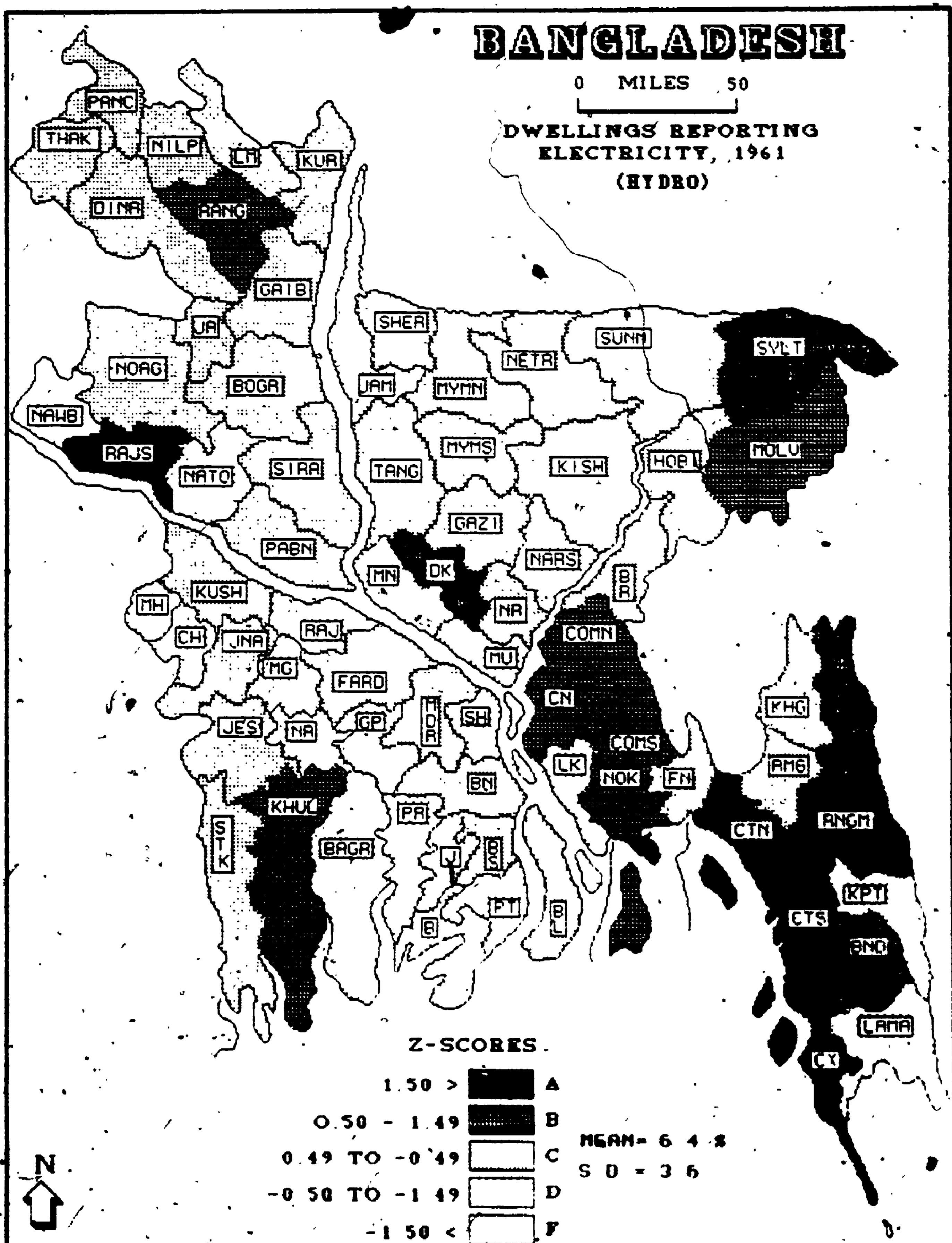
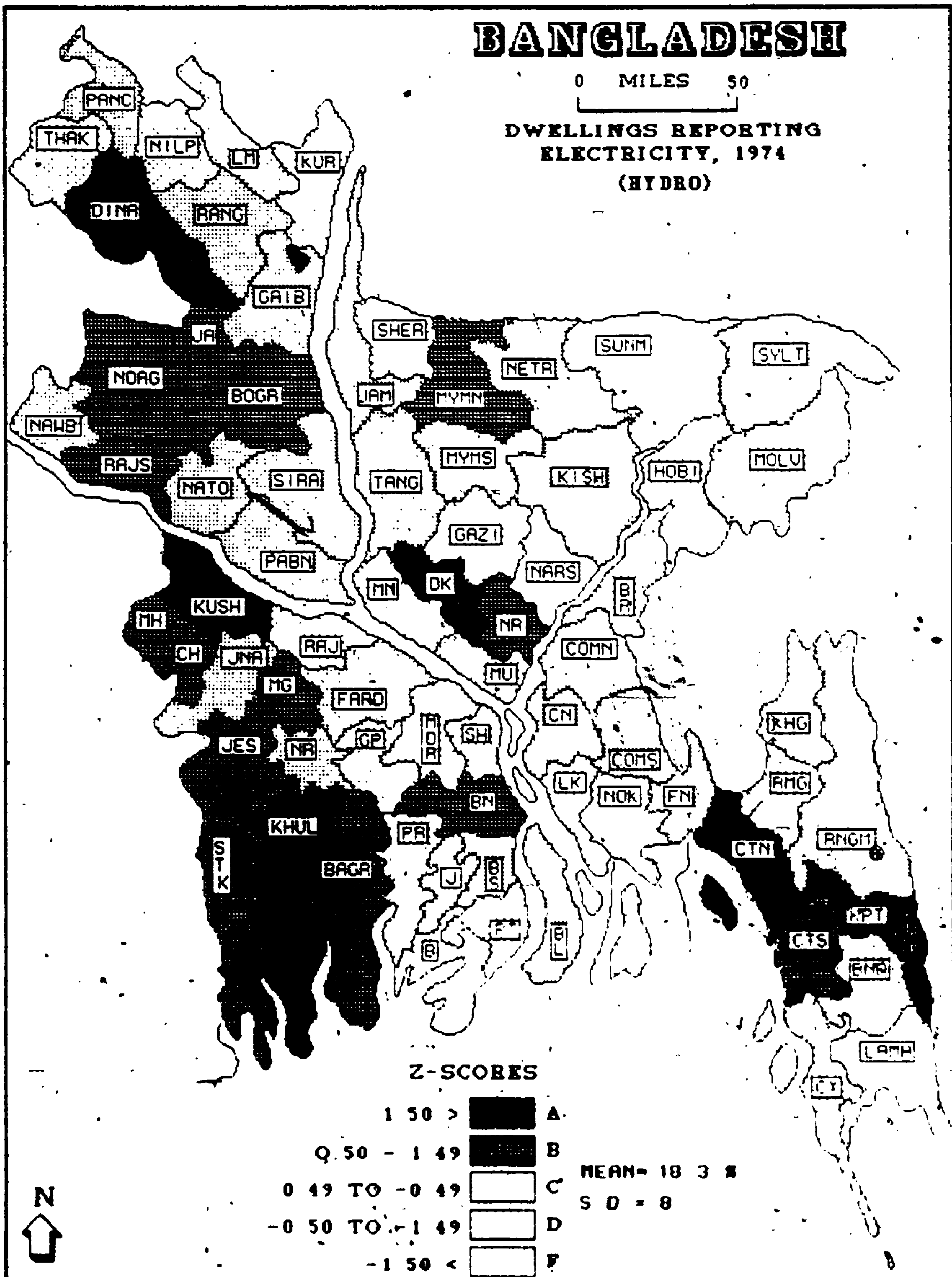

BANGLADESH
0 MILES 50
DWELLINGS REPORTING ELECTRICITY, 1961 (HYDRO)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
MYMS
MOLU
NATO
SIRA
TANG
KISH
HOBI
GAZI
PABN
NARS
MN
DK
BR
MH
KUSH
NR
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
JES
NA
GP
MDR
SH
COMS
LK
NOK
FN
AMG
KHUL
BN
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
FT
BL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 6.4 %
S D = 3.6
N

Figure 5.5a

Dwellings Reporting Electricity- Spatial and Temporal Change

The relative spatial pattern of is HYDRO recorded in Figure 5.5a for the year 1961, based on a national mean of about 6.4 per cent and an absolute range of from .20 to 19 per cent by District. Immediately apparent is the incidence of high Z scores along the major urban axis (i.e. Dhaka-Chittagong). Other scattered areas showing higher provision in HYDRO included Khulna, Rajshahi, Rangpur, Sylhet, Molvi Bazar and Rangamati Districts These are the most affluent districts from urbanization point of view, with the exception of Sylhet and Rangamati. The latter two represent cases where there are availability of local energy resources (i.e. natural gas). The installed hydro-electric project on the Karnafully river was the most decisive factor giving the high level of availability in the Hill-Tracts. Relatively low scores were most pronounced in the active delta plain. However, the relative spatial patterns in 1974 (Figure 5.5b) showed a significant change in the basic initial trend (remarked along the major urban axis, centres and resource frontiers) In broad terms, the Northern and Southern Divisions gained relatively from an average to above the average condition. To be more specific, the total number of districts in the western part of the country with high scores increased from three to fourteen, extending from Dinajpur in the north to Khulna in south. The relative spatial patterns in 1981 indicated a more diffused spatial structure Districts along the major urban axis also gained in relative terms and such characteristics were also prominent in some Northern districts (Figure 5.5c). In the Eastern Division, Sylhet, Molvi Bazar and Cox's


BANGLADESH
0 MILES 50
DWELLINGS REPORTING
ELECTRICITY, 1974
(HYDRO)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
NETA
SUNM
SYLT
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
NR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
JES
NR
GP
SH
RHG
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
KPT
CTS
BNR
B
BL
LAMH
Z-SCORES
1 50 > A
Q 50 - 1 49 B
0 49 TO -0 49 C
-0 50 TO -1 49 D
-1 50 < F
MEAN= 18 3 %
S D = 8
N
Figure 5.5b

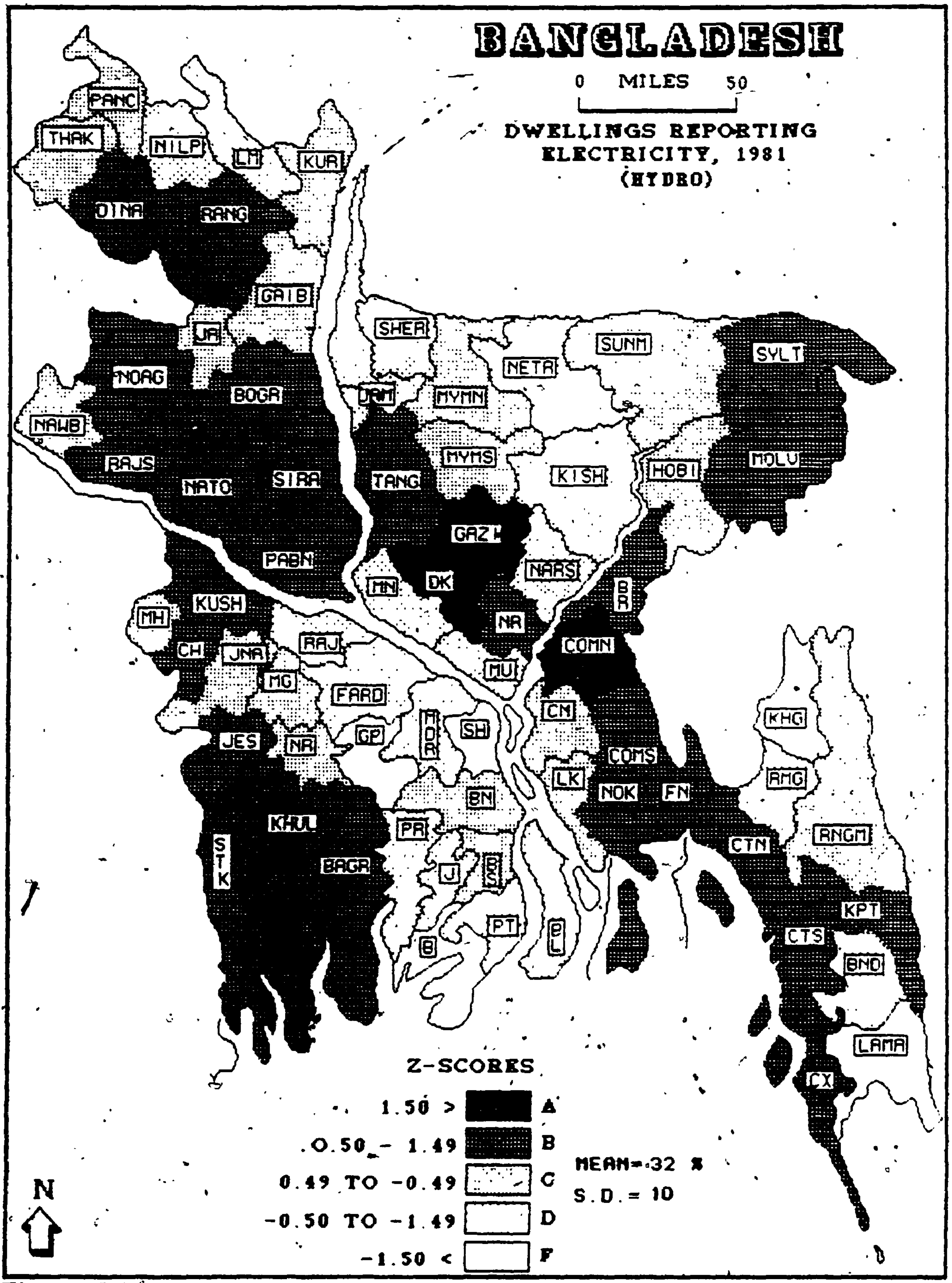

BANGLADESH
0 MILES 50
DWELLINGS REPORTING ELECTRICITY, 1981 (HYDRO)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
SUNM
SYLT
NETA
JAM
MYMN
MYMS
KISH
HOBI
MOLV
TANG
GAZI
NARS
MN
DK
NR
BR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
KHUL
STK
BAGR
PR
BN
CTN
RNGM
J
PT
BL
B
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 32 %
S.D. = 10
N

Figure 5.5c

Bazar Districts also reported a significant gain The new absolute range in 1981 of from 8 per cent in the Hill-Tracts to 53 per cent in the Dhaka and Comilla Districts reflects the fact that rates of increase varied considerably. These are indicated by District for the period 1961-1974 (Figure 5 5x) and for 1974-1981 (Figure 5 1y)

Between 1961 and 1974 increases in HYDRO above the mean value were experienced in most of the districts of Northern and Southern Divisions (Figure 5 5x). On the other hand, Districts between Dhaka and Chittagong (i.e. Comilla north, Comilla south, Chandpur, and Noakhali) declined relatively due to a low level of change A relative decline was experienced in some frontier districts including Sylhet, Molvi Bazar, Cox's Bazar and Rangamati (Figure 5 5x) Between 1974-1981 the pattern became much more diffuse Changes above the national average level were experienced in Thakurgaon, Rangpur, Pabna, Sirajganj, Gazipur, Narsingdi, Brahman - Baria, Comilla, Noakhali, Feni, Molvi Bazar, Hobiganj, Sylhet and Cox's Bazar Districts(Figure 5 5y) However, the active delta plain, Chittagong Hill-Tracts and Brahmaputra flood plain remained of relatively poorly serviced.

Dwellings Reporting Radio- Spatial and Temporal Change

The Percentage of Dwellings Reporting Radio (RADIO) in 1961 (Figure 5 6a) depicts a spatial pattern based on a national mean of 17 2 per cent, and an absolute range of 5 to 49 per cent by District This initial pattern shows that relatively high Z values were largely concentrated in districts along the major urban axis, and also in the northern part of the Eastern Division including Sunamganj, Sylhet,

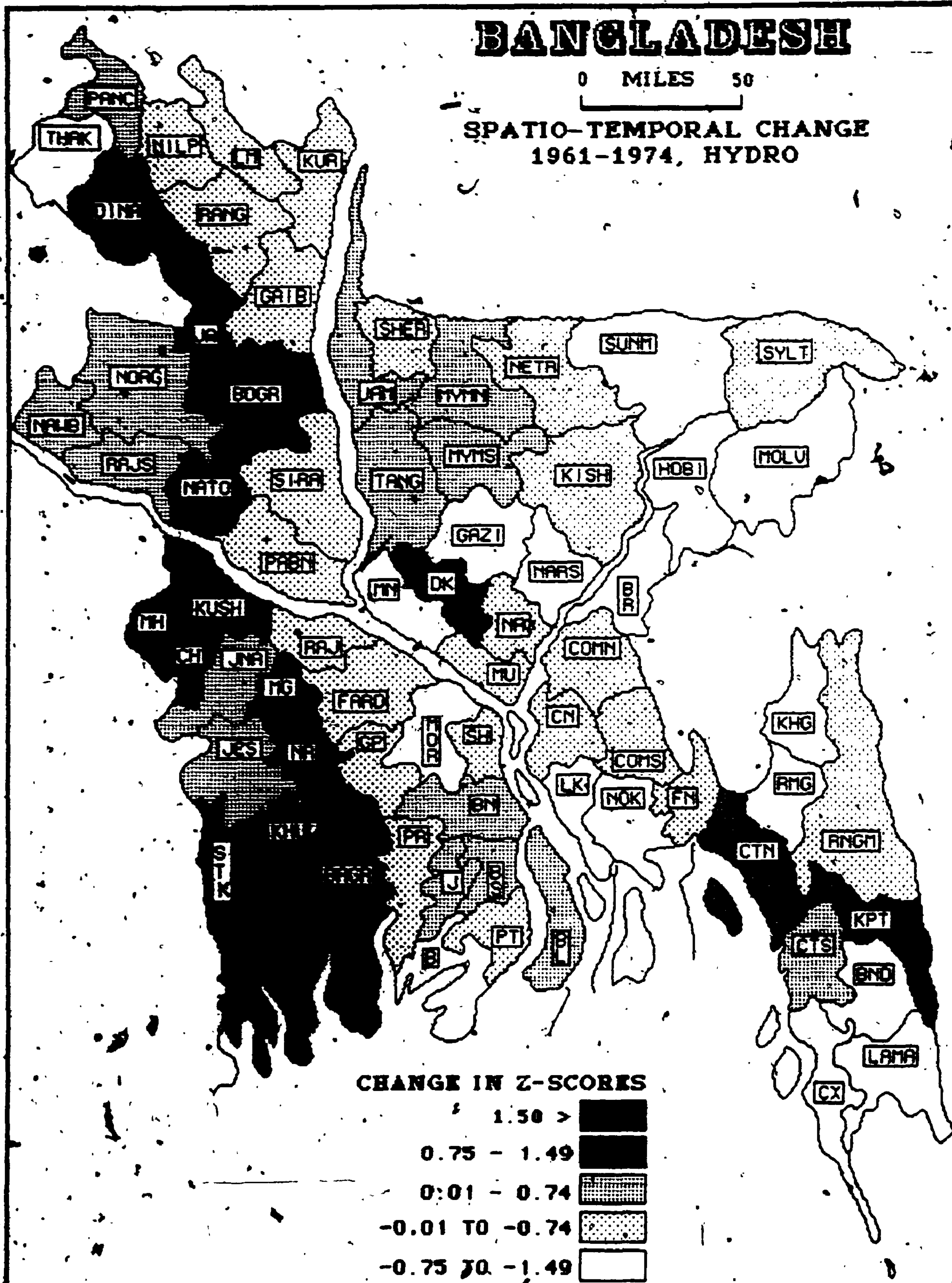
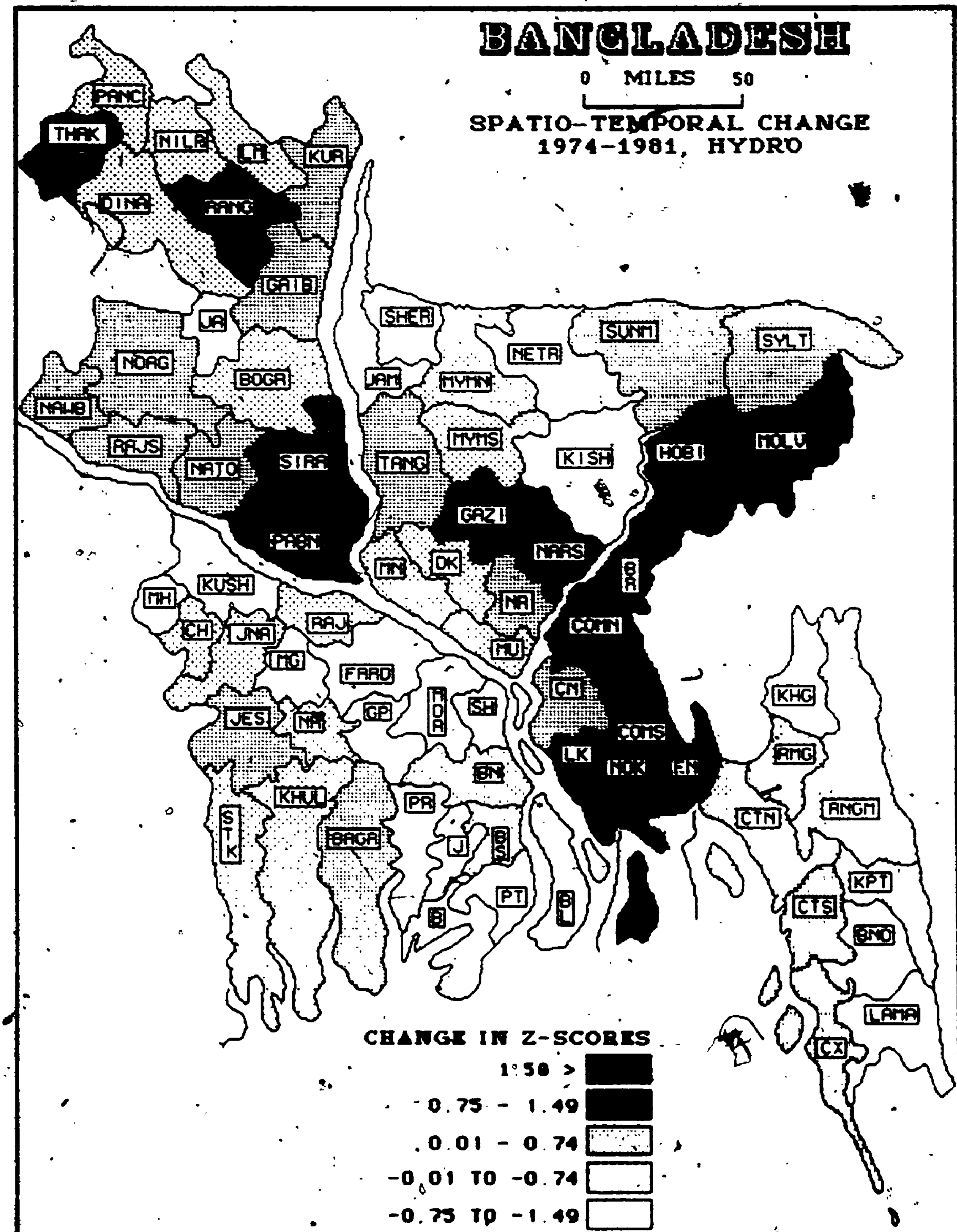

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, HYDRO
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
KUSH
MH
NAR
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
NA
GP
SH
LK
COMS
NOK
FN
RMG
BN
PR
CTN
RNGM
STK
J
PT
KPT
B
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.50 >
0.75 - 1.49
0.01 - 0.74
-0.01 TO -0.74
-0.75 TO -1.49

Figure 5.5x



BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, HYDRO
PANC
THAK
NILR
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
MYMS
MOLU
HOBI
RAJS
SIRA
TANG
KISH
NATO
GAZI
PABN
NARS
MN
DK
BR
KUSH
MH
NR
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
JES
NR
GP
SH
COMS
RMG
LK
NOK
FN
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
PT
KPT
CTS
BNO
LAMA
CX
CHANGE IN Z-SCORES
1.50 >
0.75 - 1.49
0.01 - 0.74
-0.01 TO -0.74
-0.75 TO -1.49

Figure 5.5y

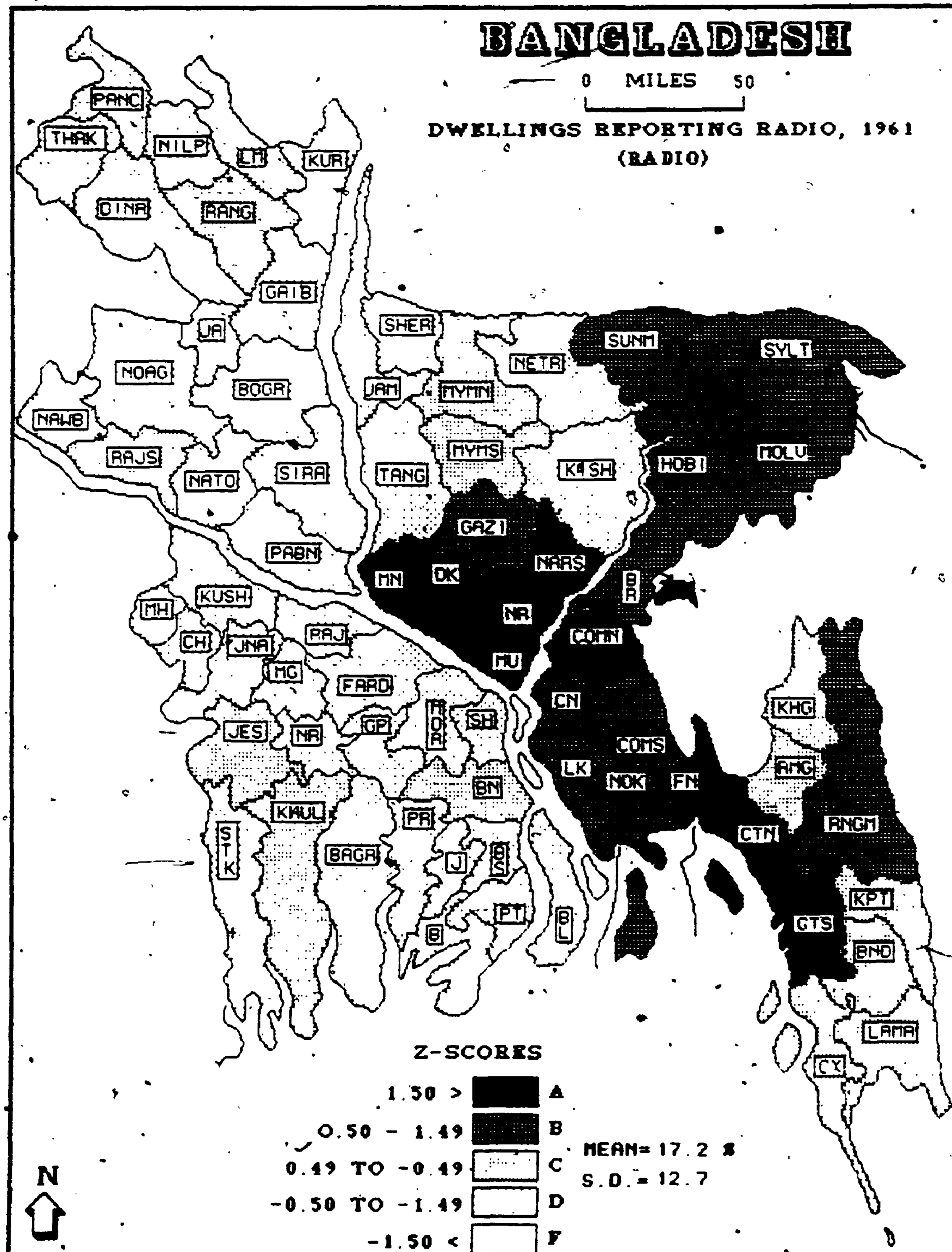

BANGLADESH
0 MILES 50
DWELLINGS REPORTING RADIO, 1961
(RADIO)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
HOBI
MOLU
MYMS
TANG
KISH
GAZI
NARS
MN
DK
NR
MU
BR
COMN
CN
COMS
LK
NOK
FN
KHG
RMG
RNGM
CTN
KPT
CTS
BND
LAMA
CX
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NR
GP
MDR
SH
BN
KHUL
PR
STK
BAGR
J
BS
PT
B
BL
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 17.2 %
S.D. = 12.7
N

Figure 5.6a

Molvi Bazar and Hobiganj Districts. The Chittagong Hill-Tracts and other initial district scores reported a medium level of such household amenity, and the rest of the country achieved scores below the national average (Figure 5.6a) We can summarize the broad initial patterns in that RADIO was an urban phenomenon in 1961. Its correlation with the northern part of Eastern Division was probably due in part to low level of population density in that area with a relatively higher foreign income It must be noted that Sylhet, Molvi Bazar, Sunamganj and Hobiganj Districts have a considerable proportion of their inhabitants in foreign countries (mainly in Britain) engaged in gainful employment The return of foreign exchange earnings definitely has an impact in the national and regional economy. This broad initial pattern, however, had diffused by 1974 (Figure 5.6b) In both the Northern and Southern Divisions of the country five districts appeared with scores above the national average These are, Khulna, Jessore, Narail, Pabna and Rangpur It must be noted that no district in these Divisions had reported a situation above the national average in 1961 Another aspect of spread was the relative gain of Northern and Southern Divisions from below the average to an average condition (Figure 5.6b) The basic patterns of 1974 remained persistent in 1981 with minor changes here and there (Figure 5.6c) Relatively high Z values were still associated with districts showing urban size and low values were more obvious in peripheral zones including a large concentration in the Chittagong Hill-Tracts and active delta plain The new absolute range in 1981 of from 6 per cent to 83 per cent suggests, however, that rates of increase varied considerably (Figure 5.6c)

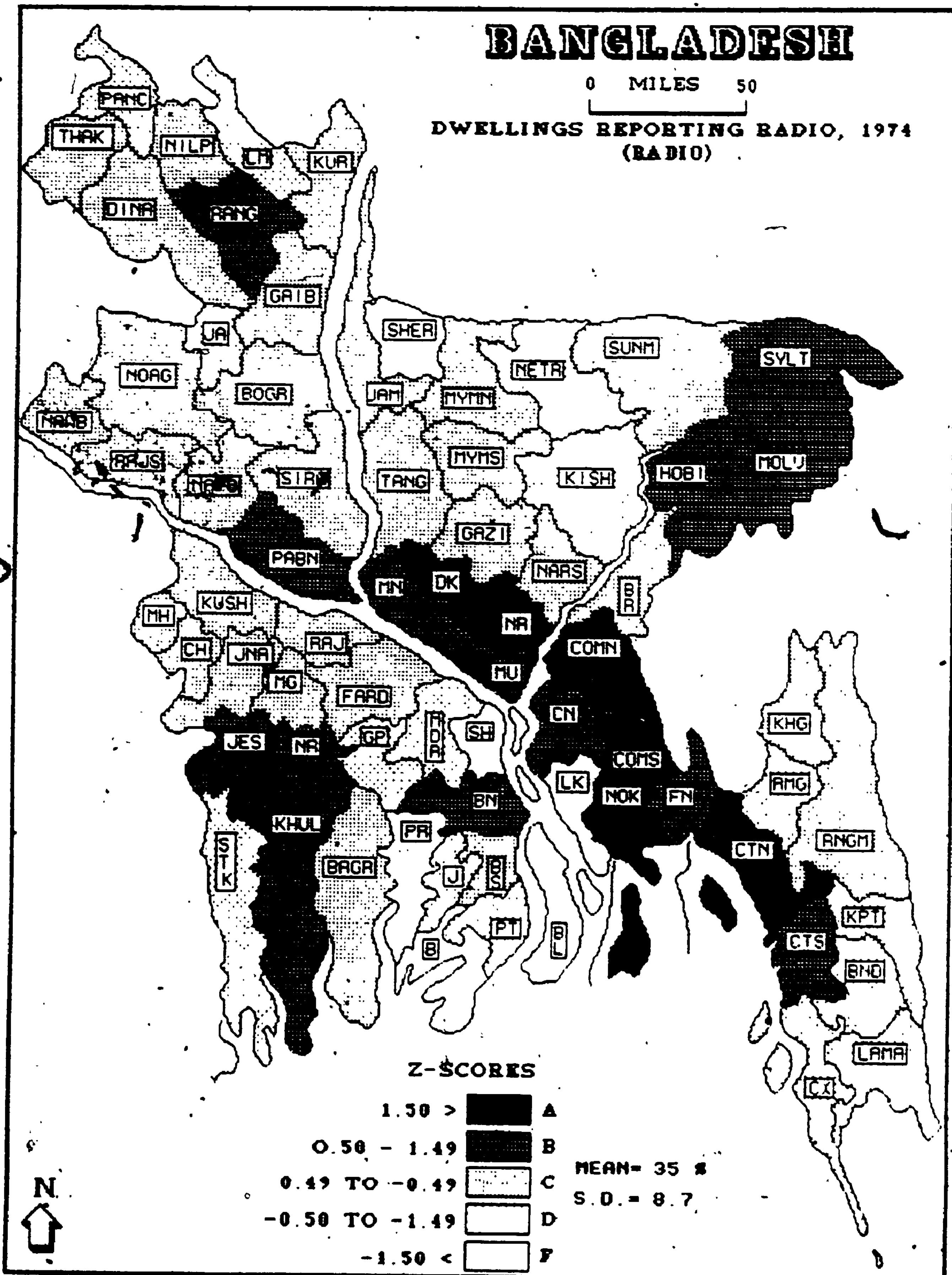

BANGLADESH
0 MILES 50
DWELLINGS REPORTING RADIO, 1974
(RADIO)
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
JAM
MYMN
NETR
NAWB
RAJS
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
MH
KUSH
NA
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
KHUL
PR
BN
CTN
RNGM
STK
BAGR
J
BS
PT
KPT
B
BL
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 35 %
S.D.= 8.7
N

Figure 5.6b

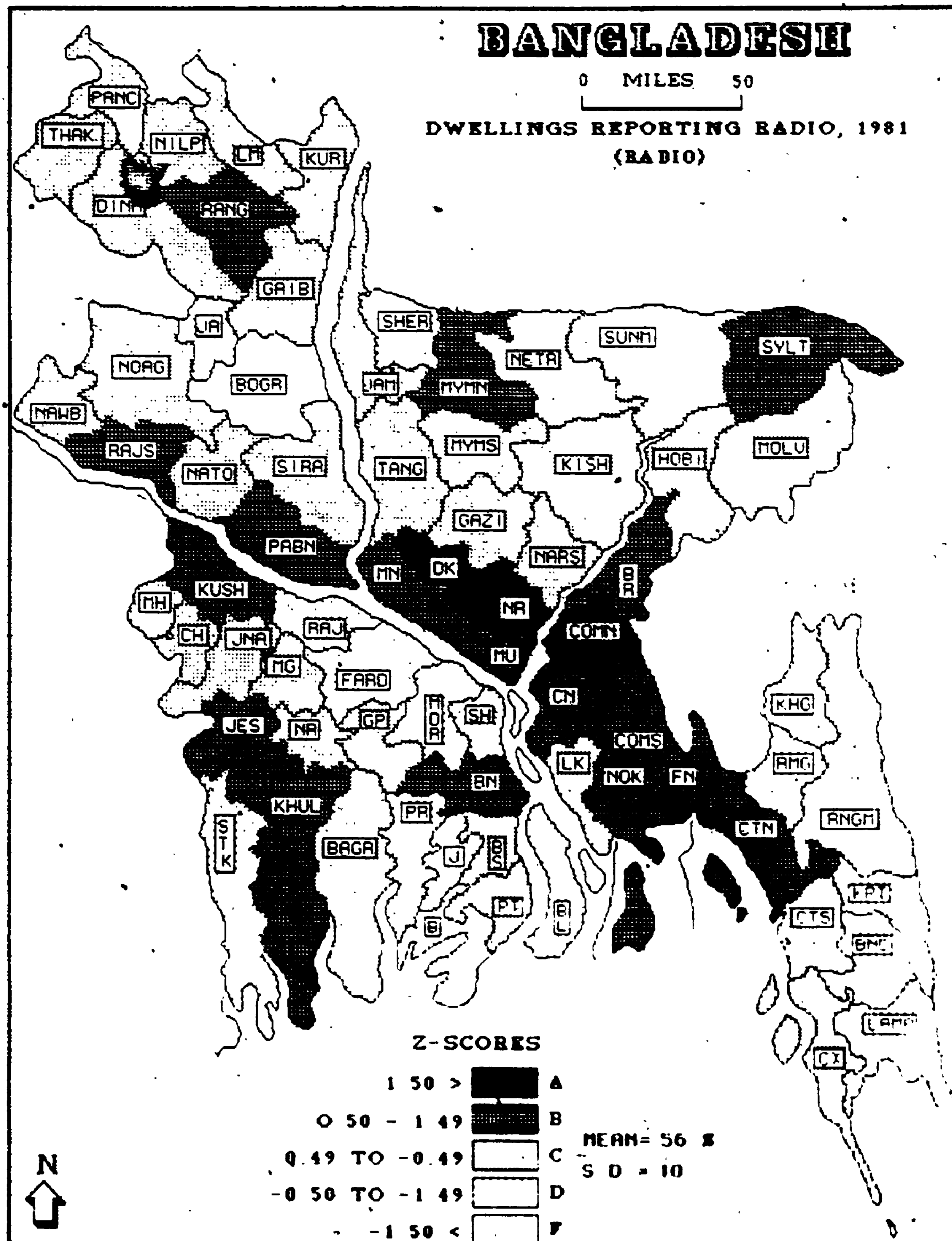

BANGLADESH
0 MILES 50
DWELLINGS REPORTING RADIO, 1981
(RADIO)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
KUSH
MH
CH
JNA
MG
RAJ
FARD
JES
NA
GP
MDR
SH
KHUL
STK
BAGA
PR
BN
J
BS
PT
B
BL
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
MN
DK
NARS
BR
NA
MU
COMN
CN
COMS
LK
NOK
FN
CTN
KHG
RMG
RNGM
CTS
CX
N
Z-SCORES
1 50 > A
0 50 - 1 49 B
0.49 TO -0.49 C
-0 50 TO -1 49 D
-1 50 < F
MEAN= 56 %
S D = 10

Figure 5.6c

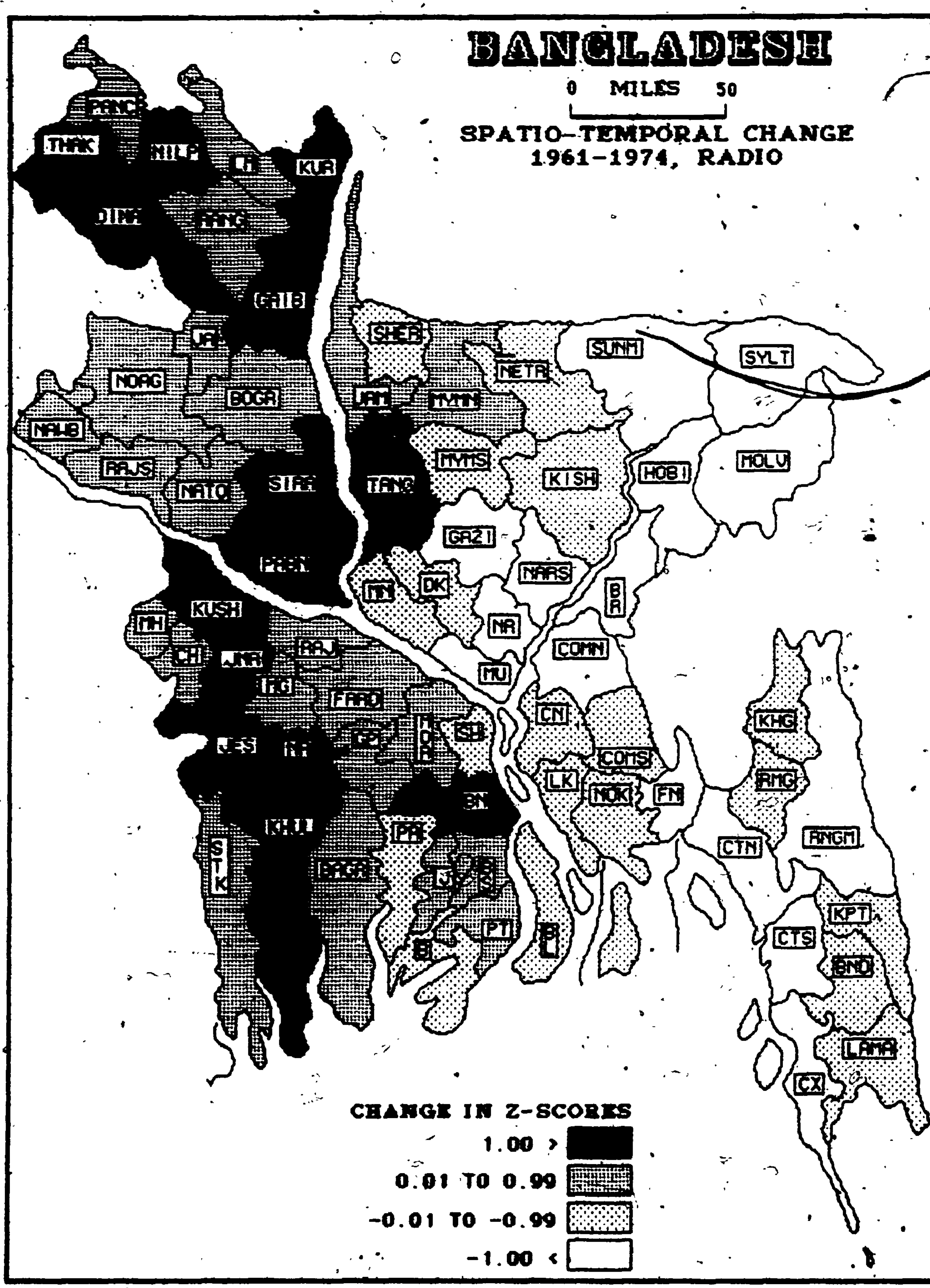

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, RADIO
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
NOAG
BOGA
NAWB
RAJS
NATO
SIRA
TANG
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
NR
MU
COMN
KUSH
MH
CH
JNA
RAJ
FARD
JES
KHUL
STK
BAGA
BN
PT
CN
LK
COMS
NOK
FN
KHG
RMG
CTN
RNGM
CTS
KPT
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <

Figure 5.6x

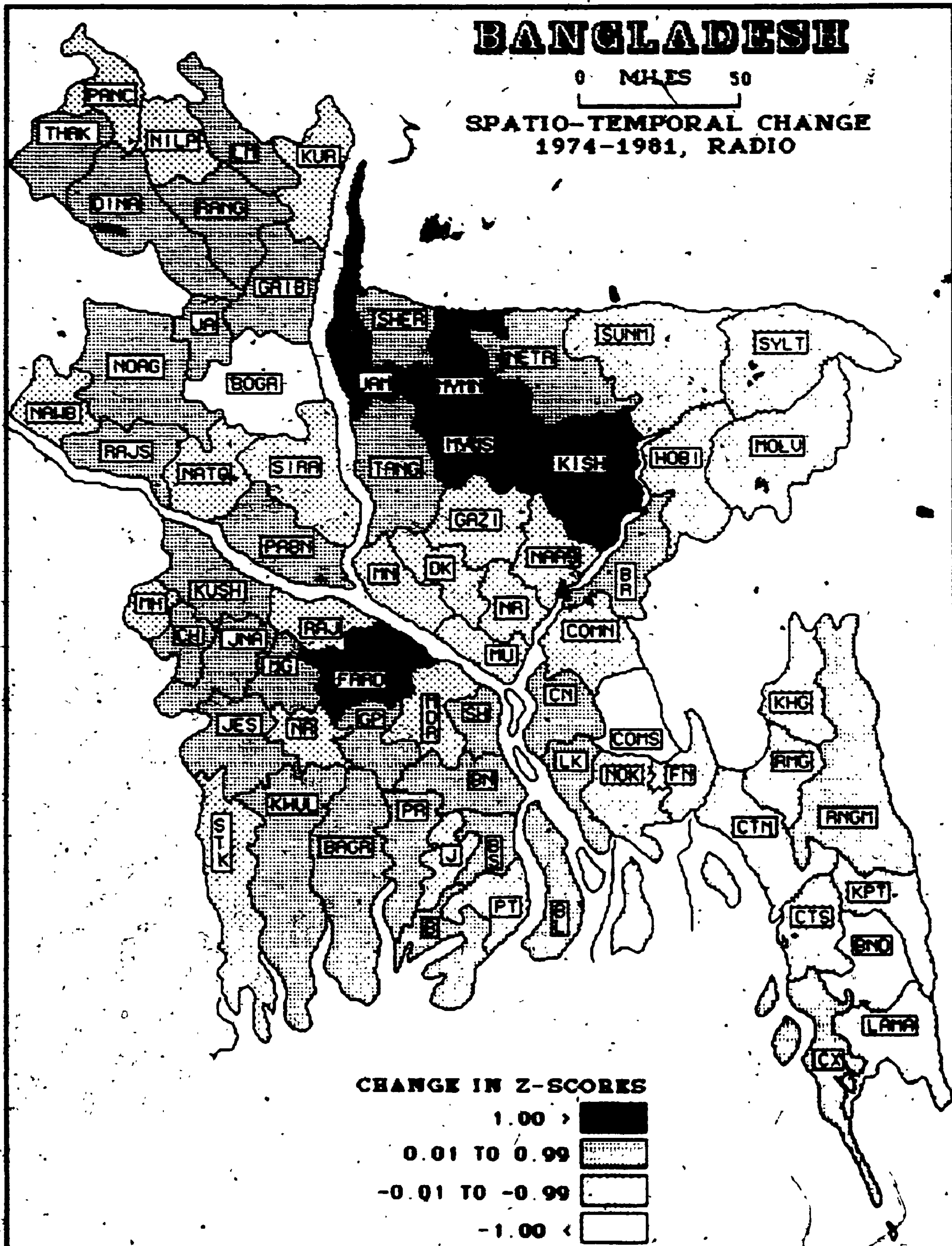

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, RADIO
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
SHER
SUNM
SYLT
JA
NETR
NOAG
BOGR
JAM
NAWB
RAJS
MYMS
KISH
HOBI
MOLU
NATO
SIRA
TANG
GAZI
PABN
NARS
MN
DK
BR
KUSH
NR
MH
COMN
RAJ
MU
CH
JNA
MG
FARD
CN
JES
GP
SH
KHG
COMS
LK
NOK
FN
RMG
KHUL
BN
PR
CTM
RNGM
BAGR
STK
J
KPT
PT
CTS
B
BL
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <

Figure 5.6y

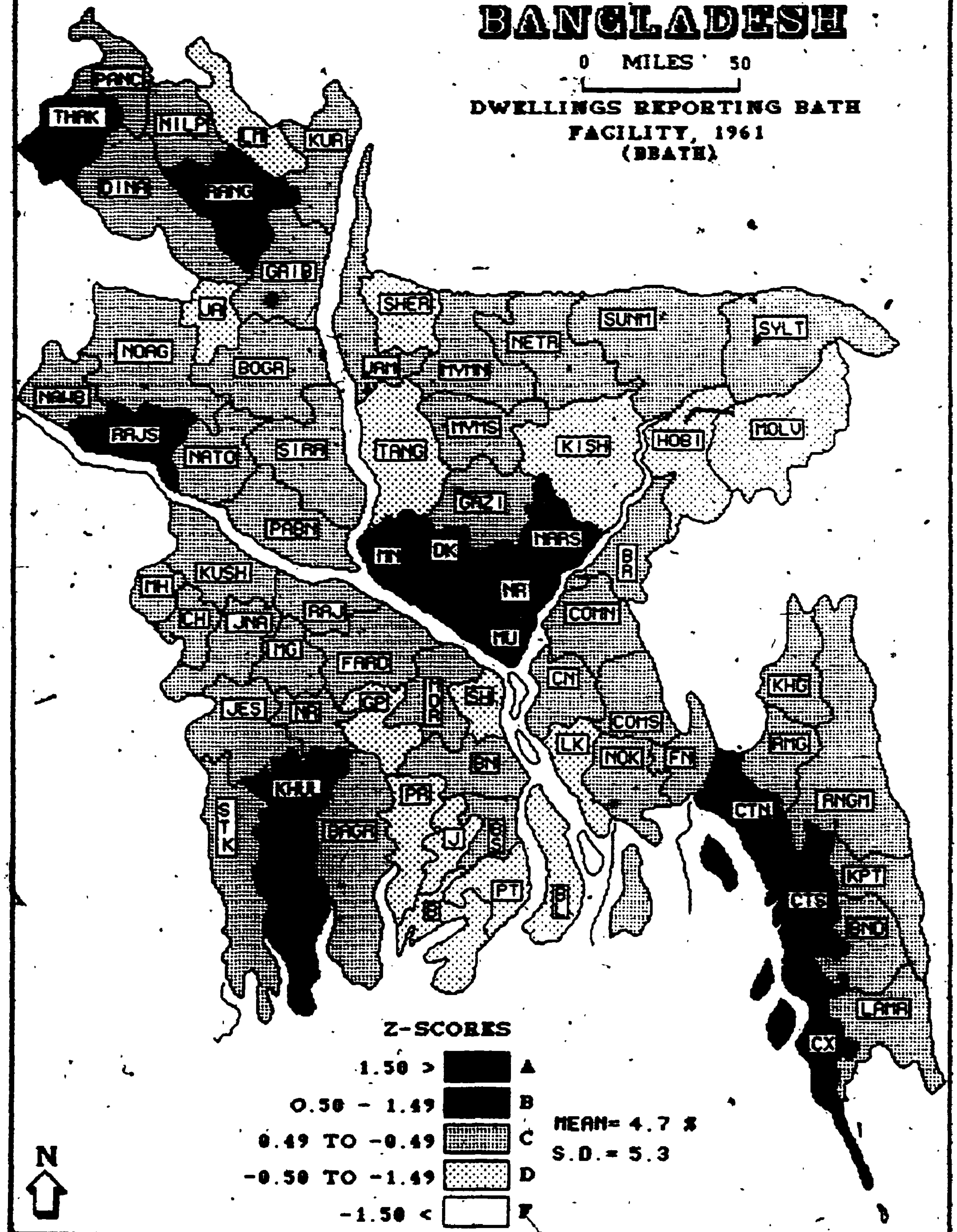

BANGLADESH
0 MILES 50
DWELLINGS REPORTING BATH
FACILITY, 1961
(BBATH)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGA
JAM
MYMN
NETA
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
NR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
KHUL
BN
PR
CTN
ANGM
STK
BAGR
J
BS
PT
BL
KPT
CTS
BNO
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 4.7 %
S.D.= 5.3
N

Figure 5.7a

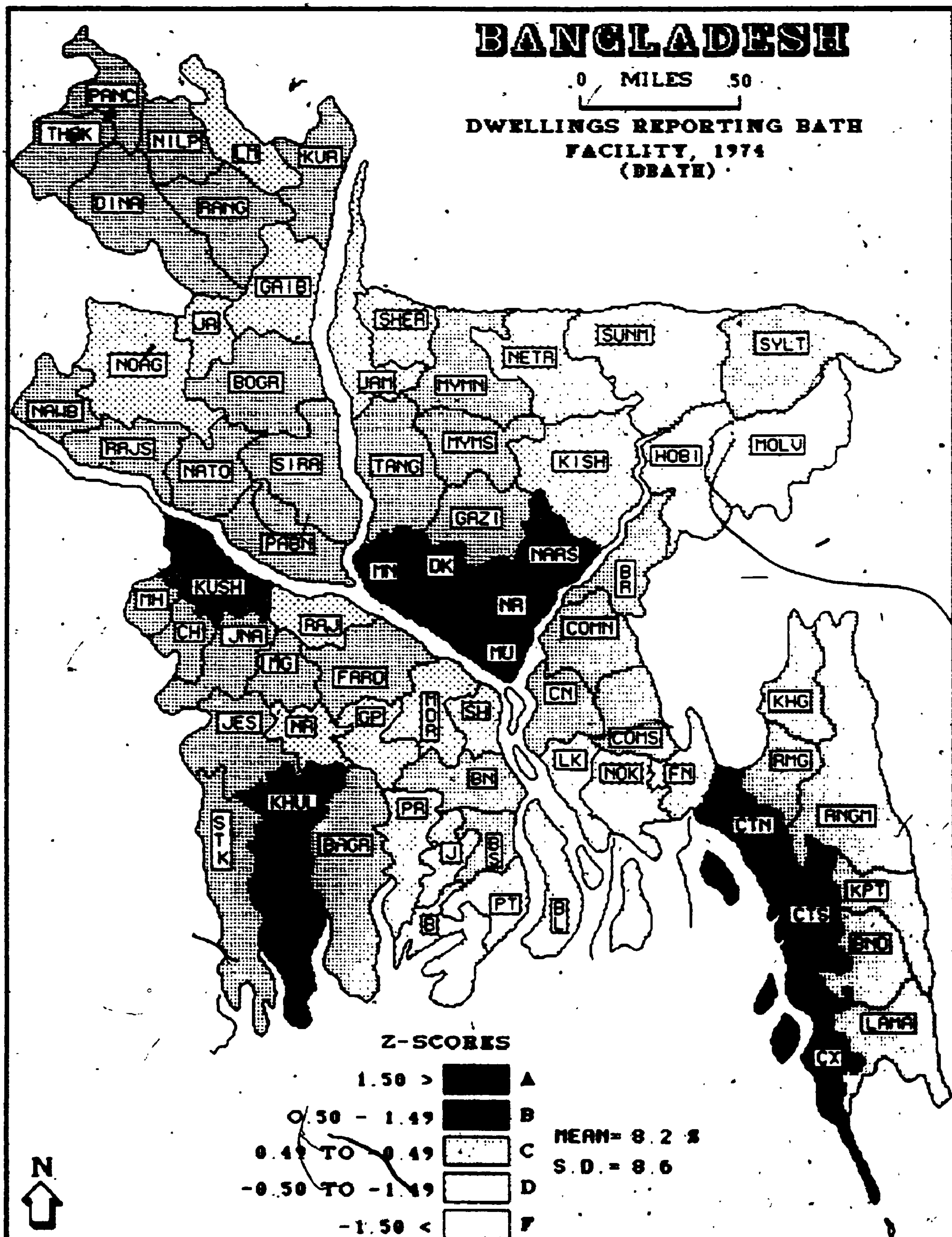

BANGLADESH
0 MILES 50
DWELLINGS REPORTING BATH FACILITY, 1974
(DBATH)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGA
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
KUSH
NA
MH
CH
JNA
RAJ
COMN
MU
MG
FARO
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
STK
BAGA
J
BS
CTN
RNGM
PT
BL
B
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 8.2 %
S.D.= 8.6
N

Figure 5.7b

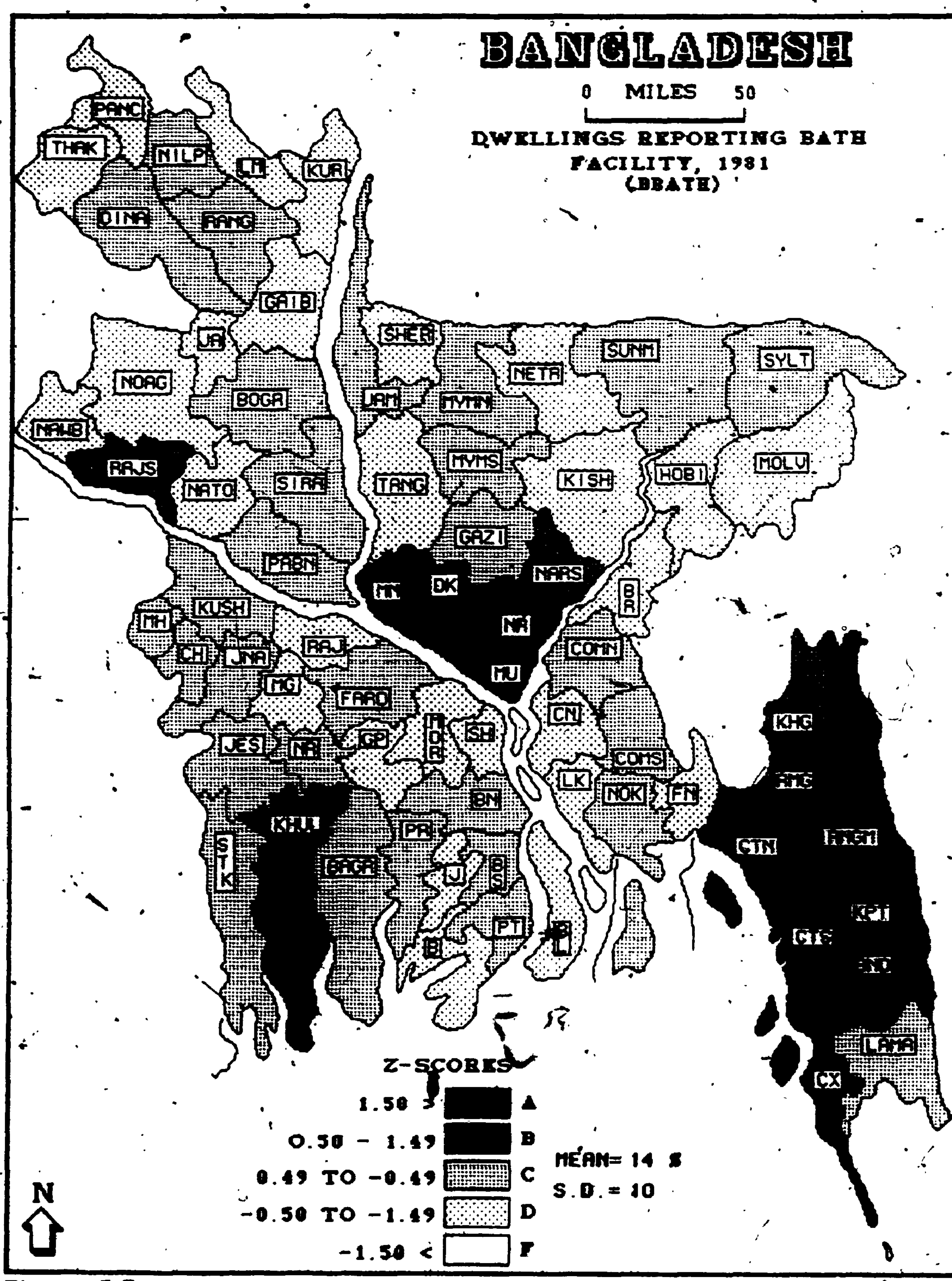

BANGLADESH
0 MILES 50
DWELLINGS REPORTING BATH FACILITY, 1981 (BBATH)
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGA
NETR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
NR
KUSH
MH
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
SH
COMS
LK
NOK
FN
KHU
BN
STK
PR
CTN
BAGA
J
BS
KPT
PT
B
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 14 %
S.D. = 10
N

Figure 5.7c

With a generally increasing percentage of dwellings reporting radio, the changes between 1961 and 1974 (Figure 5.6x) and between 1974 and 1981 (Figure 5.6y) are marked by a high incidence of positive scores. Between 1961 and 1974 the Northern and Southern Divisions of the country were scoring positive in general. In the 1974-81 period there were some positive changes in both the Central and Eastern Divisions but change was relatively slight along the major urban axis and the Eastern Division as a whole.

Dwellings Reporting Bath Facilities- Spatial and Temporal Change

Dwellings Reporting Bath Facilities (DBATH) in 1961 (Figure 5.7a) illustrates a pattern based on national mean of 4.7 per cent, and an absolute range of from 20 to about 38 per cent by district. Immediately apparent is the concentration of high scores in districts representing major urban centres i.e. Dhaka, Narayanganj, Chittagong, Khulna, Rajshahi and Rangpur. Relatively low scores are pronounced in the lower active delta plain, western Jamuna flood plain (Sherpur and Tangail) and Meghna flood plain including Districts of Kishoreganj, Hobiganj and Molvi Bazar.

These initial patterns remained stable in 1974 (Figure 5.7b) with a heavy concentration in and around metropolitan Dhaka. A relative decline in the level of bath facilities is noted in the Northern Division including Thakurgaon, Rangpur, Rajshahi, Gaibanda and Noagaon Districts. In the Central and Eastern Divisions, a similar decline in the relative levels of provision was assocrated with Sunamganj, Netrokona, Jamalpur, Noakhali and Feni Districts (Figure 5.7b).

The broad patterns of high score remained persistent in 1981 in relatively urbanized Districts. However, a radical diffusion in the Chittagong Hill-Tracts is noticed (Figure 5.7c). On the other hand, average to below average situations are observed in rather less urban and peripheral districts (Figure 5.7c) The new absolute range in 1981 of from 4 to 61 per cent reflects the fact that rates of increase varied considerably. These are indicated by District for the period 1961-1974 (Figure 5.1x) and for 1974-1981 (Figure 5.1y).

Between 1961 and 1974 increases in DBATH above the mean value were experienced in Dhaka, Narayanganj, Chittagong and Khulna. Between 1974 and 1981 the pattern was more uniform recording a very low level of change across the country, with the exception of lower active delta, Chittagong Hill-Tracts and the depressed basin.

Employment and Income Variables

Occupational structure, income and level of socio-economic development are closely associated. The changes in the structure of the labour force among three broad economic sectors (i.e. primary, secondary and tertiary) for major world regions for the period from 1900 to 1980 shows that there has been both a reduction in the proportional share of agriculture in the total labour force and an increase in the absolute number of persons released from this sector (Chowdhury, 1985). However, absolute numbers of people engaged in agriculture may be rising, especially in Bangladesh. The change that has occured in the agricultural sector over the last two decades is much greater in relative terms than that which occured in the first half of this century. However, persons employed in non-agricultural

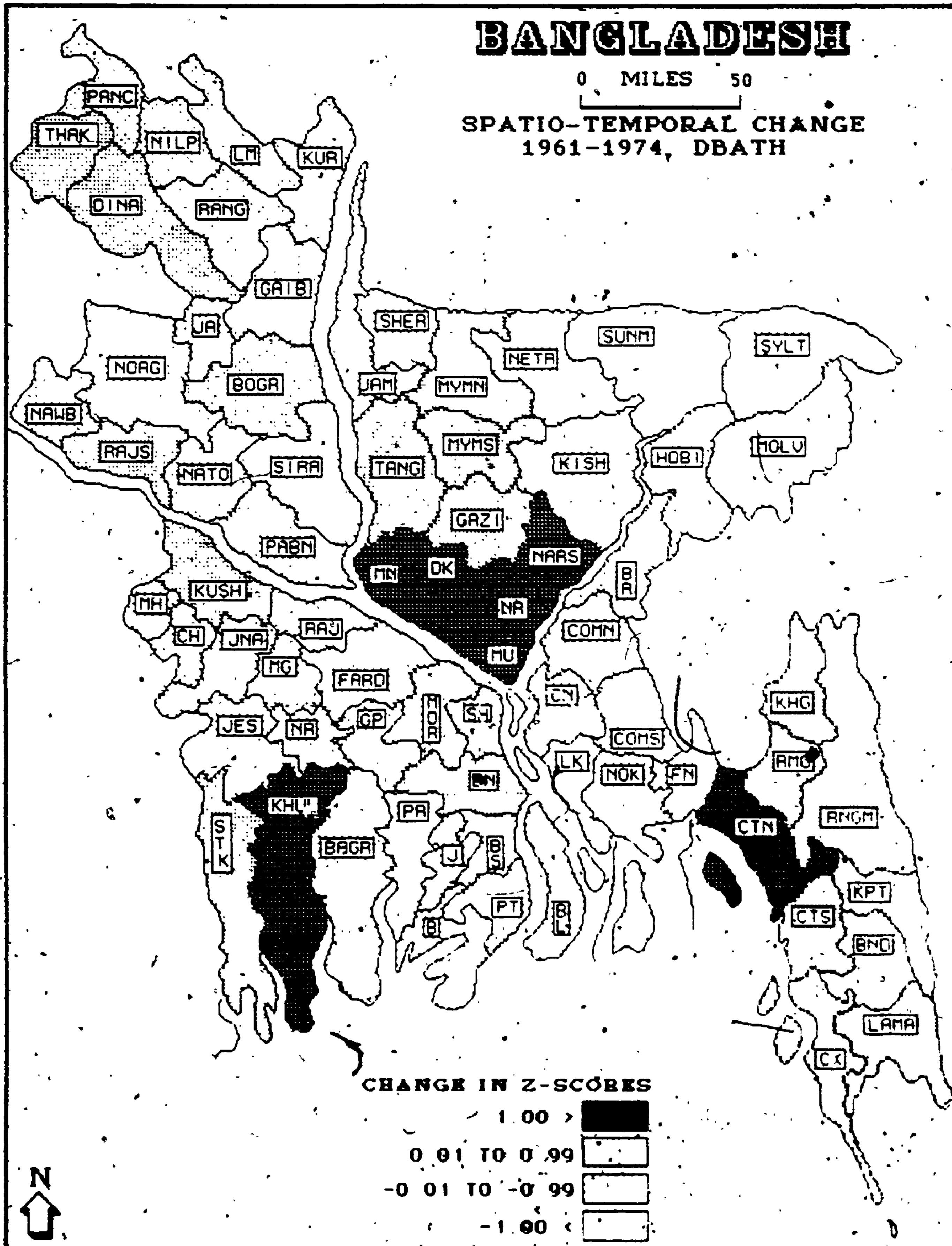
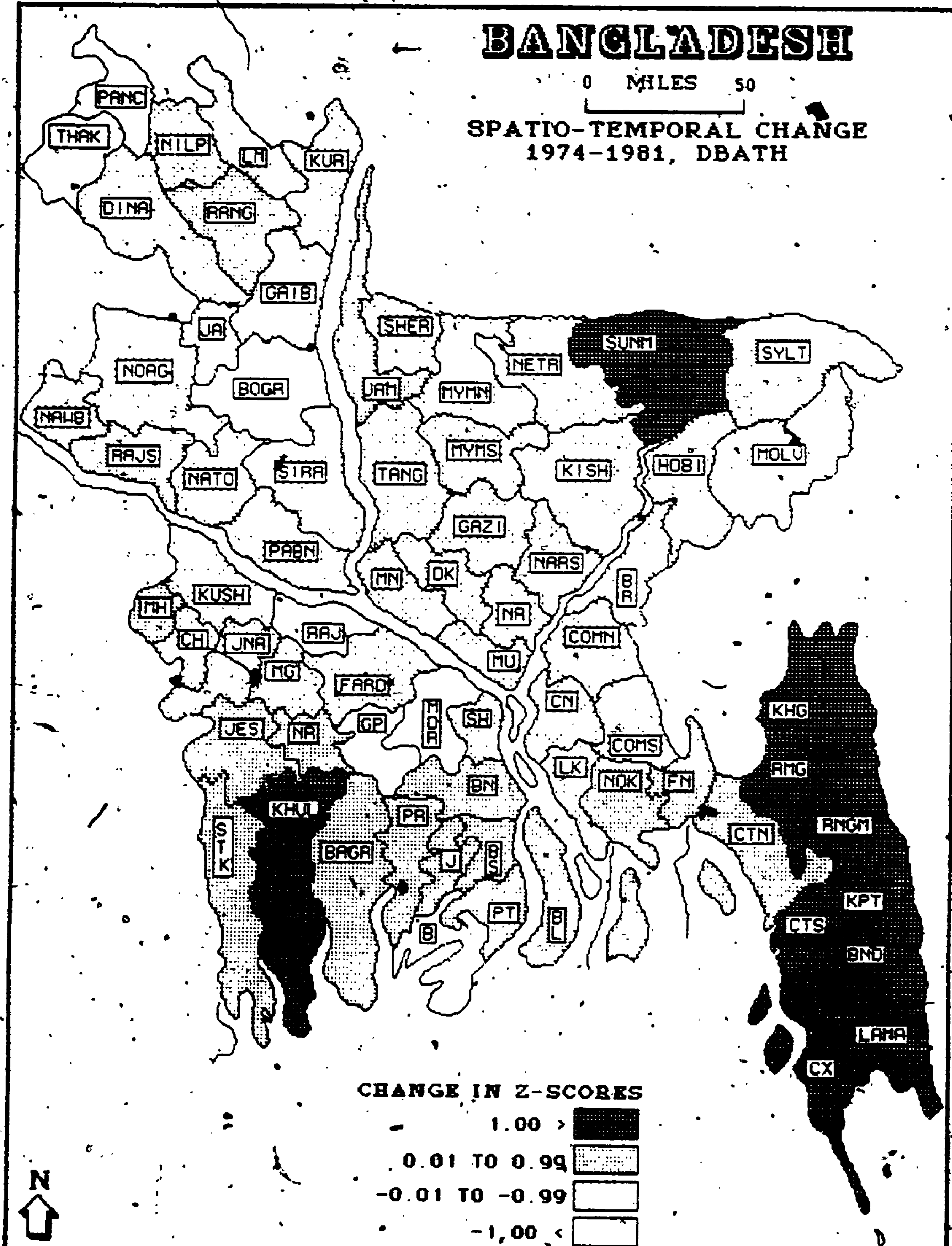

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, DBATH
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
NETA
BOGR
JAM
MYMN
NAWB
RAJS
MYMS
KISH
HOBI
MOLV
NATO
SIRA
TANG
GAZI
PABN
NARS
MN
DK
BR
KUSH
NA
MH
COMN
CH
JNA
RAJ
MU
MG
FARD
KHG
JES
NR
GP
COMS
RMG
LK
NOK
FN
KHU
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
CTS
B
BNO
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.7x


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, DBATH
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
BR
NA
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
JES
NR
GP
MOR
SH
COMS
LK
NOK
FN
KHG
RMG
KHUL
BN
PR
STK
BAGR
J
BS
CTN
RNGM
PT
BL
B
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N
Figure 5.7y

sectors of the labour force are better paid and likely to be more affluent, than those engaged in the primary sector of the economy As such, relative disadvantage of a given area is often linked with its occupational mix, and material well-being is likely to be more pronounced in urbanized areas Theoretically, the secondary and the tertiary sectors are considered the most dynamic and effective for economic development of a country or region This is because of the higher elasticity of demand which exists for industrial and manufacturing goods and services compared to agricultural products Thus the extent of labour force engaged in the manufacturing and service sectors is often taken as a crude measure of the level of economic development

The initial Range of Variables collected within the Employment and Income Category included proportion of labour force in Managerial, Administrative, Technical and Professional Employment (MANGR), Clerical, Sales, and Service Employment (SERVE), Manufacturing Employment (MANUF), Transportation, and Agriculture (AGRIC), and overall Average Per Capita Income (INCOM) From this initial array, three, namely Managerial, Administrative, Technical and Professional Employment (MANGR), Agricultural Employment (AGRIC) and Per Capita Income (INCOM) were selected for detailed analysis

Managerial, Administrative, Technical and Professional (MANGR) employment is regarded here as a representative of the tertiary category that reflects specific education and technical skills These attributes are generally lacking in other employment outside the tertiary category This, of ~~course,~~ represents the relatively affluent income group in the labour force. There was a very slight increase in the trend of MANGR at the national level over the study period. Employment in this sector increased from about 1.6 to only about 2.4 per cent between 1961 and 1981(Table 5.1). These figures are amongst the lowest of any country in the world and underline the predominantly rural nature of the economy. The variation about the mean seems high, and is largely a function of poorly endowed peripheral areas, especially the Chittagong Hill-Tracts

In this study, the variable Agricultural Employment (AGRIC) is used to represent the occupational structure in the primary sector This is the rural sector and is not as remunerative as the secondary or tertiary urbanized sectors of the national economy. Agricultural Employment (AGRIC) has seen a significant drop from about 80 to about 61 per cent, over the study period (Table 5.1). The variation in the Agricultural Employment (AGRIC) is very narrow across the country, although some important spatial variations may be observed (below) It is not surprising to see the greater uniformity in the structure of Agricultural Employment (AGRIC) among the districts of Bangladesh Basically; this reflects the almost homogeneous slope and configuration of land; its more or less uniform soil quality; the general availability of water; the evenly distributed human settlement; as well-as other socio-economic variables. Although low standard deviation suggests that there is less contrast among districts in the distribution of Agricultural Employment (AGRIC), a temporal increase in the standard deviation with a declining agricultural labour force indicated that inter-district disparity widened over the years. Districts along the major urban axis may have experienced a relatively rapid decline in Agricultural Employment (AGRIC) compared to marginal districts

The third variable presented is that of Per Capita Income (INCOM) This variable is chosen for analysis as a commonly used index of economic development Although it is an important economic criterion, overall income increases have been very modest over the study period Precisely, the Per Capita Income (INCOM) increased from about 526 Taka in 1961 to about 769 Taka in 1981, at constant prices (Table 5 1) Very low standard deviation suggests a high degree of homogenity accross the national space

The primary sector is the dominant sector of the national economy, employing about 80 per cent of the labour force in 1961 By 1981, employment generally has seen a significant drop in the proportion engaged in agriculture/AGRIC (-19 1 per cent) and modest increase in other categories i e MANUF (+9 4 per cent), SERVE (+6 per cent), MANGR (+0 8 per cent) are observed, although, overall income increases have been very modest between 1960-1980 (Table 5 1)

Within-group relationships suggest that there is a common underlying regularity in the occupational structure and income distribution Positive associations are evident between income and non-agricultural categories For example, Per Capita Income(INCOM) is directly related to SERVE (78) and MANUF (74) and negatively associated with AGRIC (-68), suggesting that rural population have lower per capita incomes On the other hand, positive associations between non-agricultural categories indicate that they are urban characteristics For example, MANGR is positively related to SERVE (59) and SERVE is positively associated with MANUF (77) Their negative associations with AGRIC imply the notion that agricultural and non-agricultural occupations are mutually exclusive variables, but suggests an indirect underlying regularity in the linear relationship.

Between group relationships indicate that non-agricultural occupations are positively related to per capita expenditures on education and health. For example, SERVE is positively associated with PEXED (.76) and PEHCS (.83). Similarly, MANUF is positively related to PEXED (.76) and PEHCS (.79). In other word, per capita expenditures on education and health are higher where people are more likely to engage in secondary and tertiary sector of the economy. The relationships between demographic characteristics, income, employment, housing and household amenities have already been established in previous discussion.

Tertiary Sector Employment- Spatial and Temporal Chnage

Managerial, Administrative, Technical and Professional Employment (MANGR) in 1961 (Figure 5.8a) depicts a pattern based on a national mean of about 1.6 per cent, and an absolute range of from .10 to 5 per cent by District. The extreme low Z values are mainly found in the Chittagong Hill-Tracts and relatively high scores are largely associated with most of the initial District cores. No broad changes appeared in the relative patterns for 1974 (Figure 5.8b), except that the proportion of Districts showing high scores in 1961 declined and a strong tendency emerged along the major urban axis (Dhaka-Chittagong). However, Districts around Dhaka were lagging including the active delta plain in the Southern Division (Figure 5.8b).

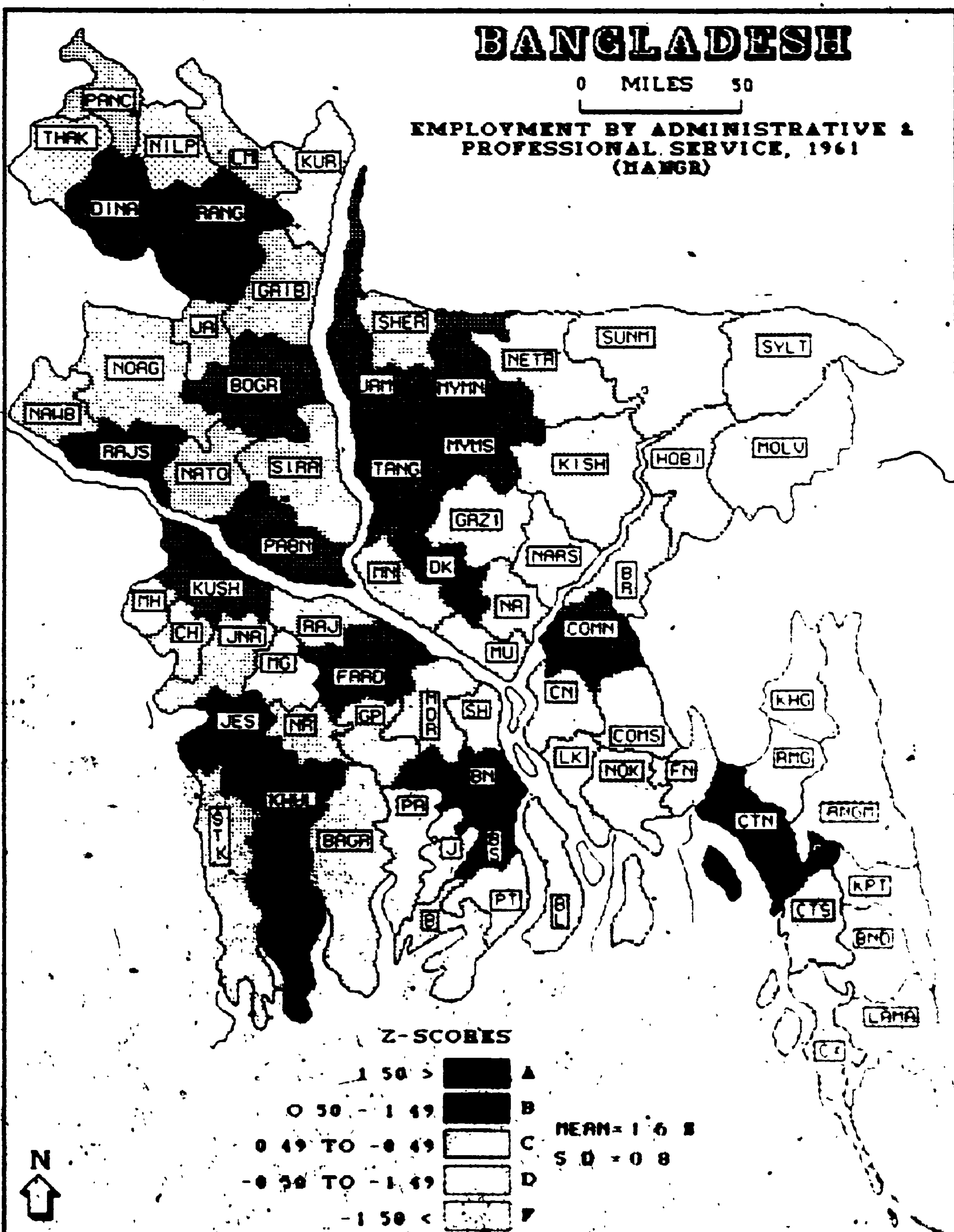

BANGLADESH
0 MILES 50
EMPLOYMENT BY ADMINISTRATIVE & PROFESSIONAL SERVICE, 1961 (MANGR)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
KUSH
NR
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
GP
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
BAGR
J
KPT
PT
CTS
BNO
LAMA
Z-SCORES
1 50 > A
0 50 - 1 49 B
0 49 TO -0 49 C
-0 50 TO -1 49 D
-1 50 < F
MEAN= 1 6 8
S D = 0 8
N

Figure 5.8a

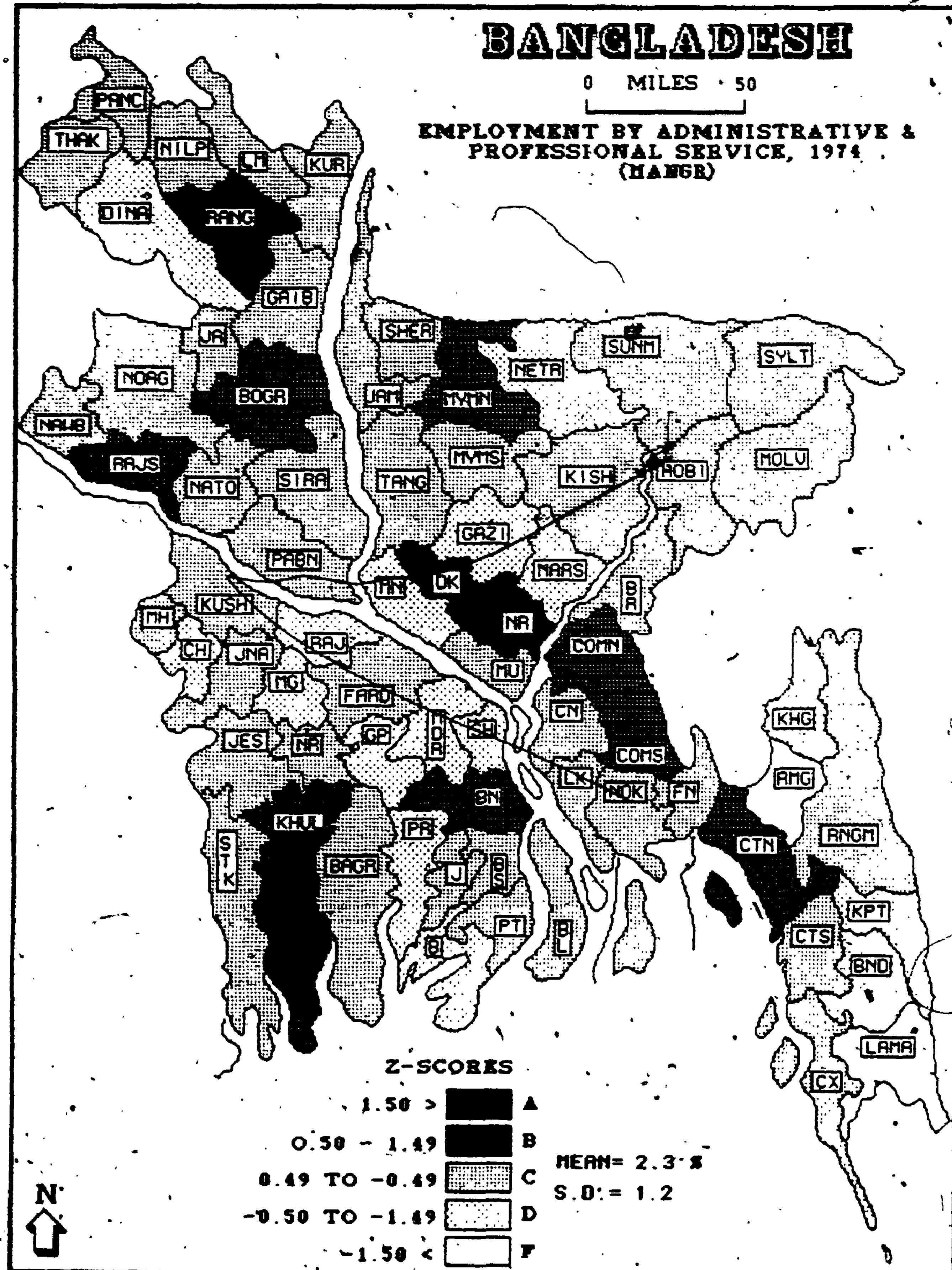

BANGLADESH
0 MILES 50
EMPLOYMENT BY ADMINISTRATIVE & PROFESSIONAL SERVICE, 1974 (MANGR)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
JAM
MYMN
NETR
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
MARS
MN
DK
BR
NR
KUSH
MH
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
KHUL
PR
BN
CTN
RNGM
STK
BAGR
J
BS
PT
BL
CTS
KPT
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 2.3 %
S.D.= 1.2
N

Figure 5.8b

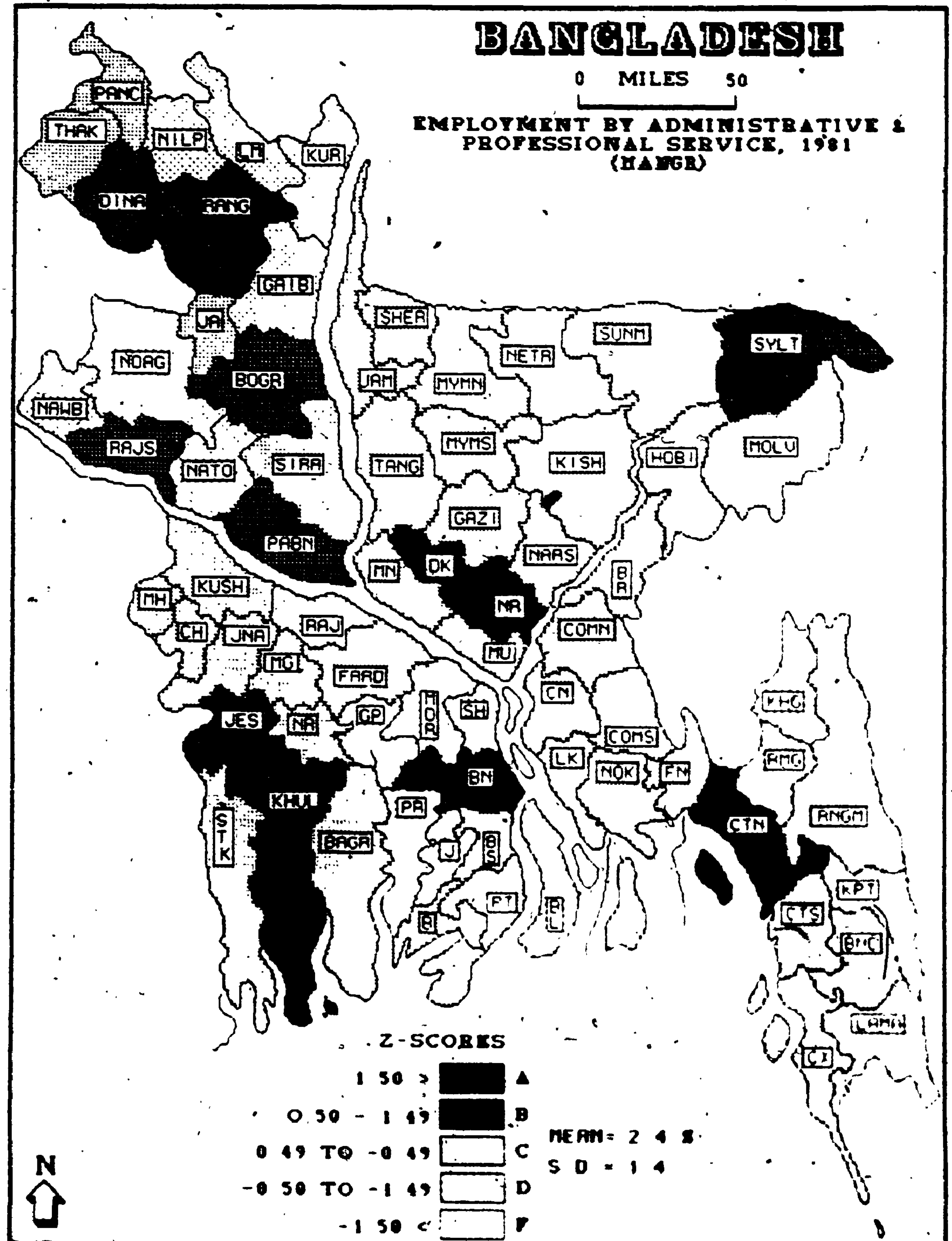

BANGLADESH
0 MILES 50
EMPLOYMENT BY ADMINISTRATIVE & PROFESSIONAL SERVICE, 1981 (MANGR)
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
NOAG
NAWB
BOGR
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MOLV
HOBI
KISH
MYMS
TANG
GAZI
NARS
DK
MN
NA
BR
COMN
MU
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NA
GP
MDR
SH
CN
COMS
LK
NOK
FN
BN
KHUL
STK
BAGR
PA
J
BS
PT
B
BL
CTN
RNGM
KHG
CTS
KPT
BNC
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN = 2.4 %
S.D. = 1.4
N

Figure 5.8c

In 1981 (Figure 5.8c), relatively high Z values remained in urbanized districts, with some minor changes. In the Northern Division, the contrast between the initial District cores i.e. Rajshahi, Pabna, Bogra, Dinajpur and Rangpur and the rest became quite significant. A condition of relative disadvantage was also evident in the active delta plain (Figure 5.8c) The new absolute range in 1981 of from .70 (in the Hill-Tracts, active delta and few Northern Districts) to 11 per cent (in Dhaka and Narayanganj Districts) reflects the fact that rates of increase varied consideraably.

Temporal changes between 1961 and 1974 suggest that the Eastern and Northern Divisions of the country were the most effective receiving areas compared to the Central and Southern Divisions (Figure 5.8x). Between 1974 and1981 the pattern of change was much more fragmented. Several Districts in Central and Eastern Divisions gained at above the national average and low level changes were experienced largely in the Northern and Eastern Divisions (Figure 5.8y).

Primary Sector Employment- Spatial and Temporal Change

Agricultural Employment (AGRIC) in 1961 (Figure 5.9a), illustrates, a pattern based on a national mean of about 80 per cent, and an absolute range of from 57 to 91 per cent, by district. Lower levels of agricultural employment are prominent largely along the major urban axis (Dhaka-Chittagong) and to some extent in few initial District cores (i.e. Dhaka, Chittagong Comilla, Khulna, Barisal, Mymensingh, Jessore, Rajshahi, Rangpur). Relatively high Z values are concentrated mainly in the Chittagong Hill-Tracts and distributed

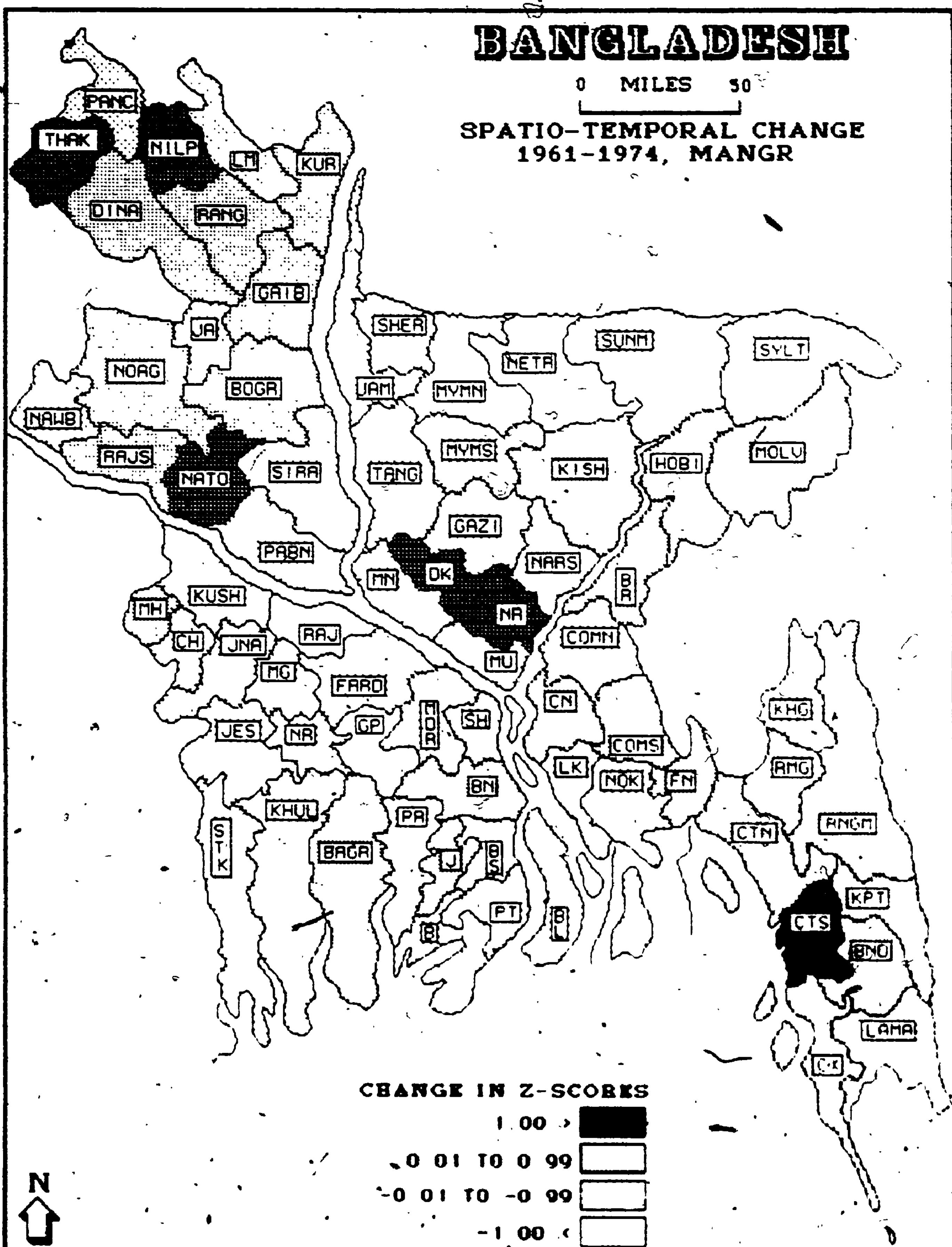

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, MANGR
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NORG
NETR
BOGR
JAM
MYMN
NAWB
RAJS
MYMS
MOLV
NATO
SIRA
TANG
KISH
HOBI
GAZI
PABN
DK
NARS
MN
KUSH
MH
NA
BR
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
STK
BAGR
CTN
RNGM
J
BS
PT
BL
KPT
B
CTS
BNO
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
.0 01 TO 0 99
-0 01 TO -0 99
-1.00 <
N

Figure 5.8x

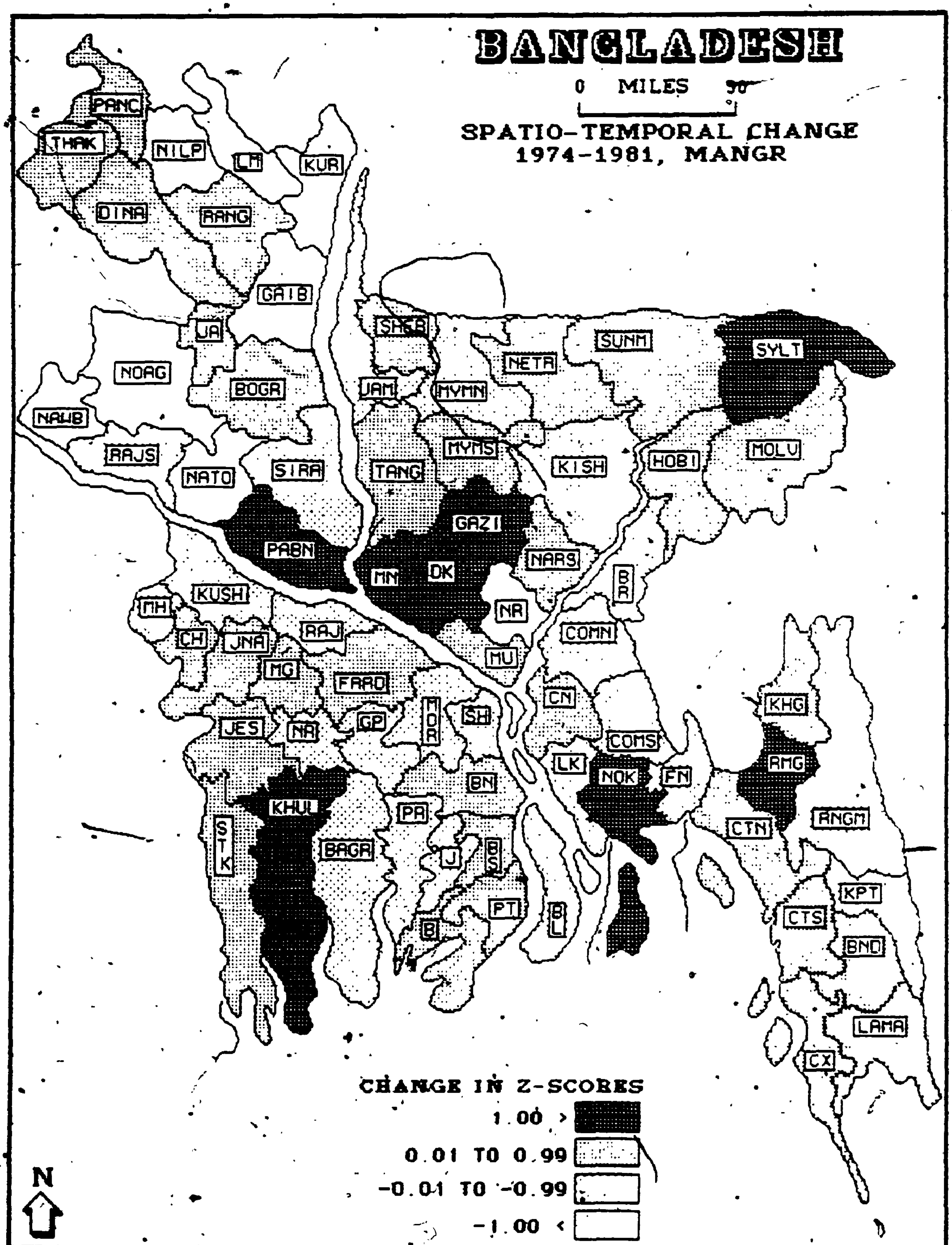

BANGLADESH
0 MILES 30
SPATIO-TEMPORAL CHANGE
1974-1981, MANGR
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
JAM
MYMN
NETR
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
MN
DK
NARS
BR
NR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
KHUL
PR
BN
CTN
RNGM
STK
BAGR
J
BS
PT
BL
KPT
CTS
B
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.8y

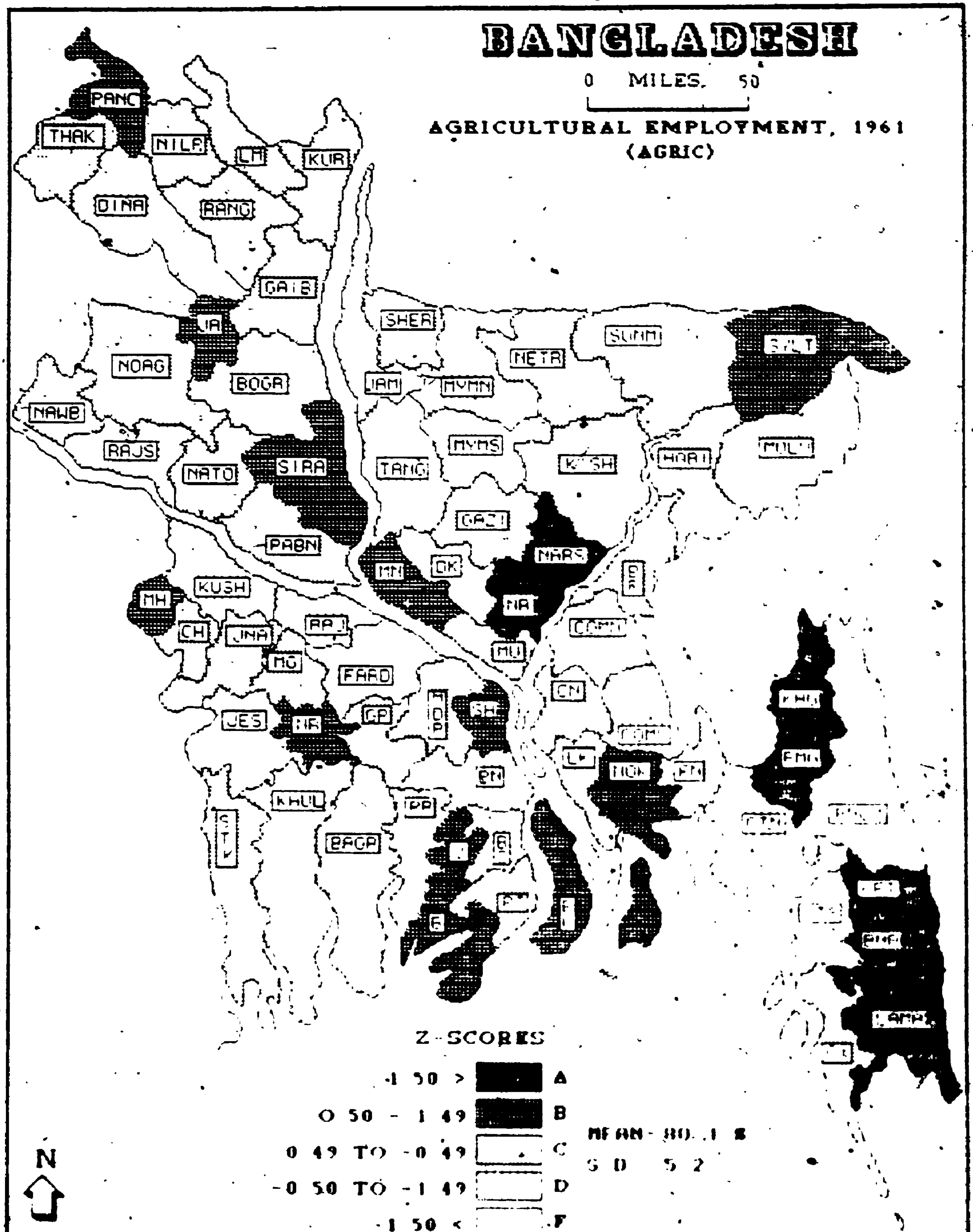

BANGLADESH
0 MILES 50
AGRICULTURAL EMPLOYMENT, 1961
(AGRIC)
PANC
THAK
NILF
LA
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
HABI
MOLV
GAZI
NARS
DK
MN
NA
MH
KUSH
CH
JNA
RAJ
MG
FARD
MU
COMM
JES
CN
GP
SH
KHUL
BAGR
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

Figure 5.9a

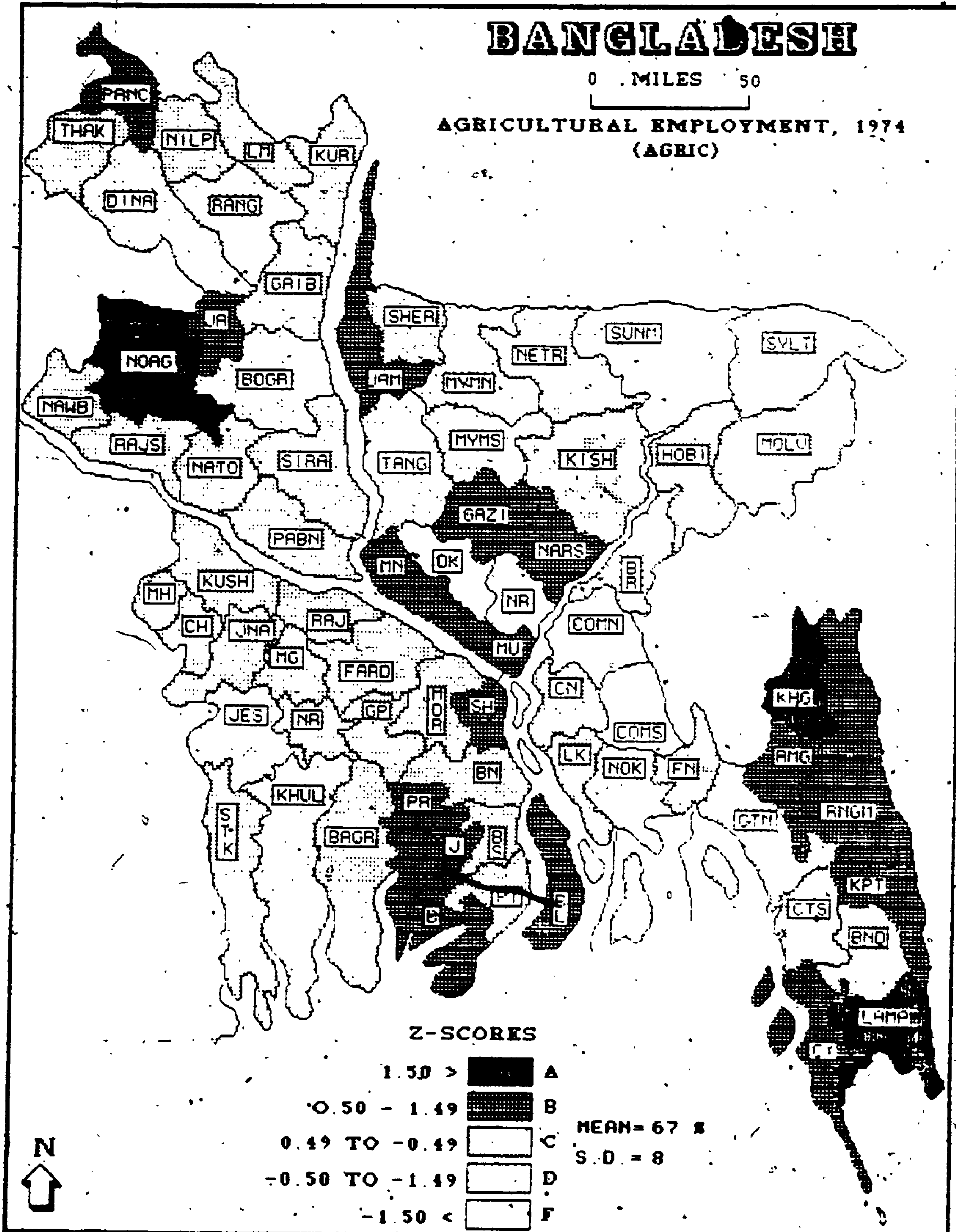

BANGLADESH
0 MILES 50
AGRICULTURAL EMPLOYMENT, 1974
(AGRIC)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHERI
JAM
MYMN
NETR
SUNM
SYLT
TANG
MYMS
KISH
HOBI
GAZI
NARS
MN
OK
NR
BR
MU
COMN
KUSH
MH
CH
JNA
RAJ
MG
FARD
CN
KHG
JES
NR
GP
SH
COMS
LK
NOK
FN
RMG
KHUL
BN
PR
STK
BAGR
J
BS
CTN
RNGM
KPT
CTS
BND
LAMP
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 67 %
S.D. = 8
N

Figure 5.9b

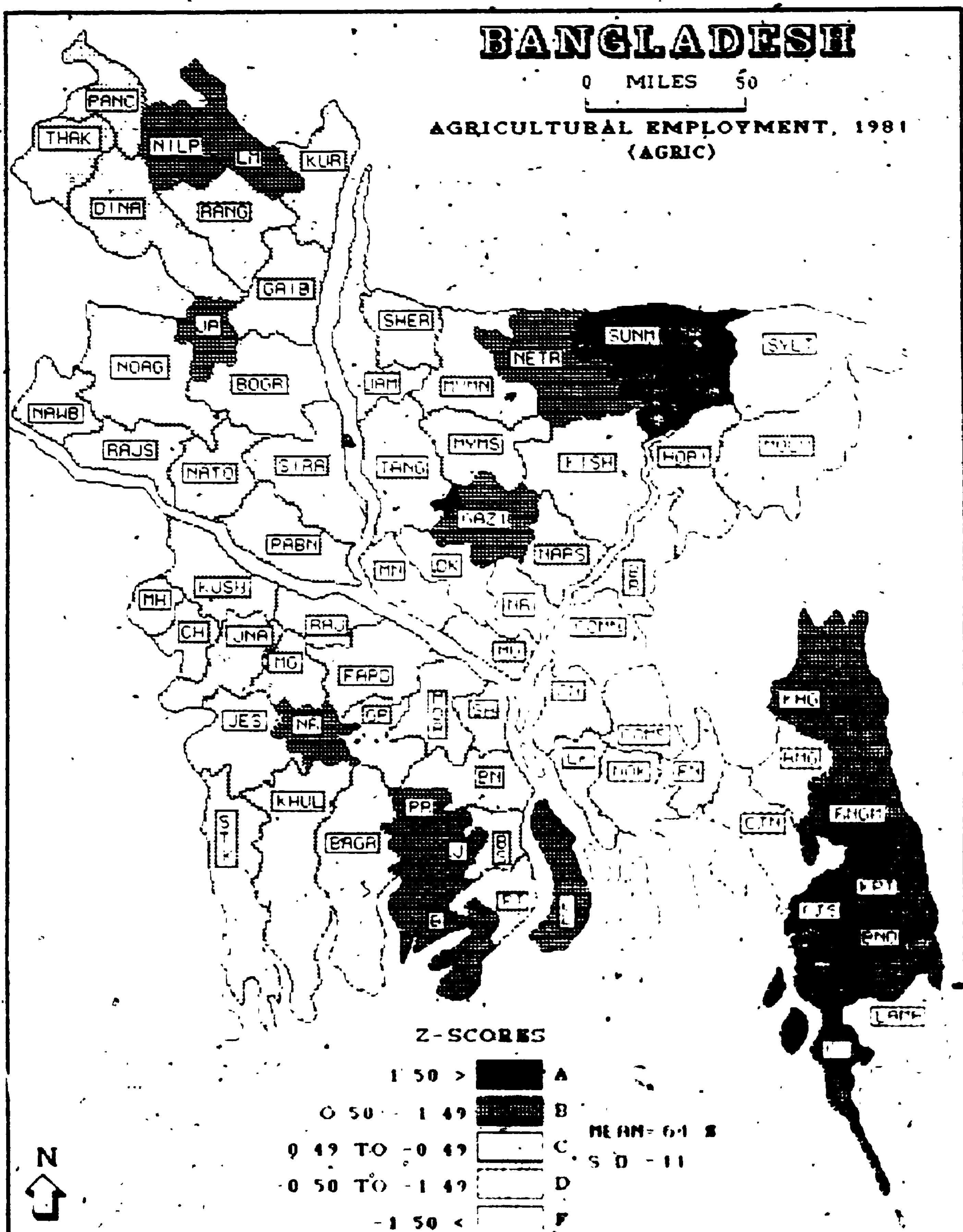

BANGLADESH
0 MILES 50
AGRICULTURAL EMPLOYMENT, 1981
(AGRIC)
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
SUNM
NETR
MYMS
TANG
GAZI
NAPS
MN
DK
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NR
GP
KHUL
BAGR
PR
J
B
SYLT
HOBI
CTN
LAMF
Z-SCORES
1 50 > A
0 50 - 1 49 B
0 49 TO -0 49 C
-0 50 TO -1 49 D
-1 50 < F
N

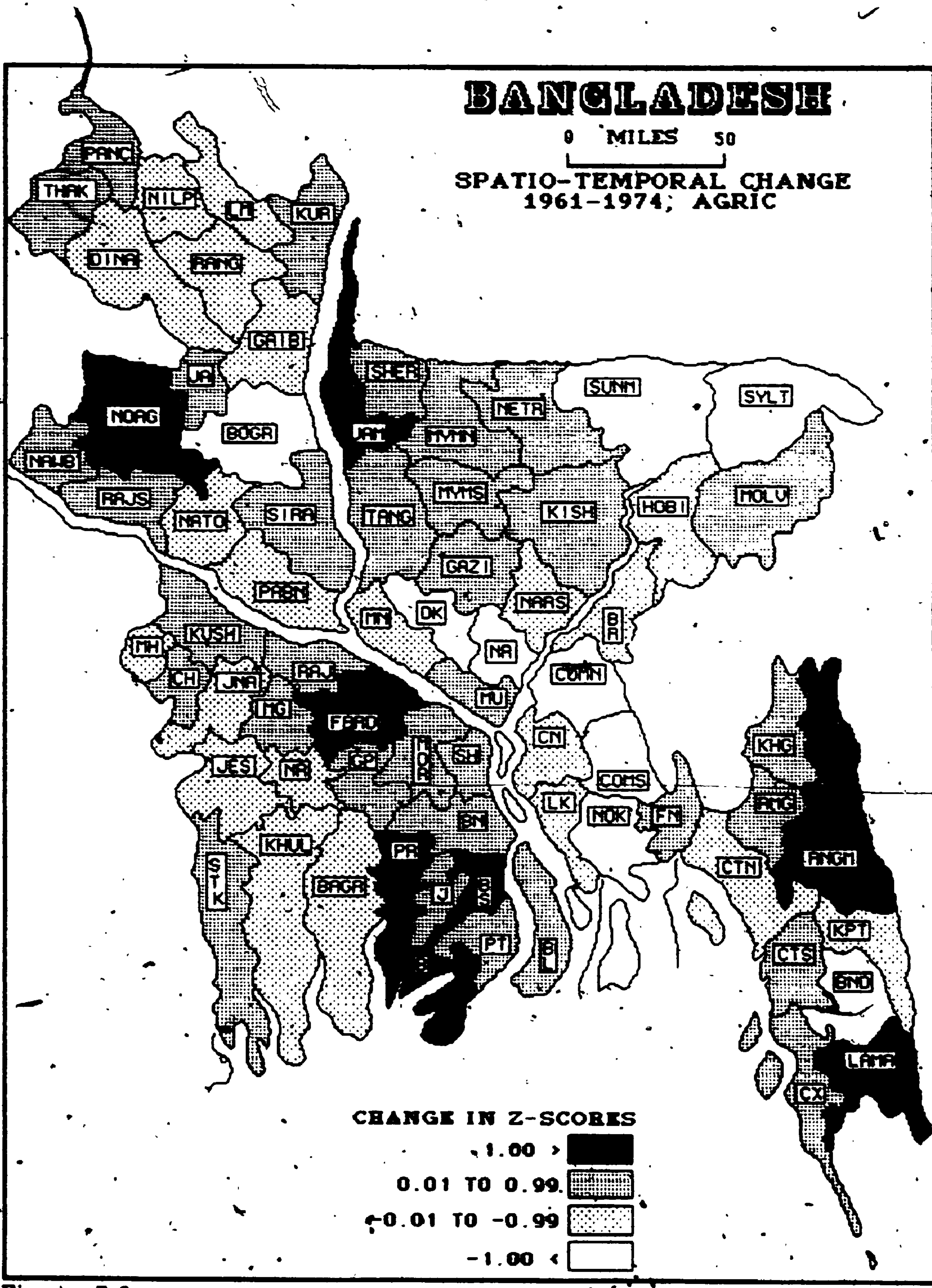
Figure 5.9c

across the country in a random fashion. The broad spatial pattern remained relatively stable in 1974 (Figure 5.9b) and 1981 (Figure 5.9c) but included a significant reduction in Agricultural Employment (AGRIC) along the Dhaka-Chittagong axis. The new absolute range in 1981 of from 7 per cent in the District of Dhaka to about 81 per cent in the Chittagong Hill-Tracts suggests the fact that rate of decline in Agricultural Employment (AGRIC) varied widely and was more rapid in urbanized Districts. These are indicated by District for the period 1961-1974 (Figure 5 9x) and for 1974-1981 (Figure 5 9y)

Between 1961 and 1974 greater declines in Agricultural Employment (AGRIC) were experienced in the Dhaka region along the Dhaka Chittagong axis, and for a substantial number of Districts in the northwest, northeast and moribund delta. Between 1974 and 1981 the pattern was much more uniform, however, greater negative changes occured mainly in districts along the three major river systems.

Per Capita Income- Spatial and Temporal Change

Per Capita Income (INCOM) for 1961 (Figure 5.10a), for 1974 (Figure 5.10b) and for 1981 (Figure 5.10c) maintained a consistent pattern with only minor changes. Based on a national mean of 526 Taka, and an absolute range of from 520 to 532 Taka there was very minor spatial variation across the country in 1961. Per Capita Income (INCOM) was also highest in 1974 (Figure 5.10b) mainly in districts along the major urban axis, and in other districts representing intial District cores. Of course there are minor exceptions because of low standard deviations among Districts. Correspondingly, the Per Capita Income (INCOM) are substantially below average at each time period


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, AGRIC
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
SHER
SUNM
SYLT
NETR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
NA
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FPAD
CN
KHG
JES
NR
GP
SH
COMS
LK
NOK
FN
AMG
KHUL
BN
PR
CTN
ANGM
STK
BAGR
J
BS
PT
BL
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
Figure 5.9x

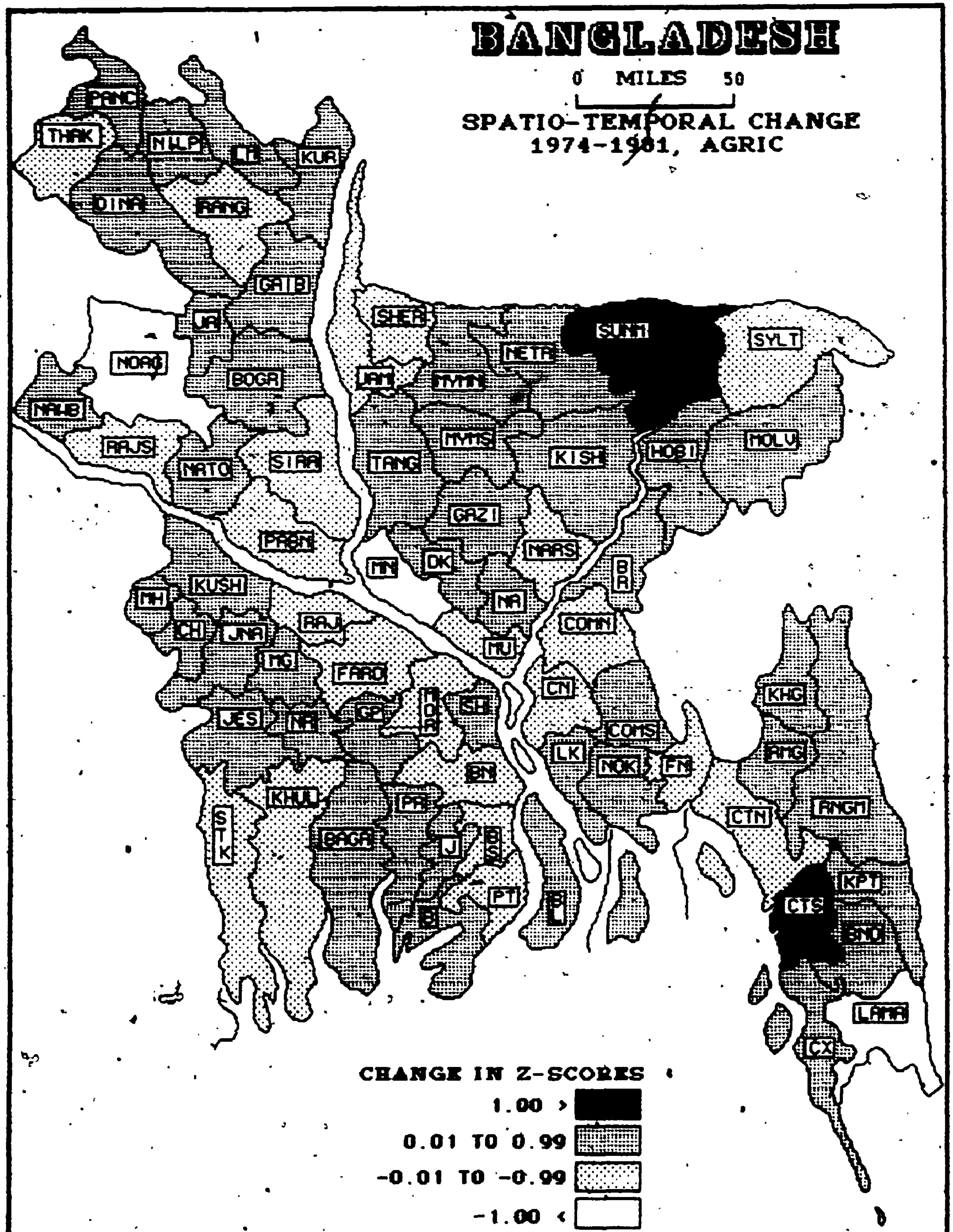

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, AGRIC
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
MN
DK
NARS
NA
BR
COMN
MU
KUSH
MH
CH
JNA
RAJ
MG
FARD
CN
JES
NA
GP
SH
COMS
LK
NOK
FN
KHG
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGA
J
PT
CTS
KPT
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <

Figure 5.9y

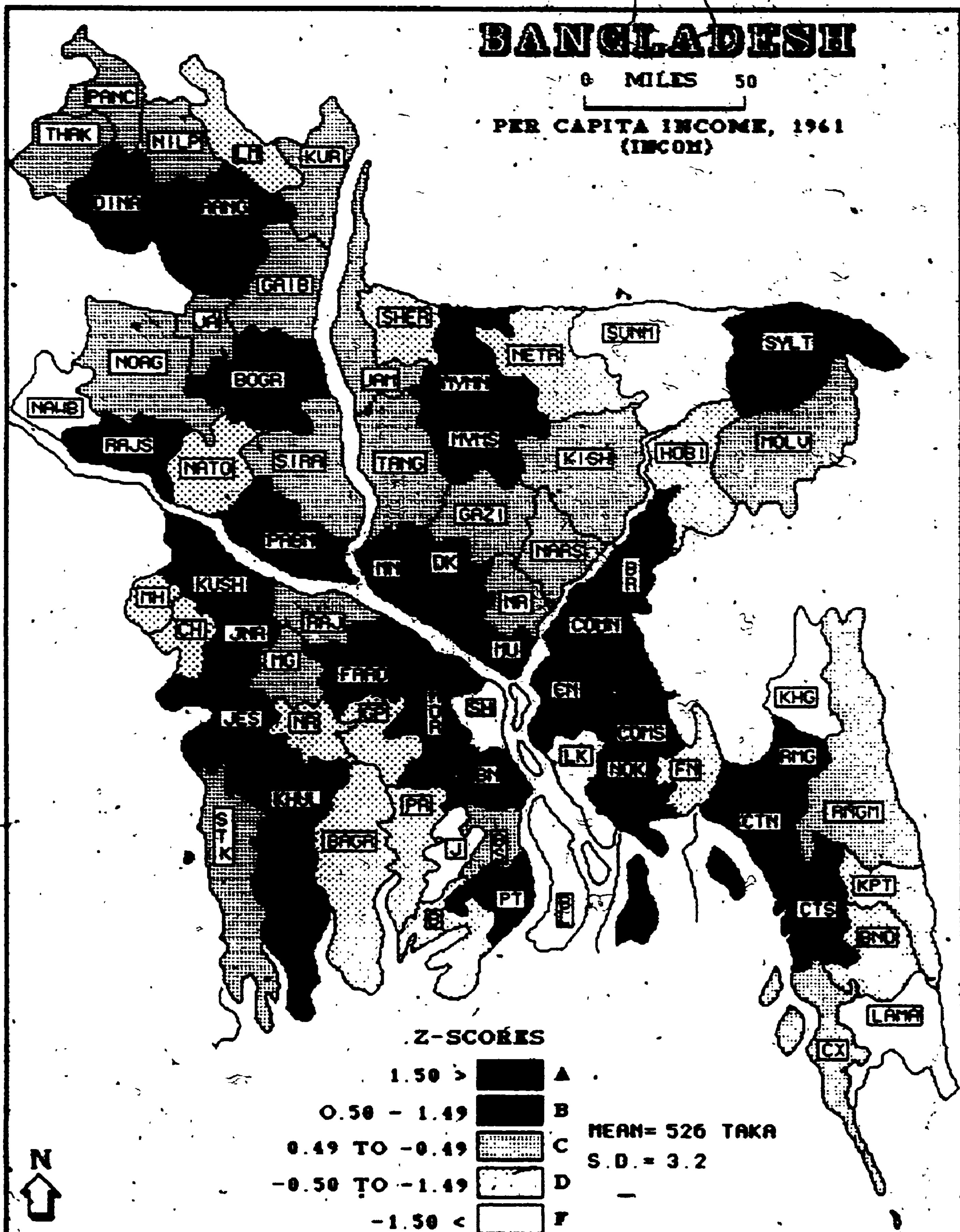

BANGLADESH
0 MILES 50
PER CAPITA INCOME, 1961
(INCOM)
PANC
THAK
NILP
LH
KUR
DINA
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
TANG
NETR
SUNM
SYLT
MOLV
HOBI
KISH
GAZI
NARS
DK
MN
NA
MU
BR
CODN
KUSH
MH
CHI
JNR
RAJ
MG
FARD
JES
NR
SH
KHUL
STK
BAGA
PR
J
PT
COMS
LK
NOK
FN
KHG
RMG
RNGM
CTN
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 526 TAKA
S.D.= 3.2
N

Figure 5.10a

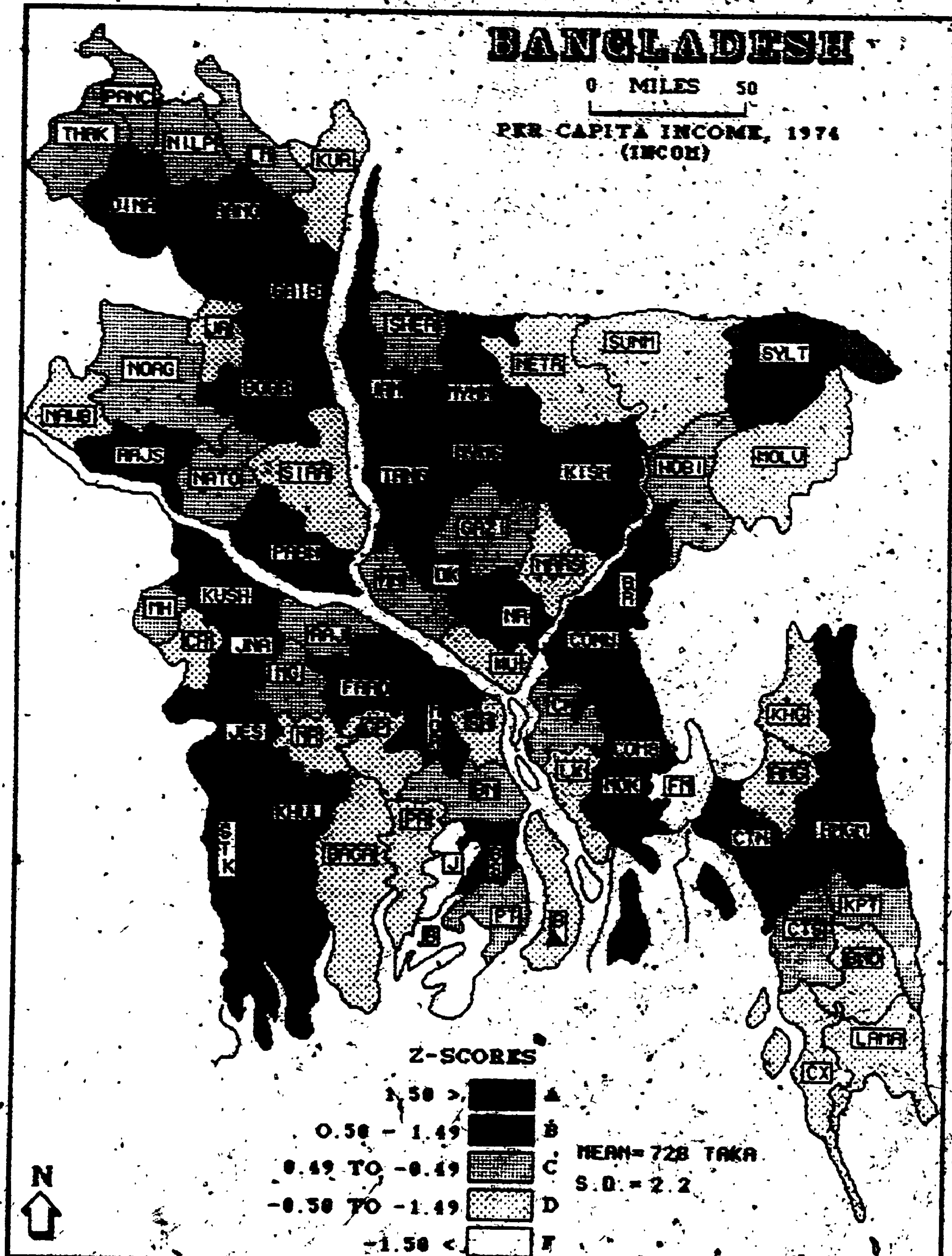

BANGLADESH
0 MILES 50
PER CAPITA INCOME, 1974
(INCOM)
PANC
THAK
NILP
KUR
DINA
NOAG
NAWB
RAJS
NATO
SIRA
PABN
SHER
NETR
SUNM
SYLT
HOBI
MOLV
KISH
DK
NR
COMM
KUSH
MH
JNA
JES
KHUL
STK
BAGR
PT
LK
FN
KHG
CTG
KPT
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 728 TAKA
S.D. = 2.2
N

Figure 5.10b

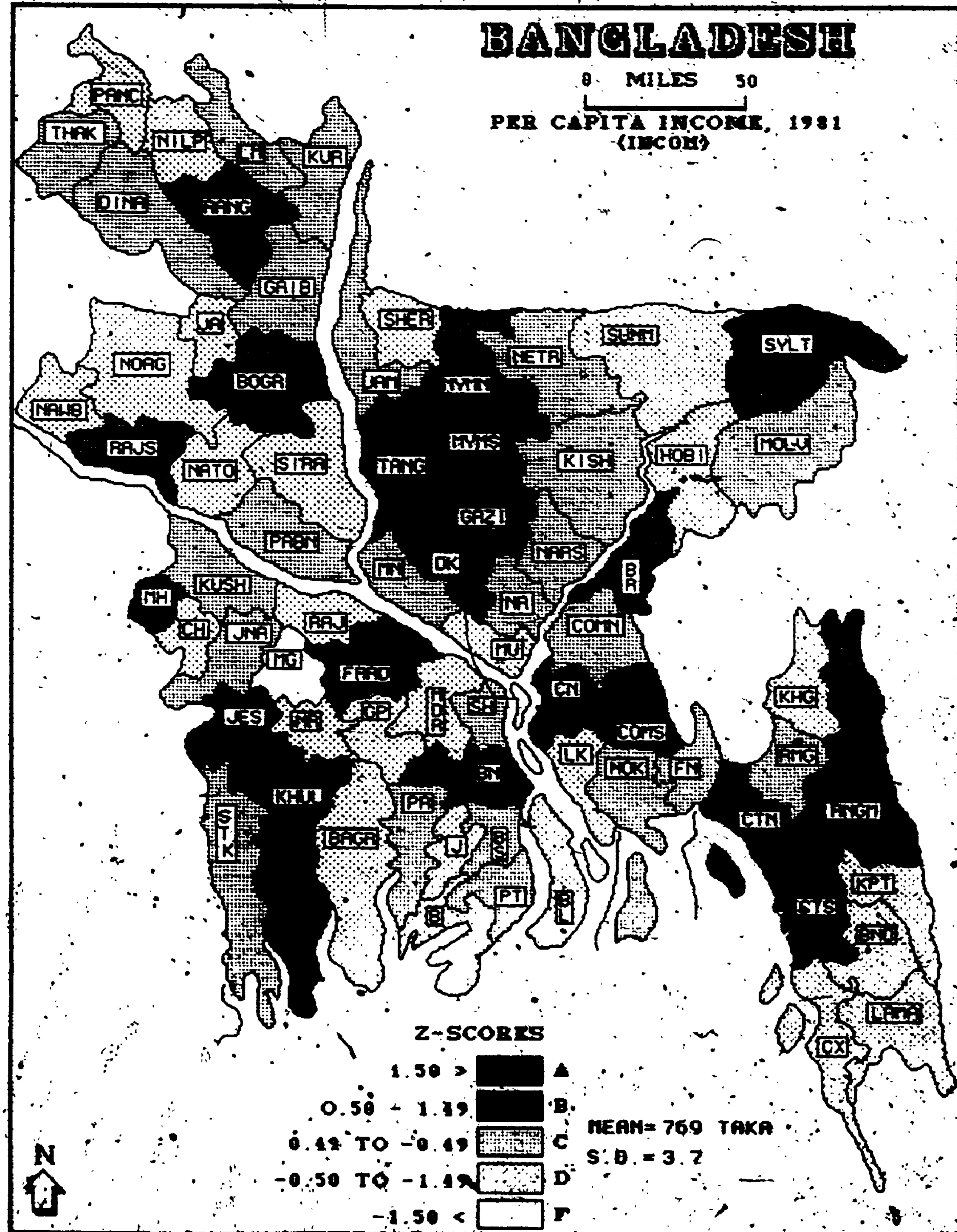

BANGLADESH
0 MILES 50
PER CAPITA INCOME, 1981
(INCOM)
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
SUNM
SYLT
NETR
MYMS
TANG
KISH
HOBI
MOLV
GAZI
DK
MN
NARS
BR
NR
MU
KUSH
MH
CHI
JNA
RAJ
MG
FARD
COMN
CN
JES
GP
SH
KHG
COMS
LK
NOK
FN
RMG
KHUL
STK
BAGR
PR
CTN
ANGM
PT
BL
KPT
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 769 TAKA
S.D = 3.7
N

Figure 5.10c

particularly in the Chittagong Hill-Tracts, active delta and the Sunamganj and Netrokona Districts in the depressed basin. By 1981 (Figure 5.10c) a few northwestern Districts experienced relative stress in addtion to the basic initial pattern. The new absolute range in 1981 of from 756 to 779 Taka reflects the fact that increases in the Per Capita Income (INCOM) had not varied considerably.

Between 1961 and 1974 (Figure 5.10x) increases in Per Capita Income above the mean value were experienced mostly in rural-peripheral Districts. The major urban axis and the initial District cores gained at a rate below the national average. Between 1974 and 1981 (Figure 5.10y) the pattern was much more random. In gross terms, the Central and Eastern Divisions of the country gained at a rate above the national average, while, the Northern and Southern Divisions experienced negative growth compared to the national mean. This is simply because of the existance of industrial cities both in the Central (e.g: Dhaka, Narayanganj) and Eastern Divisions (Chittagong). They represent concentrations of job opportunities in both the secondary and tertiary sectors, creating economic demands for food, other goods and services, and in turn stimulating the development of surrounding areas.

Health Variables

The provision of health care and medical services contributes significantly to national well-being. There are many studies to illustrate how ill-health is economically wasteful and hinders development. It is generally assumed that governments have a responsibility to promote the health of citizens. There are evidences in the Third World how lack of such provisions hinders economic

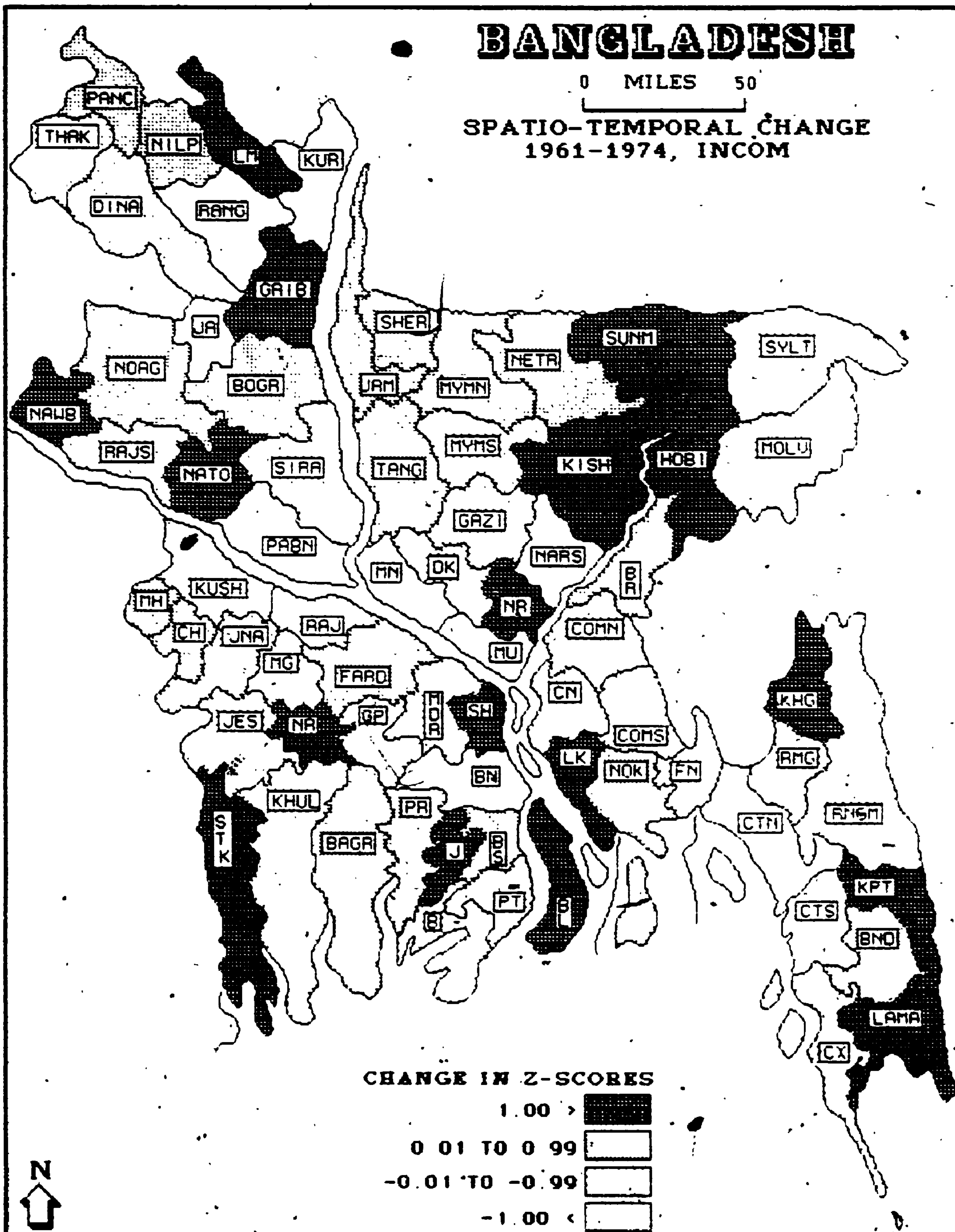

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, INCOM
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
NETR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
MN
DK
NARS
BR
KUSH
MH
NR
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
STK
BAGR
J
BS
BL
CTN
RNSM
KPT
PT
CTS
B
BNO
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0 01 TO 0 99
-0.01 TO -0.99
-1.00 <
N

Figure 5.10x

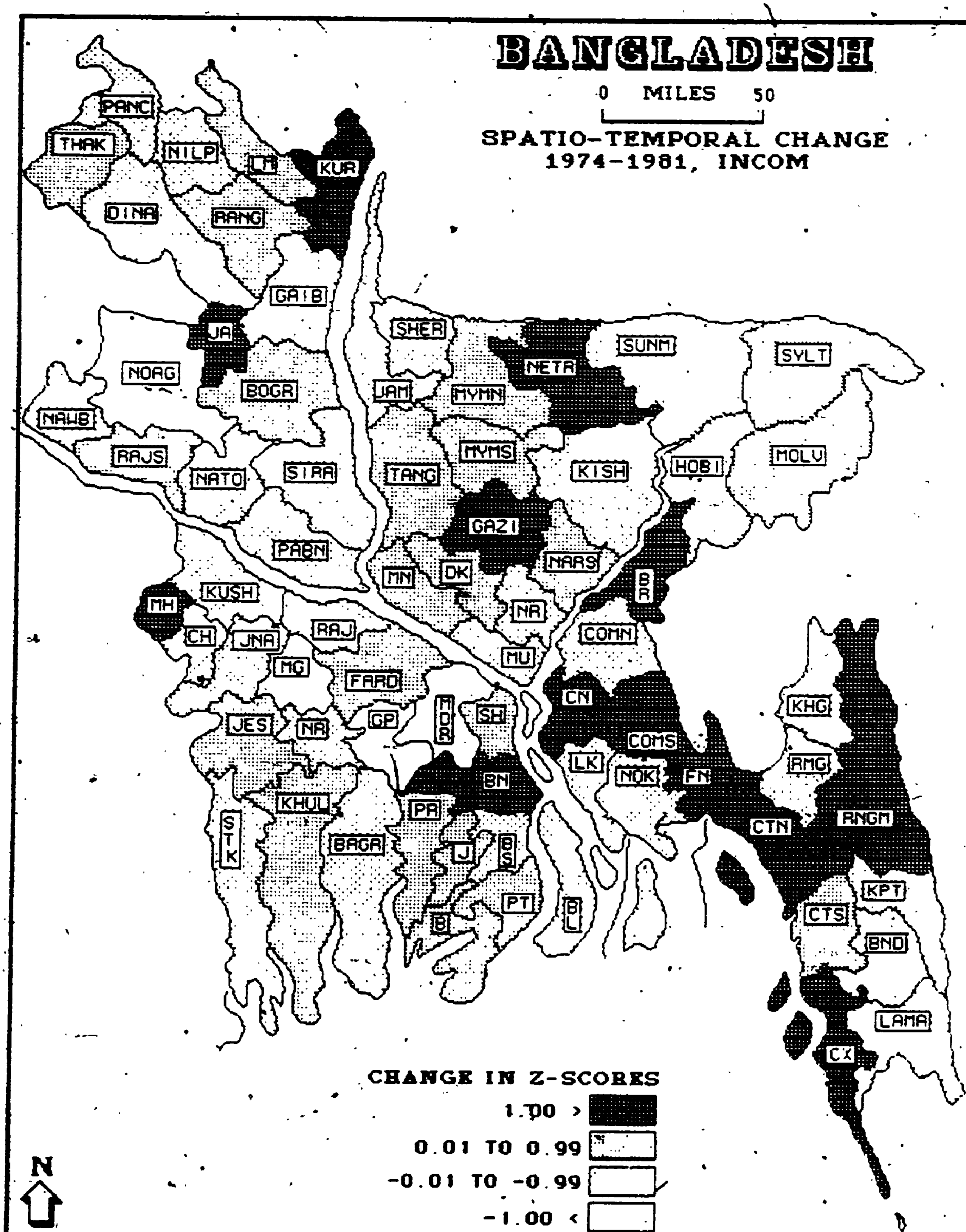

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, INCOM
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
MN
DK
NARS
BR
NR
MU
COMN
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NR
GP
MDR
SH
CN
COMS
LK
NOK
FN
KHG
RMG
KHUL
STK
BAGR
PR
BN
J
BS
B
PT
BL
CTN
RNGM
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.10y

development. Likewise substantial variations in provision between regions within a country may lead to extreme inequalities and thereby low levels of living. Therefore, the availability of physicians, nurses, hospital beds (per unit population) and per capita expenditure on health care in a given area may be discriminatory indicators of the health dimension. Bangladesh has been identified as one of the countries of the world in which health and medical care facilities per unit population are very low. The country is relatively small but has a very large and rapidly expanding population that quickly absorbs increases in health service provisions. However, this dimension of social well-being is difficult to measure directly The variables used here are surrogates for the general level of health of the population, and measure of access to medical facilities

The initial range of variables collected within the Health Category included Per Capita Expenditure on Health Care Services, Total Number of District Hospitals, Total Number of Hospital Beds, Total Number of Rural Health Complexes, Total Number of Maternal Centres, Total Number of Family Planning Centres, Total Number of Dispensaries, Total Number of Physicians and Total Number of Registered Nurses (from which average numbers per 50,000 population were calculated) From this initial array, three, namely Per Capita Expenditure on Health Care Services (PEHCS), Average Number of Physicians per 50,000 Population (AVDOC) and Infant Mortality Rate (INFNT) were selected for detailed analysis District Hospitals, Rural Health Complexes, Maternal Centres, Family Planning Centres, and Dispensaries are not included in analysis simply because standard deviations of these variables are insignificant.

In the areas of health there is some evidence of modest change at the national level. For example, Average Number of Hospital Beds (AVHBD) increased from 5.7 in 1961 to 10.7 in 1981 per 50,000 population. Average Number of Physicians (AVDOC) and Nurses (AVNRS) per unit population indicate changes at a much lower rate (Table 5.1) It must be noted that the absolute number of doctors, nurses and hospital beds have definitely increased in Bangladesh over time, but their benefits were absorbed by the growing population size, and as such, a lower rate of growth in the health service provision, per unit of population.

Per capita expenditure patterns on health measure the quality of public health care. It is assumed that the greater the amount of expenditures on health- the higher the quality of public health Increases in the Per Capita Expenditure on Health Care Services (PEHCS) in Bangladesh have been very modest in absolute but significant in relative terms. The figure increased from about 4.30 to 16.50 Taka per capita over the study period (Table 5.1).

On the other hand, hospitals are mostly concentrated in urban areas where they serve only a relatively small proportion of population. As a result, relatively urbanized Districts are more likely to have health service provisions. There were about 3 doctors on average per 50,000 population, in 1961 (Table 5.1). Temporal change has been very modest over the study period. By 1981, Bangladesh reported only about 5 doctors in average, per unit population. The disparity between predominantly urban and rural areas seems to be very sharp. This is indicated by the higher standard deviations in the distribution of AVDOC (Table 5.1).

The third variable presented is that of the Infant Mortality Rate (INFNT). Although a demographic aspect, it is correlated with lifestyle, standards of nutrition and health care provisions. Infant mortality rates have fallen in developed countries (from 30 to 11 per 1000, between 1960 and 1980; World Bank Report, 1982), but in the Third World the rates are still high (declined from 165 to 94 per 1000, between 1960 and 1980; World Bank Report, 1982). Malnutrition increases as more and more children compete for limited food, and such is the case in LDCs. Similar notions can be applied within the country context. It may be assumed that predominantly rural areas will have relatively high infant mortality. However, there was sharp decline in the Infant Mortality Rate (-25) in Bangladesh, particularly, between 1974 and1981 whose impact has broad significance in social well-being, and that may be related to increased level of investment and health care facilities. To be specific, the national mean of INFNT dropped from about 148 to 123 per 1000, between 1961 and1981 (Table 5.1).

The relationships between Health variables are to be expected. Within-group relationships suggest that there is a broad consistency in the data set with the exception of PEHCS which is independent. For example, Average Number of Hospital Beds (AVHBD) is observed as a positively associated variable with Average Number of Physicians (AVDOC) (.79) per 50,000 Population. Similarly, AVDOC is positively related to the Average Number of Nurses (AVNRS) (.79)

Although Infant Mortality is a vital statistic, it is interpreted more clearly under the demographic aspects. Relationships between health related variables and other categories i.e. income, employment structure and household amenities, have already been established above.

Per Capita Expenditure on Health- Spatial and Temporal Change

Per Capita Expenditure on Health Care Services (PEHCS) in 1961 (Figure 5.11a) depicts a pattern based on a national mean of 4.30 Taka, and an absolute range of from 3 to 6 Taka per capita by District. Immediately apparent is the concentration of relatively high Z values in the Northern and Southern Divisions. Dhaka is the only District in the Central Division showing high score and no Districts in the Eastern Division evidence high scores. Further, the Chittagong Hill-Tracts and depressed basin are found to be even more relatively disadvantaged, as evident by the concentration of low Z values in these areas (Figure 5.11a). The spatial patterns of 1974 (Figure 5.11b) showed a marked change. Quite a few Districts along the major urban axis (Dhaka-Chittagong) achieved relatively high Z values (Figure 5.11b). Former District cores i.e. Sylhet and Mymensingh south also gained in relative terms. The Northern Division, however, declined in importance from former level. The moribund delta remained stable in broad terms, but a relative decline is noticed in the District of Kushtia, Chuaganga, Jessore and Khulna (Figure 5.11b). However, the spatial patterns were more diffused in 1981. High Z values became associated with most of the initial District cores with minor exceptions. As such, a systematic but dispersed pattern

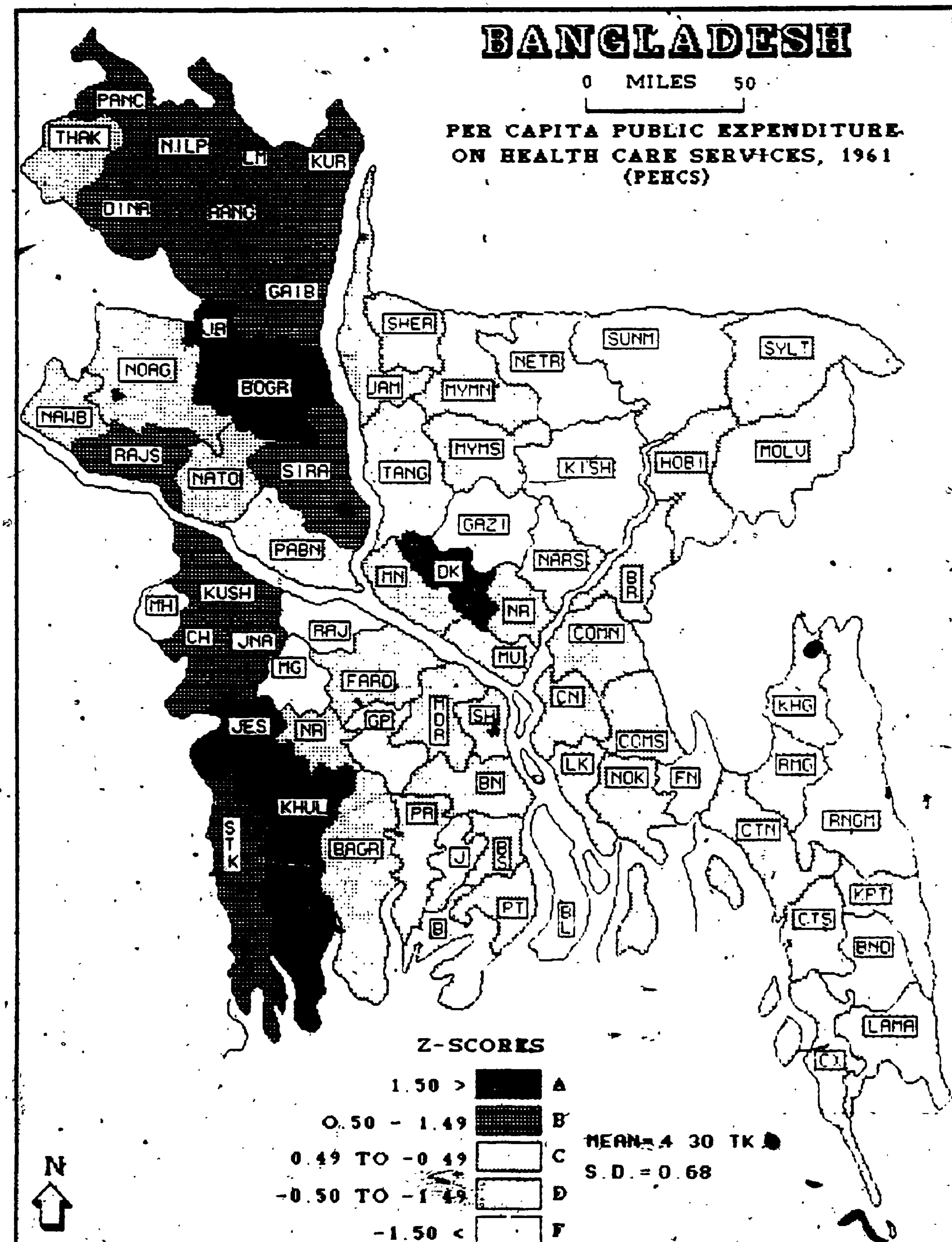

BANGLADESH
0 MILES 50
PER CAPITA PUBLIC EXPENDITURE ON HEALTH CARE SERVICES, 1961 (PEHCS)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
BR
NR
KUSH
MH
CH
JNA
RAJ
MG
FARD
MU
COMN
CN
KHG
JES
NR
GP
MDR
SH
CCMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN=4.30 TK
S.D.=0.68
N

Figure 5.11a

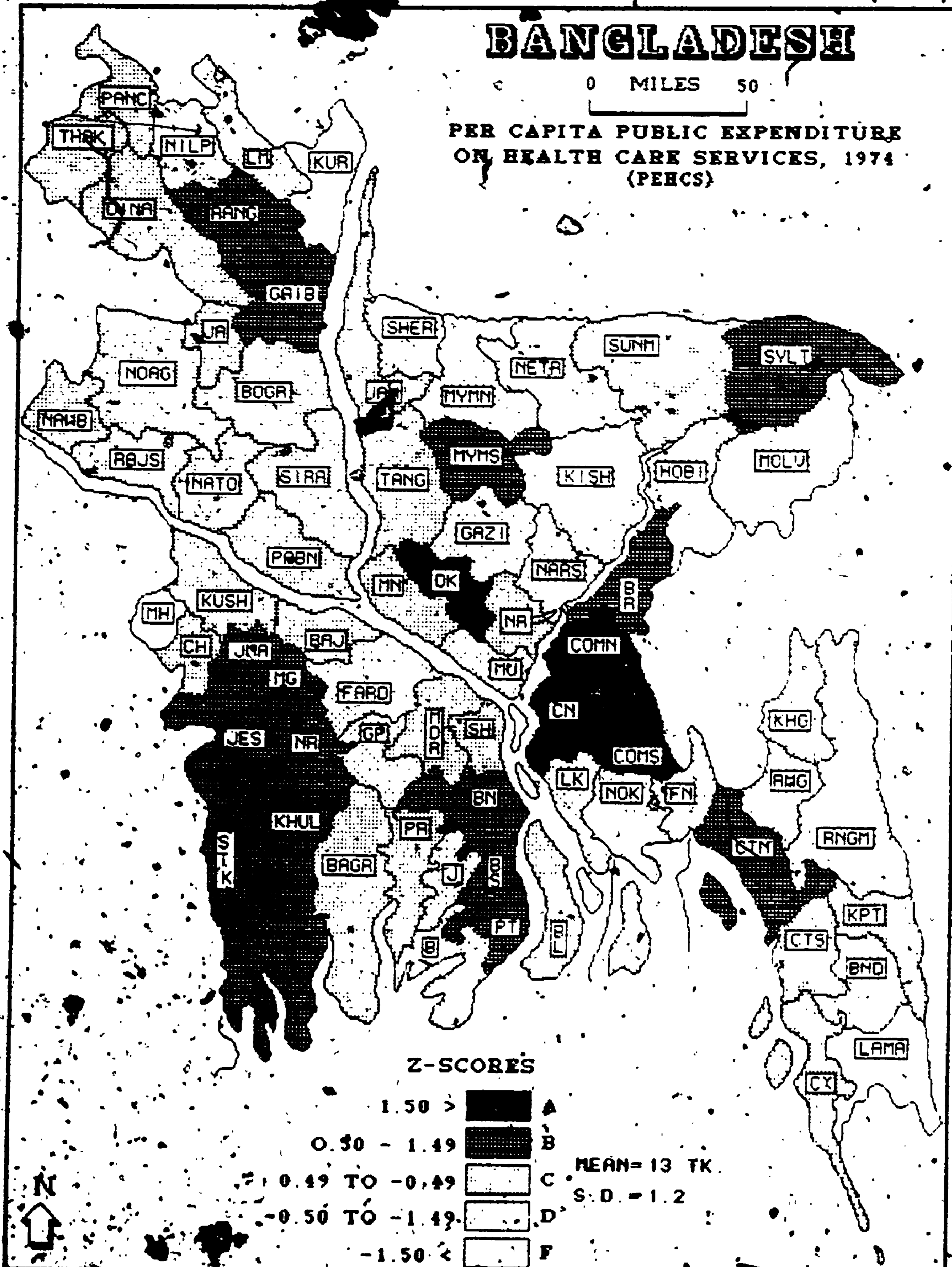

BANGLADESH
0 MILES 50
PER CAPITA PUBLIC EXPENDITURE ON HEALTH CARE SERVICES, 1974 (PEHCS)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
KUSH
MH
CH
JNA
BAJ
MG
FARD
JES
NR
GP
KHUL
STK
BAGR
PR
J
B
BS
PT
BN
MDR
SH
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
KISH
HOBI
MOLV
TANG
GAZI
MN
DK
NARS
NR
BR
COMN
MU
CN
COMS
LK
NOK
FN
KHG
RMG
RNGM
CTN
CTS
KPT
BND
BL
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 13 TK
S.D = 1.2
N

Figure 5.41b

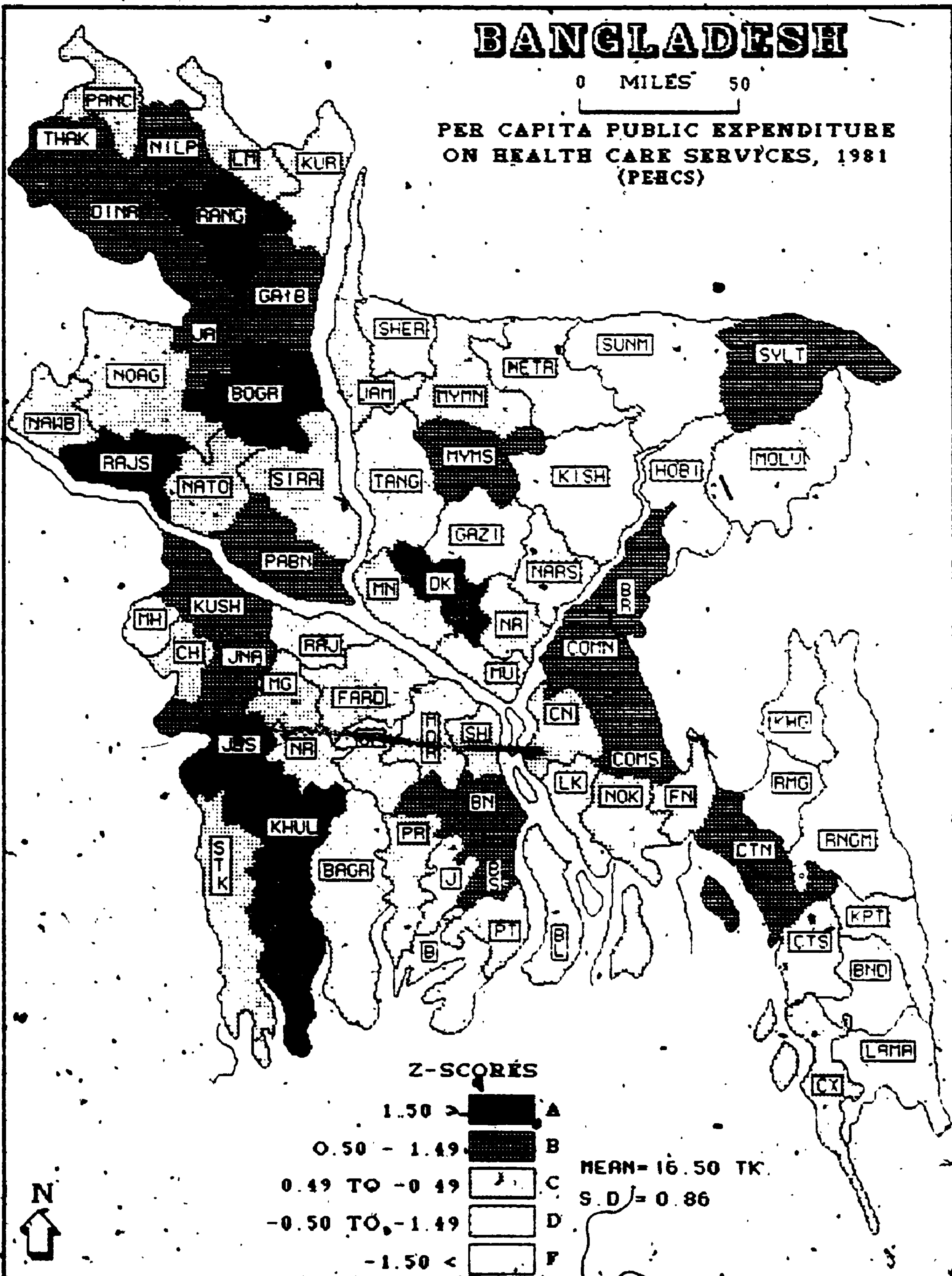

BANGLADESH
0 MILES 50
PER CAPITA PUBLIC EXPENDITURE
ON HEALTH CARE SERVICES, 1981
(PEHCS)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
SUNM
SYLT
NETR
JAM
MYMN
MYMS
TANG
KISH
HOBI
MOLU
GAZI
NARS
MN
DK
NA
BR
KUSH
MH
CH
JNA
RAJ
MG
FARD
MU
COMN
CN
JES
NR
SH
COMS
LK
NOK
FN
KHC
RMG
BN
KHUL
PR
STK
BAGR
J
CTN
RNGM
PT
BL
B
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 16.50 TK
S.D = 0.86
N

Figure 5.11c

emerged. Low scores remained persistent in the Chittagong Hill-Tracts, depressed basin and active delta areas (Figure 5.11c). The new absolute range in 1981 of from 14 to 19 Taka per capita reflects the fact that rates of increase in PEHCS did not vary considerably. These are indicated by District for the period 1961-1974 (Figure 5.11x) and for 1974-1981 (Figure 5.11y).

Between 1961 and 1974 increases in PEHCS above the mean value were experienced largely along the major urban axis (Dhaka-Chittagong), and low level changes were more pronounced in the Northern and Southern Divisions. In the East, such low level changes were associated with the Chittagong Hill-Tracts and depressed basin (Figure 5.11x). Between 1974 and 1981 These areas reported low level changes in addition to the major urban axis. Most high level changes occured in the Northern Division (Figure 5.11y).

Average Physicians- Spatial and Temporal Change

Average Number of Physicians per 50,000 Population (AVDOC) in 1961 (Figure 5.12a) depicts a pattern based on a national mean of about 2.7, and an absolute range of from 05 to 37 by District. The incidence of relatively high Z values are pronounced in areas representing most of the initial District cores i.e. Dhaka, Chittagong, Khulna, Rajshahi, Rangpur, Kushtia, Faridpur, Barisal, Mymensingh and Sylhet (Figure 5.12a). Some of these Districts have the distinctive advantage of medical colleges together with hospitals that gave a particular pattern to these areas. The District of Kapti was an exception, probably because of low population density, however, with an increasing importance of the nation's only hydro-electric project in this area. The rest of the country reported a rather uniform

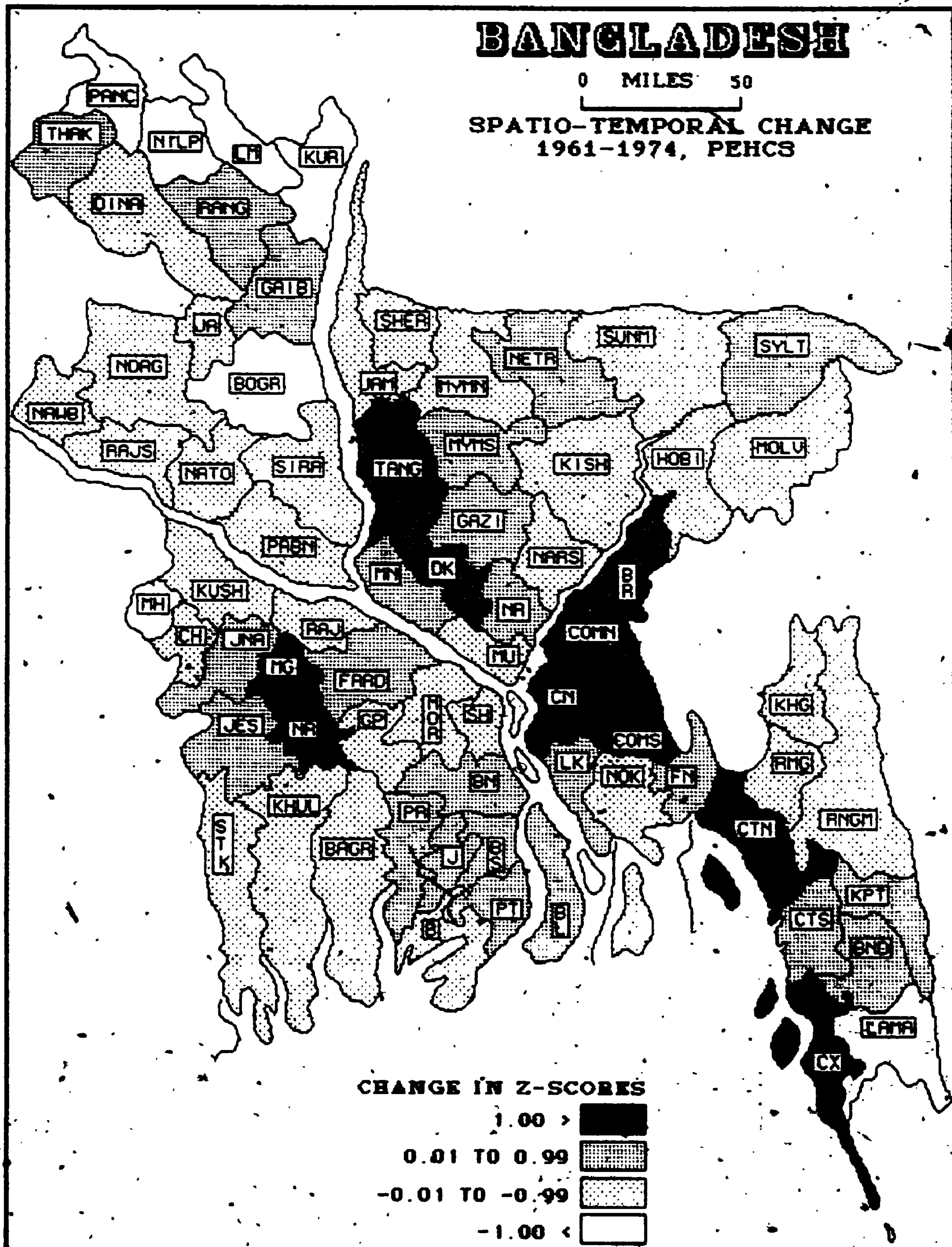

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, PEHCS
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JR
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
GAZI
KISH
HOBI
MOLV
NARS
DK
MN
NA
BR
COMN
CN
COMS
MU
KUSH
MH
CH
JNA
RAJ
MG
FARD
GP
SH
JES
NR
KHUL
STK
BAGR
PR
BN
J
BS
PT
B
BL
LK
NOK
FN
KHG
RMG
RNGM
CTN
KPT
CTS
BND
CAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <

Figure 5.11x

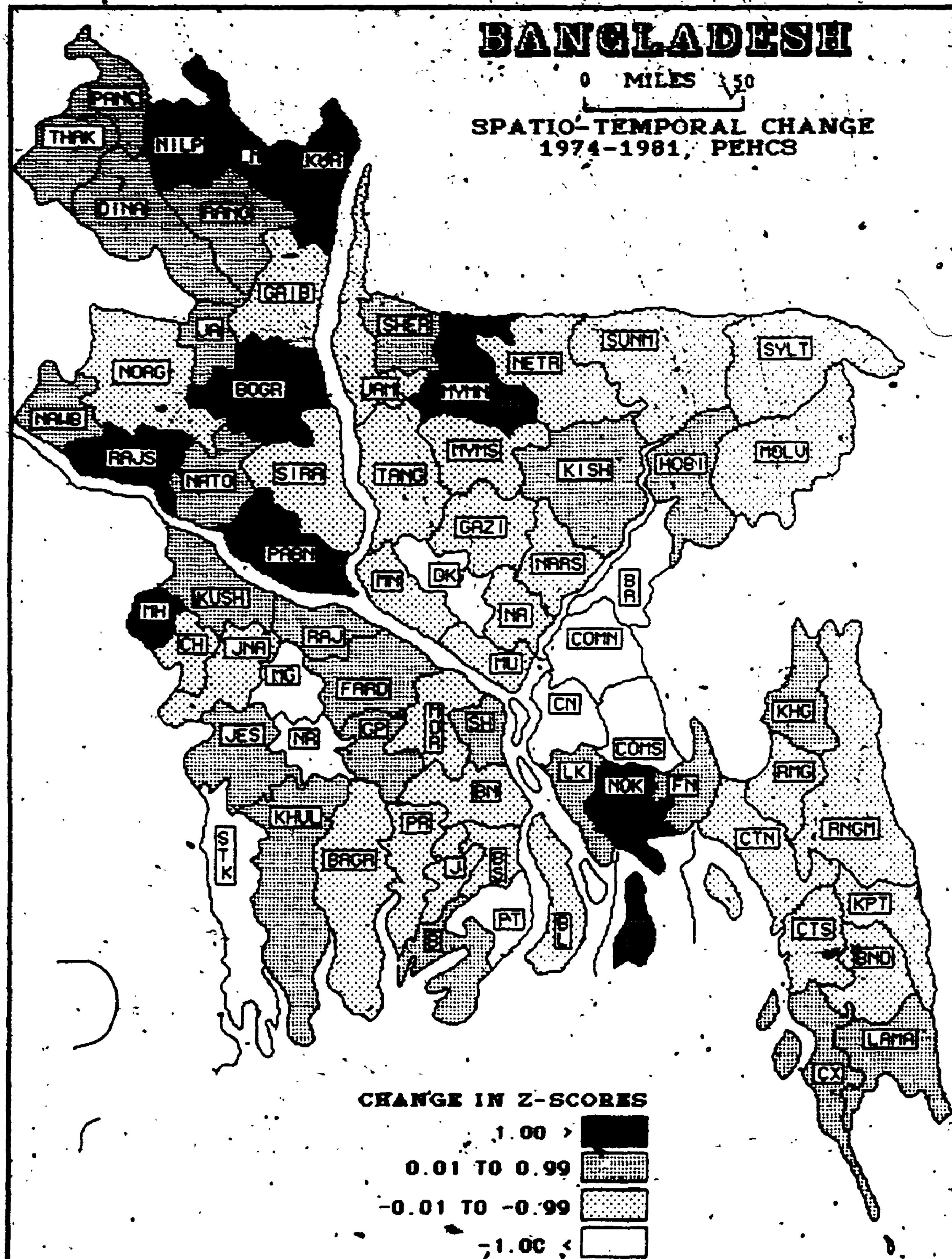

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, PEHCS
PANC
THAK
NILP
KGA
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLU
GAZI
NARS
MN
DK
NA
BR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
JES
NR
GP
MDR
SH
COMS
KHG
LK
NOK
FN
RMG
KHUL
BN
PR
CTN
RNGM
STK
BAGR
J
BS
PT
BL
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <

Figure 5.11y

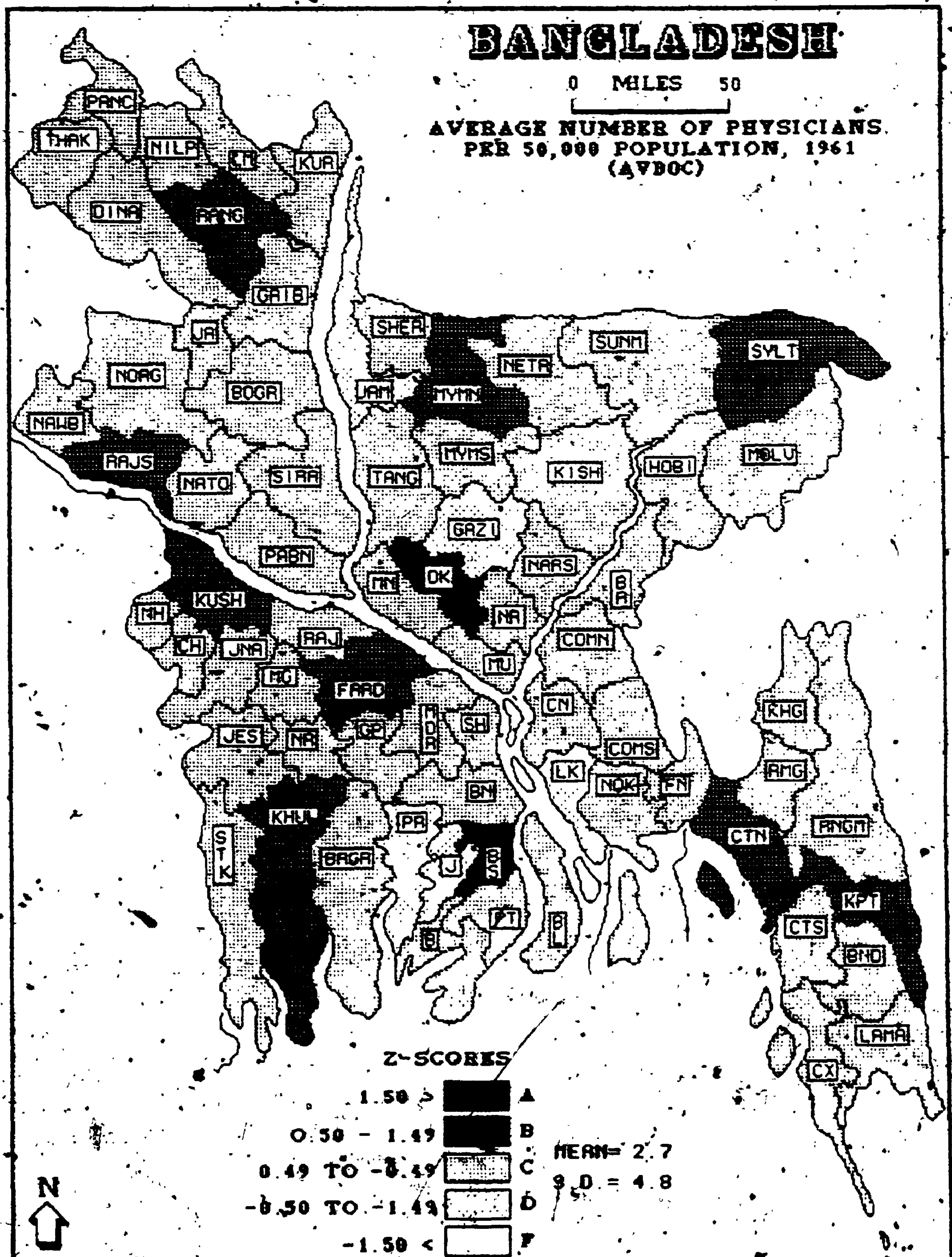

BANGLADESH
0 MILES 50
AVERAGE NUMBER OF PHYSICIANS PER 50,000 POPULATION, 1961 (AVBOC)
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JR
SHER
NETR
SUNM
SYLT
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
MN
DK
NARS
KUSH
MH
NR
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
RHG
SH
JES
GP
COMS
LK
NOK
FN
RMG
BN
KHU
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
C
D
-1.50 < F
MEAN= 2.7
S.D = 4.8
N

Figure 5.12a

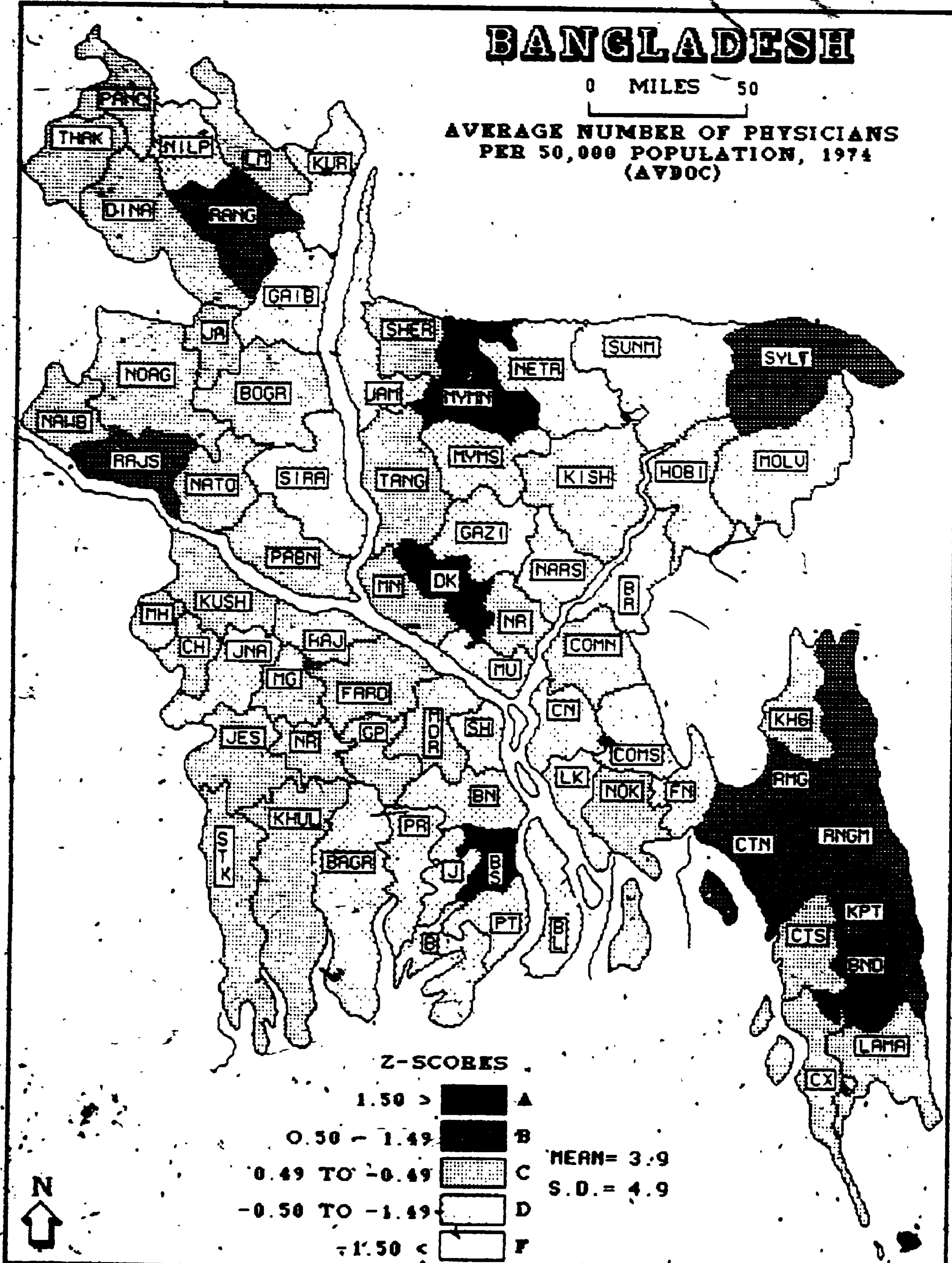

BANGLADESH
0 MILES 50
AVERAGE NUMBER OF PHYSICIANS
PER 50,000 POPULATION, 1974
(AVDOC)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETA
NOAG
BOGR
JAM
MYMN
NAWB
MYMS
MOLV
RAJS
NATO
SIRA
TANG
KISH
HOBI
GAZI
PABN
NARS
MN
DK
BR
MH
KUSH
NR
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
RMG
LK
NOK
FN
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 – 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 3.9
S.D.= 4.9
N

Figure 5.12b

pattern in gross terms. In 1974 (Figure 5.12b), concentration of high scores were strictly associated with those Districts having medical colleges. Other initial District cores i.e Khulna, Faridpur and Kushtia declined in relative terms. Although the Chittagong Hill-Tracts gained relatively because of sparse population, while other marginal areas i.e. the depressed basin and active delta lagged behind (Figure 5.12b). Basic patterns of 1974 remained relatively unchanged in 1981 (Figure 5.12c). The new absolute range in 1981 of from 7 to 32 reflects the fact that absolute level varied considerably, however, to a lesser degree compared to the base year

Rapid expansion of health service provisions in the Chittagong Hill-Tracts is recorded in the map showing temporal changes between 1961 and1974 (Figure 5.12x). Rather consistent but low level changes occured in most Bangladesh Districts between 1974 and 1981 (Figure 5.12y).

<u>Infant Mortality Rate- Spatial and Temporal Change</u>

The distribution of Infant Mortality rate (INFNT) for 1961 (Figure 5.13a) depicts a spatial pattern based on a national mean of 144 per 1000, and an absolute range of from 136 along the major urban axis to 149 in the Chittagong Hill-Tracts and Depressed Basin. The high Z scores are concentrated in four major peripheral areas i.e. the Chittagong Hill-Tracts, depressed basin, upper piedmont alluvial plain and upper active delta plain. Relatively low Z values are largely prominent along the major urban axis (Dhaka-Chuttagong) and moribund delta. Further, incidence of low Z values are relateable to most of the initial District cores (Figure 5.13a). In 1974 (Figure 5.13b), spatial patterns suggested a relative decline in Infant Mortality

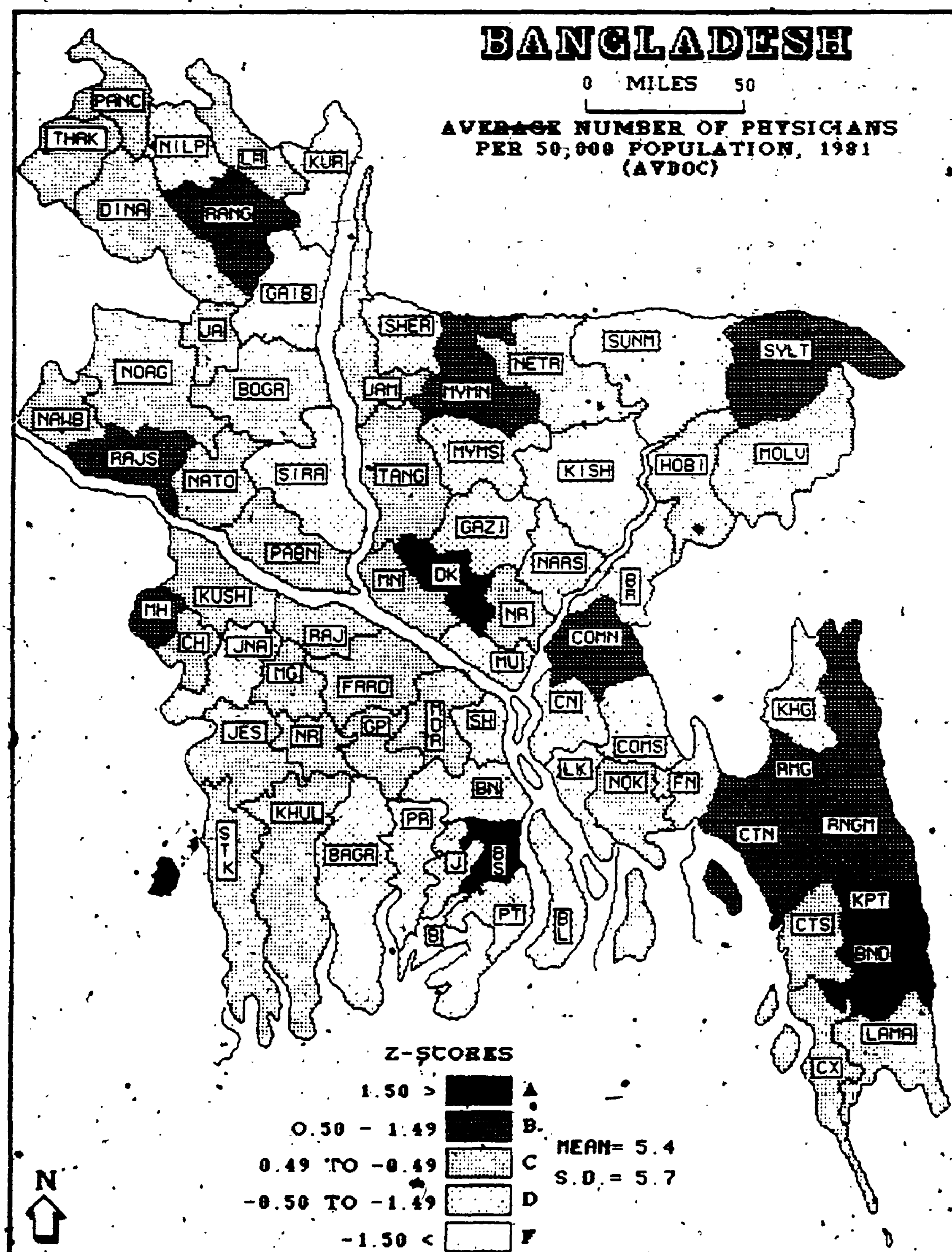

BANGLADESH
0 MILES 50
AVERAGE NUMBER OF PHYSICIANS PER 50,000 POPULATION, 1981 (AVDOC)
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
NOAG
BOGA
NAWB
RAJS
NATO
SIRA
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
KISH
HOBI
MOLV
TANG
GAZI
NARS
PABN
MN
DK
NA
BR
KUSH
MH
CH
JNA
RAJ
MG
FARD
MU
COMN
CN
JES
NR
GP
MDR
SH
KHG
COMS
LK
NOK
FN
RMG
KHUL
STK
BAGA
PA
BN
J
BS
CTN
ANGM
PT
BL
B
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B.
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 5.4
S.D = 5.7
N

Figure 5.12c

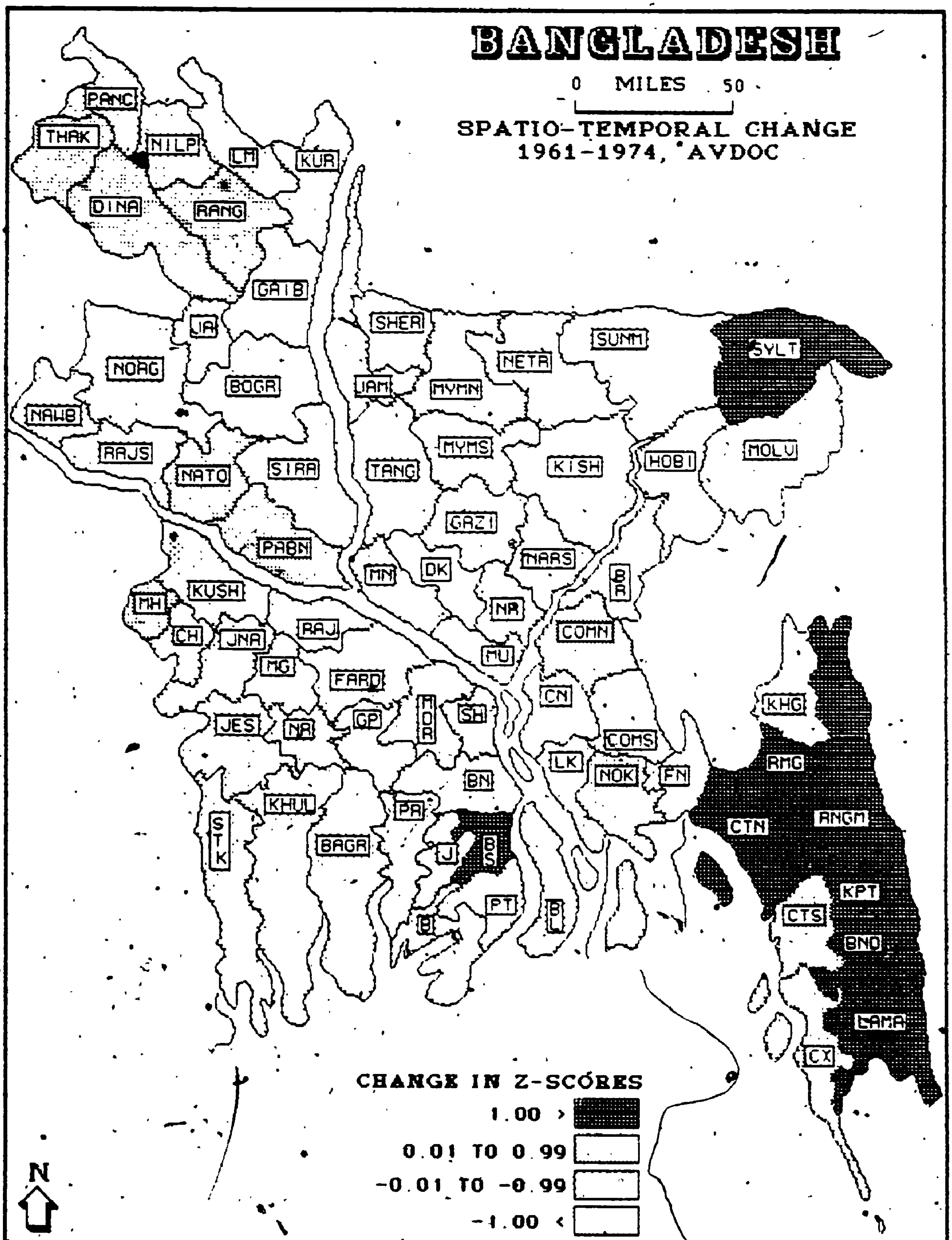
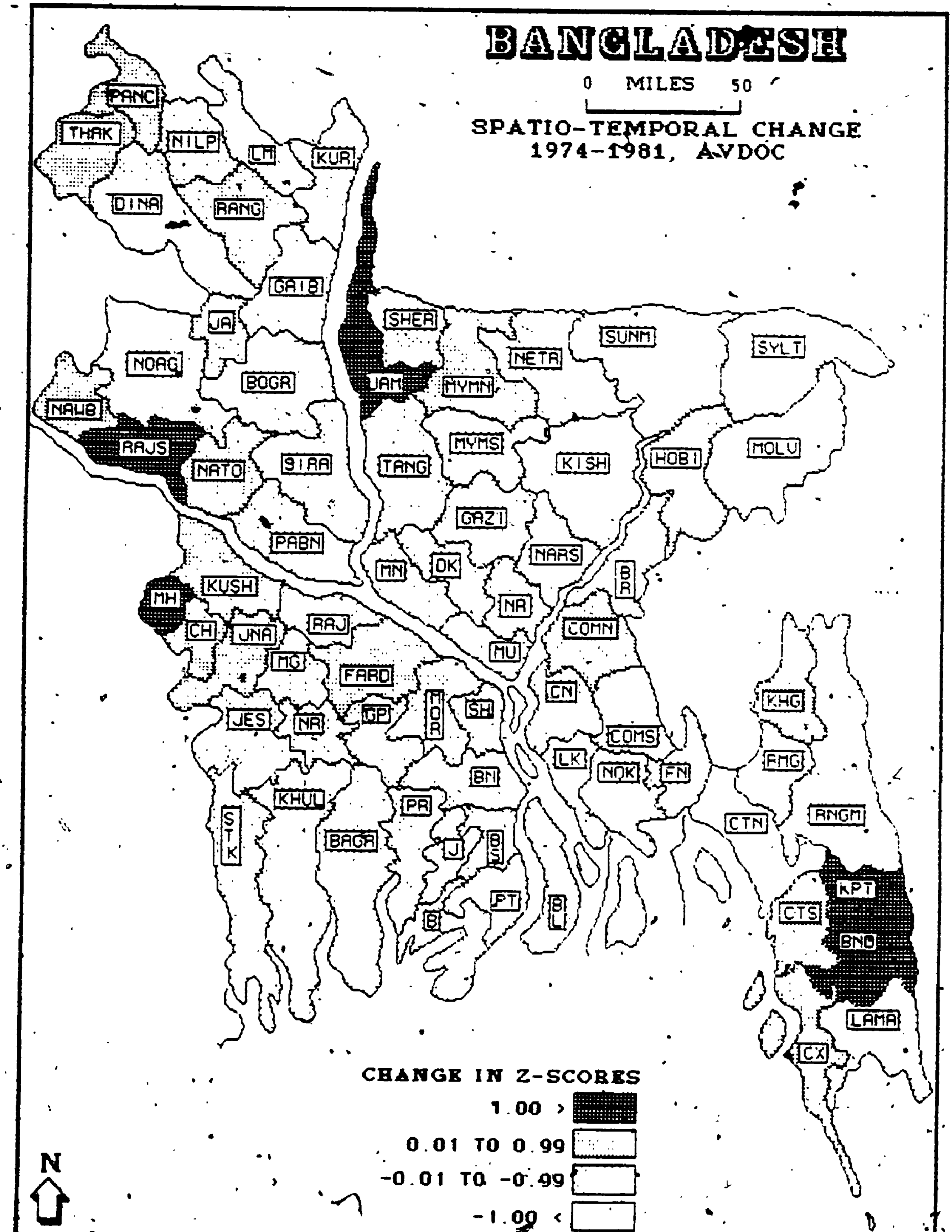

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, AVDOC
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
KUSH
MH
NR
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NA
GP
MDR
SH
COMS
RMG
LK
NOK
FN
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
PT
BL
KPT
CTS
BNO
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.12x


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, AVDOC
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
NETR
JAM
MYMN
NAWB
RAJS
MYMS
KISH
HOBI
MOLU
NATO
SIRA
TANG
GAZI
PABN
MN
DK
NARS
BR
KUSH
MH
NR
RAJ
COMN
CH
JNA
MU
MG
FARD
MDR
SH
CN
KHG
JES
NR
GP
COMS
LK
NOK
FN
FMG
KHUL
BN
PR
STK
BAGR
CTN
RNGM
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N
Figure 5.12y

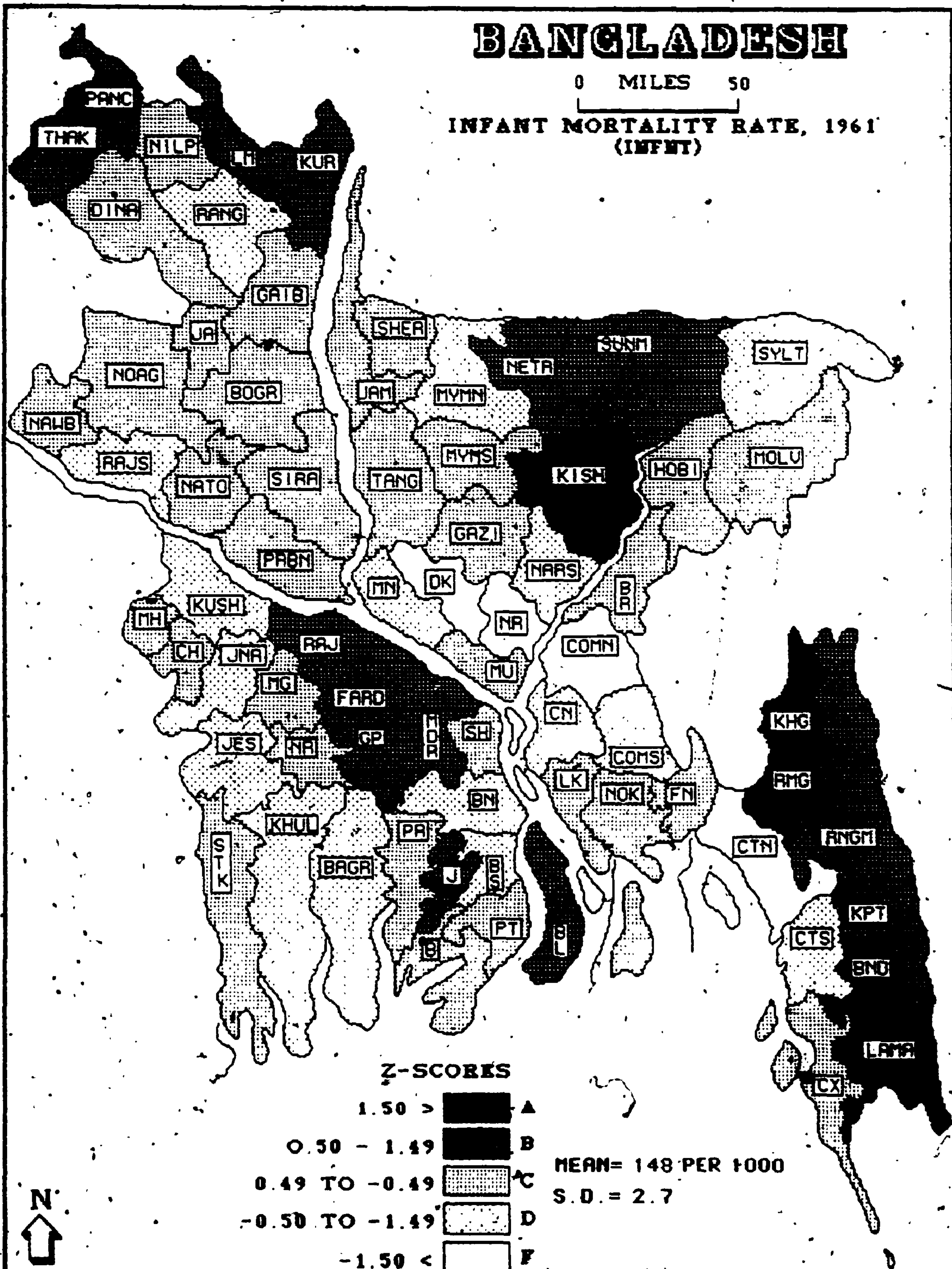

BANGLADESH
0 MILES 50
INFANT MORTALITY RATE, 1961
(INFNT)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
MYMS
TANG
GAZI
SUNM
NETR
KISH
SYLT
HOBI
MOLV
NARS
BR
MN
DK
NR
COMN
MU
KUSH
MH
CH
JNA
RAJ
MG
FARD
GP
MDR
SH
JES
NA
CN
COMS
LK
NOK
FN
BN
KHUL
STK
BAGR
PR
J
BS
PT
B
BL
CTN
KHG
RMG
RNGM
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 148 PER 1000
S.D. = 2.7
N

Figure 5.13a

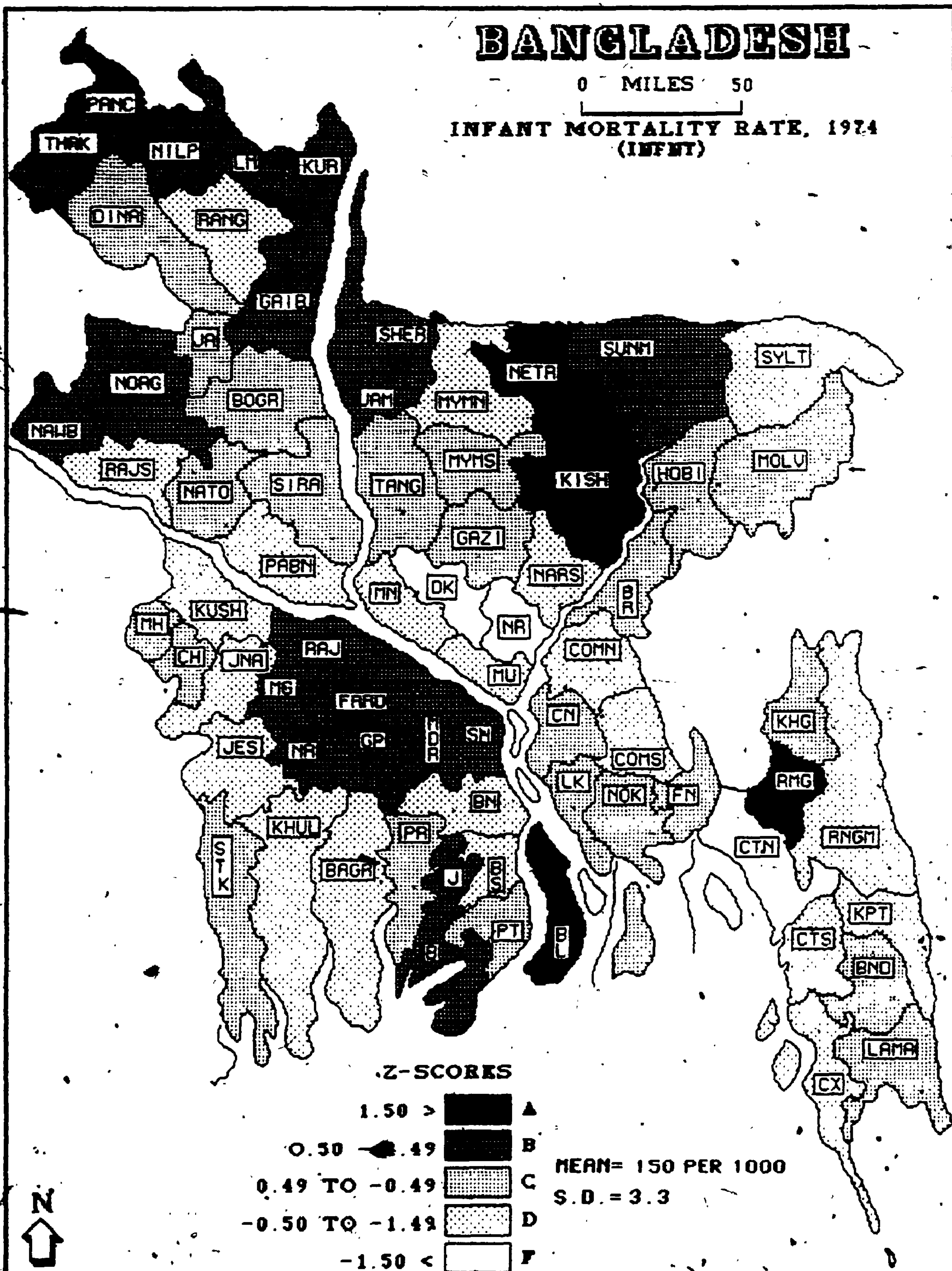

BANGLADESH
0 MILES 50
INFANT MORTALITY RATE, 1974
(INFNT)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NORG
NETR
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
NR
KUSH
MH
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
HDR
SH
COMS
LK
NOK
FN
RMG
KHUL
BN
PR
CTN
RNGM
STK
BAGR
J
BS
PT
BL
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 >
A
0.50
.49
B
0.49 TO -0.49
C
-0.50 TO -1.49
D
-1.50 <
F
MEAN= 150 PER 1000
S.D. = 3.3
N

Figure 5.13b

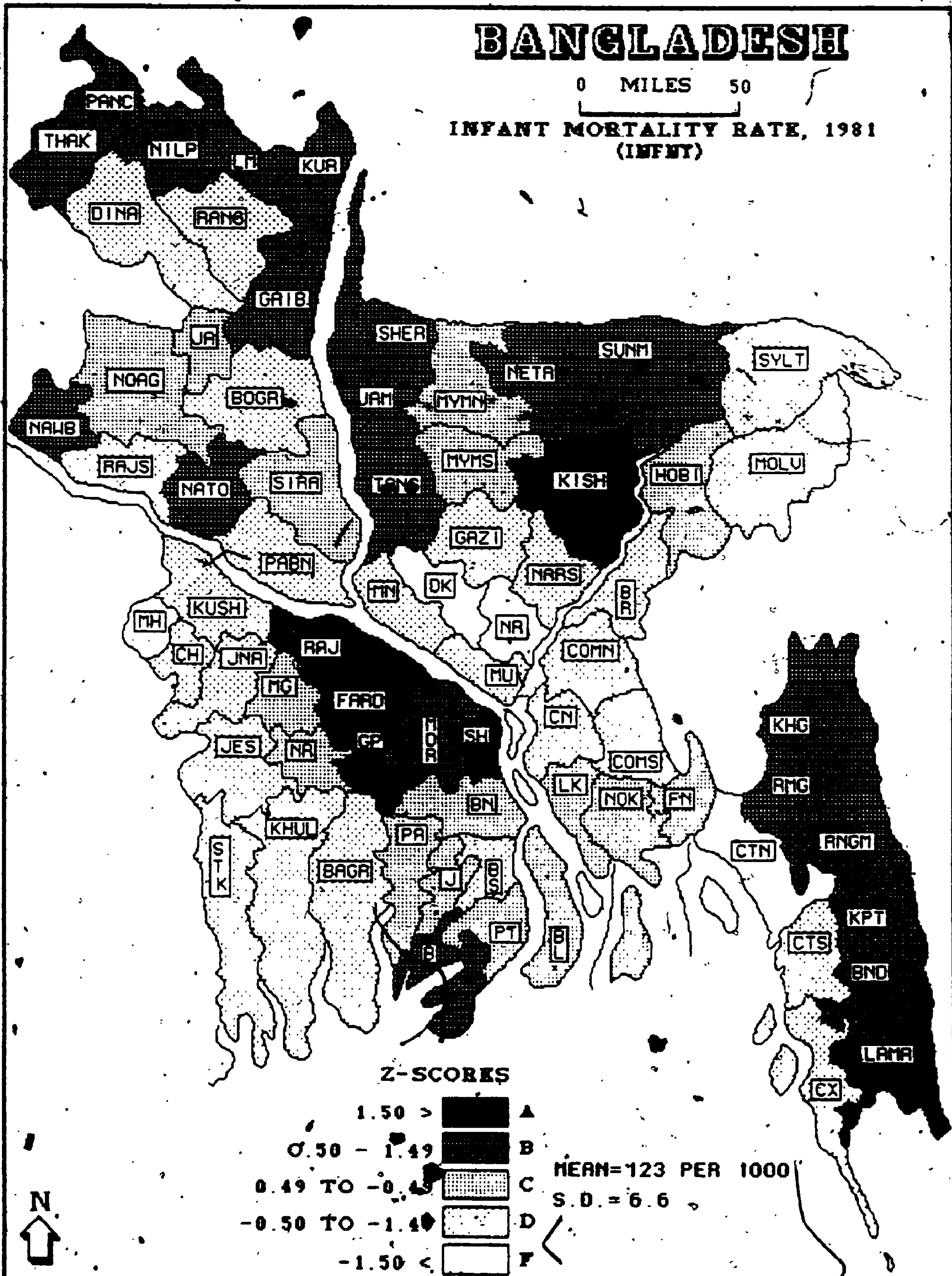
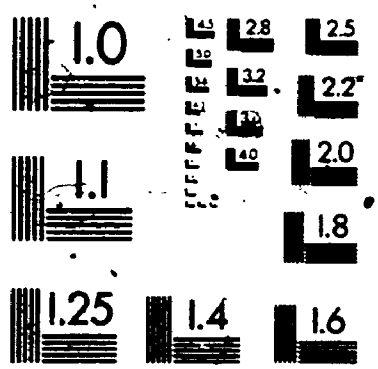

BANGLADESH
0 MILES 50
INFANT MORTALITY RATE, 1981
(INFNT)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
SUNM
NETA
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
MN
DK
NARS
NR
BR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
GP
MDR
SH
CN
JES
NA
COMS
LK
NOK
FN
KHUL
BN
PA
CTN
STK
BAGA
J
BS
PT
BL
B
KHG
RMG
RNGM
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN=123 PER 1000
S.D.=6.6
N

Figure 5.13c

4



Rates, particularly in the Chittagong Hill-Tracts. In 1981 (Figure 5.13c) a sharp drop in Infant Mortality is found along the major urban axis and in most of the initial District cores. However, the basic initial patterns of 1961 remained consistent over the study period. The incidence of relatively high Infant Mortality Rates were evident in the piedmont alluvial plain, the eastern Jamuna flood plain, active delta, depressed basin and the Chittagong Hill-Tracts. The new absolute range in 1981 of from 112 to 136 suggests the fact that rates of decline in Infant Mortality varied widely across the country, and a greater variation is indicated by the high standard deviation.

Between 1961 and 1974 almost all Districts in Bangladesh experienced a uniform rate of change above the national average, except the Chittagong Hill-Tracts where the rate of change was below the mean (Figure 5.13x). This is simply because of the low level changes (increase) taking place across the country in this period. Between 1974 and 1981 (Figure 5.13y), a significant change (decline) in Infant Mortality is observed. The major urban axis, moribund delta and most of the initial District cores reported a sharp decline in INFNT compared to the Chittagong Hill-Tracts and active delta where the rates of decline were below the national mean.

Education Variables

Education is a key to development; education determines the level of prosperity, welfare and security of the people. It must be noted that education is a basic need to mankind. The United Nations Declaration of Human Rights includes the right of individuals to education and national plan frequently state the aim of promoting greater access to educational opportunities for the rural mass. The

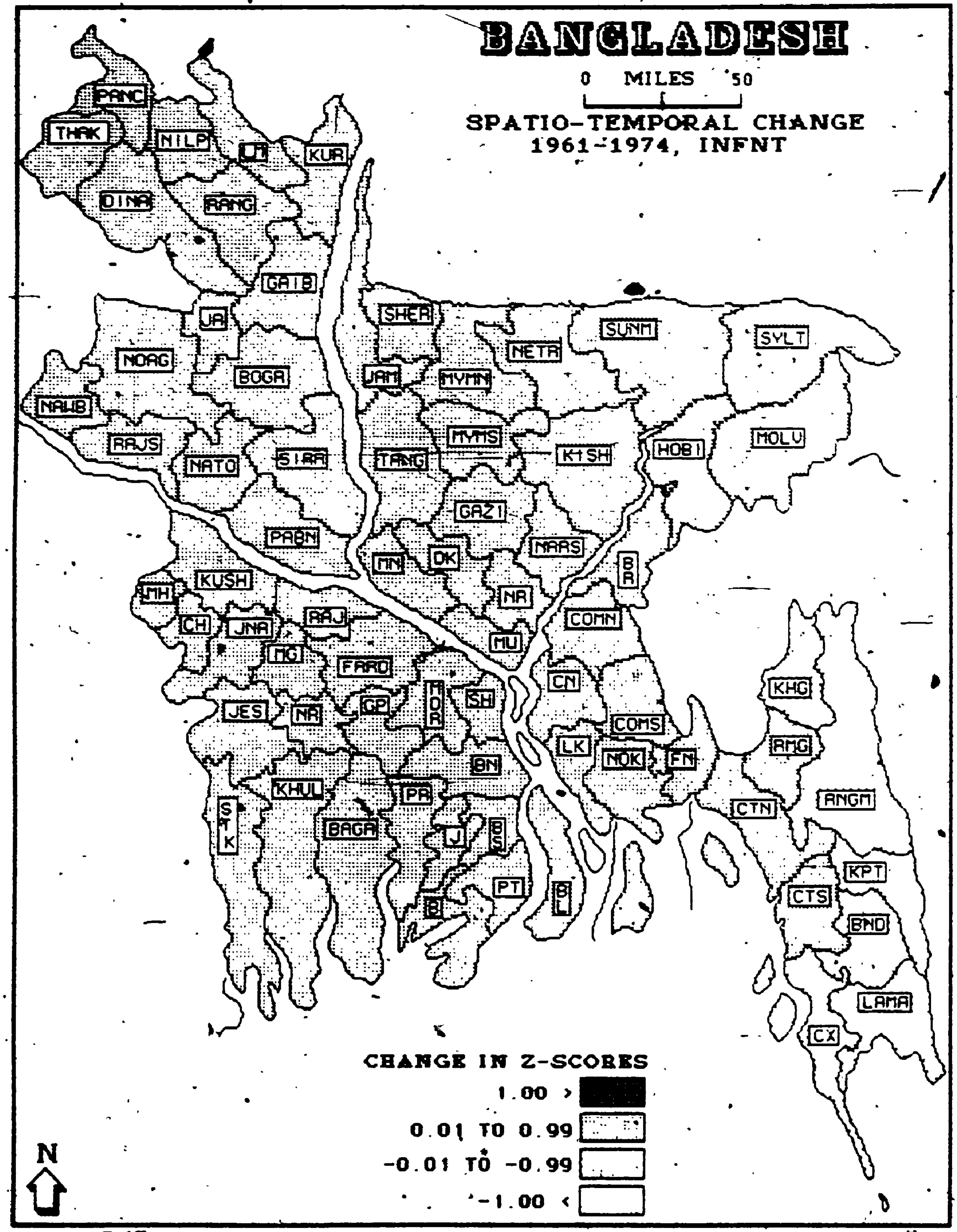

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, INFNT
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGA
NETR
JAM
MYMN
NAWB
RAJS
MYMS
NATO
SIRA
TANG
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
BR
KUSH
NR
MH
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
ANGM
STK
BAGA
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.13x

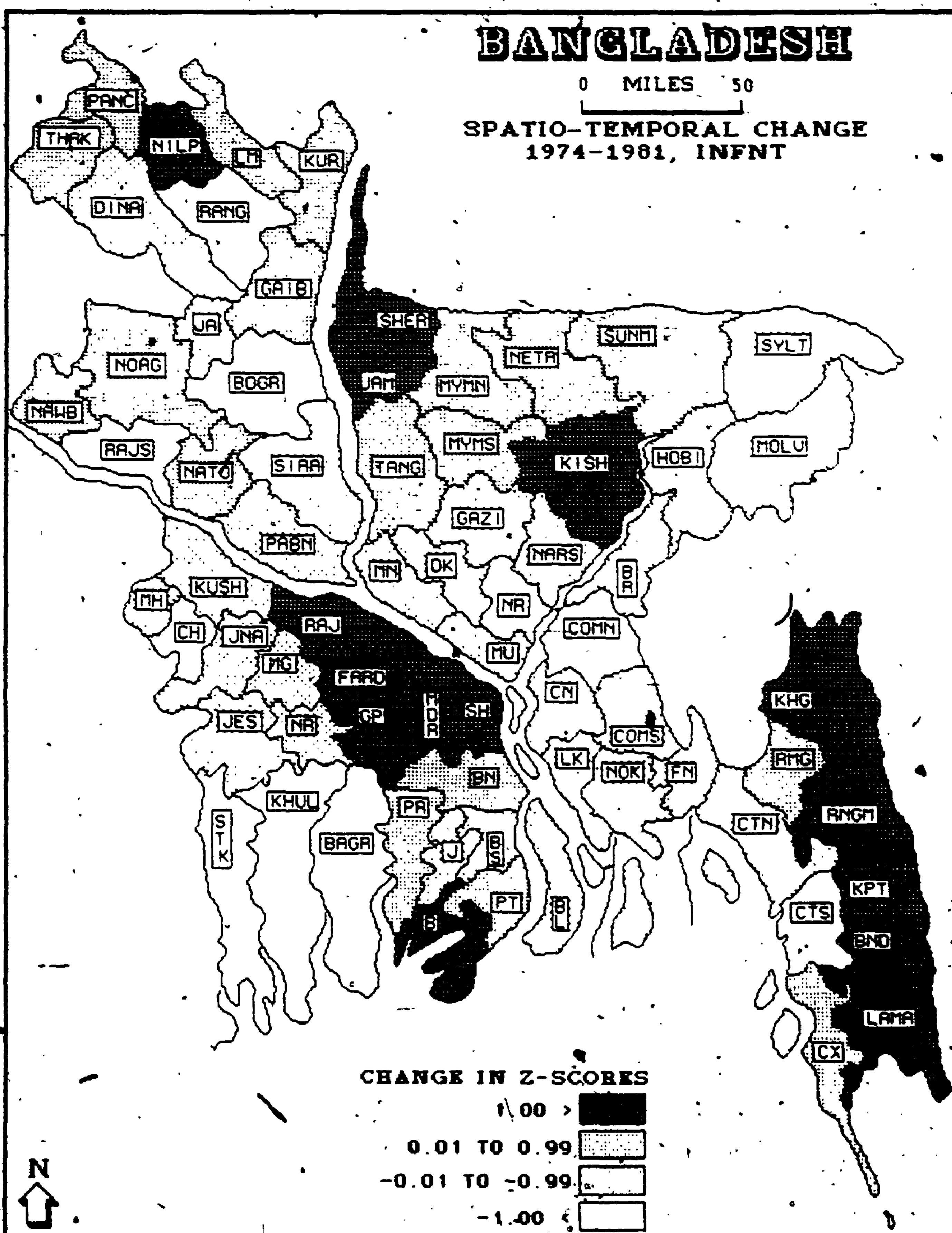

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, INFNT
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
MN
DK
NARS
BR
MH
KUSH
NR
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
PT
BL
KPT
CTS
B
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.13y

national plans of developing countries reflect the importance attached to education. The importance of education to social well-being operates in a number of different ways, including the improvement of earning capacity and all that goes with it, the bestowal of status and social mobility, and making known and available to individuals wider ranges of alternatives for the manner in which they arrange their lives. However, Third World countries are educationally backward compared to their developed counterparts. In Bangladesh, more than two-thirds of the population are illiterate. Student's attendance rate at schools is fairly low. A similar notion can be applied within the country context. There is an urban-rural distinction in access to post-secondary education.

Like health, the education dimension is also difficult to measure directly. Although there are many statistical series relating to expenditure inputs, there are very few on educational output. The initial range of variables collected within the Education Category included Per Capita Expenditure on General Education, Per Capita Expenditure on Primary Education, Per Capita Expenditure on Secondary Education, Per Capita Expenditure on Post Secondary Education, Total Number of Primary Schools, Total Number of Secondary Schools, Total Number of Colleges, Total Number of Students in Primary Schools, Total Number of Students in Secondary Schools, Total Number of Students in Colleges (from which percentage and average were calculated and indices constructed), Percentage of Students Attending Schools and Adult Literacy Rate. From this initial array, two variables namely Per Capita Expenditure on General Education (PEXED) and Adult Literacy Rate (LITER) were selected for detailed analysis. These are included partly as surrogates for achievement and partly on the assumption that exposure to education has societal benefits not necessarily reflected in the test performances. The quality of educational services should logically be measured by success in educating people; but the shortage of achievement indicators may justify the inclusion of level of service such as the teacher/student ratio. In this case, it is assumed that the teacher/student ratio is normally distributed across the country with the exception of Chittagong Hill-Tracts.

In the key areas of education there is some evidence of improvement. Per Capita Expenditure on Education (PEXED) is taken into consideration as a measure of quality and effectiveness of public instruction. It is anticipated that a higher per capita expenditure on education will bring higher return in the output. There has been a noticeable shift in the Per Capita Expenditure on Education over time. PEXED increased from 16 Taka in 1961 to 41.6 Taka in 1981- a total increase of 25.6 Taka on a per capita basis (Table 5.1).

Adult Literacy Rate (LITER) is chosen as the second most important variable which measures achivement in education. Increased expenditure on general education has resulted the increase in Adult Literacy Rate (LITER) which rose from 19 per cent in 1961 to about 29 per cent in 1981. An absolute change of about 10 per cent is thus quite significant over the years. However, there were very modest changes in the Average Number of Secondary Schools (AVSCH) per 50,000 Population, Students Attendence Rates in Schools (SATND) and Percentage of Students Attending Colleges (PCCST).

A moderate positive association within group is expected between AVSCH and PCSST (.53). Such association is also evident between PEXED and LITER (.52). However, PEXED and LITER are observed as more directly related variables within other categories including Per Capita Income, Non-Agricultural Occupations and Household Amenities. Average Number of Secondary Schools per 50,000 Population (AVSCH), Percentage of Students Attending Secondary Schools (PCSST), Colleges (PCCST) and Students Attendence Rates in Schools (including primary) are found to be independent of PEXED and LITER.

Educational Expenditure- Spatial and Temporal Change

Per Capita Expenditure on Education (PEXED) in 1961 (Figure 5.14a) depicts a pattern based on a national mean of 16 Taka, and an absolute range of from 14 to 18 by District. Relatively high scores are remarked along the major urban axis (Dhaka-Chittagong) and in the Chittagong Hill-Tracts. Relatively low values are found largely in the lower active delta, upper piedmont alluvial plain, depressed basin and southern part of North Bengal (Northern Division), extending from the Districts of Noagaon in the north to Pabna in the south (Figure 5.14a). These areas with relatively low scores are rather peripheral. The reason for higher initial Per Capita Expenditure on Education in the Chittagong Hill-Tracts was probably due to its sparse population distribution. However, low standard deviation suggests that inter-District variations are very minor.

Spatial patterns in 1974 (Figure 5.14b) depicted a broader change. The distribution of high scores were more scattered in 1974 compared to 1961. Relative improvement is noticed in most of the

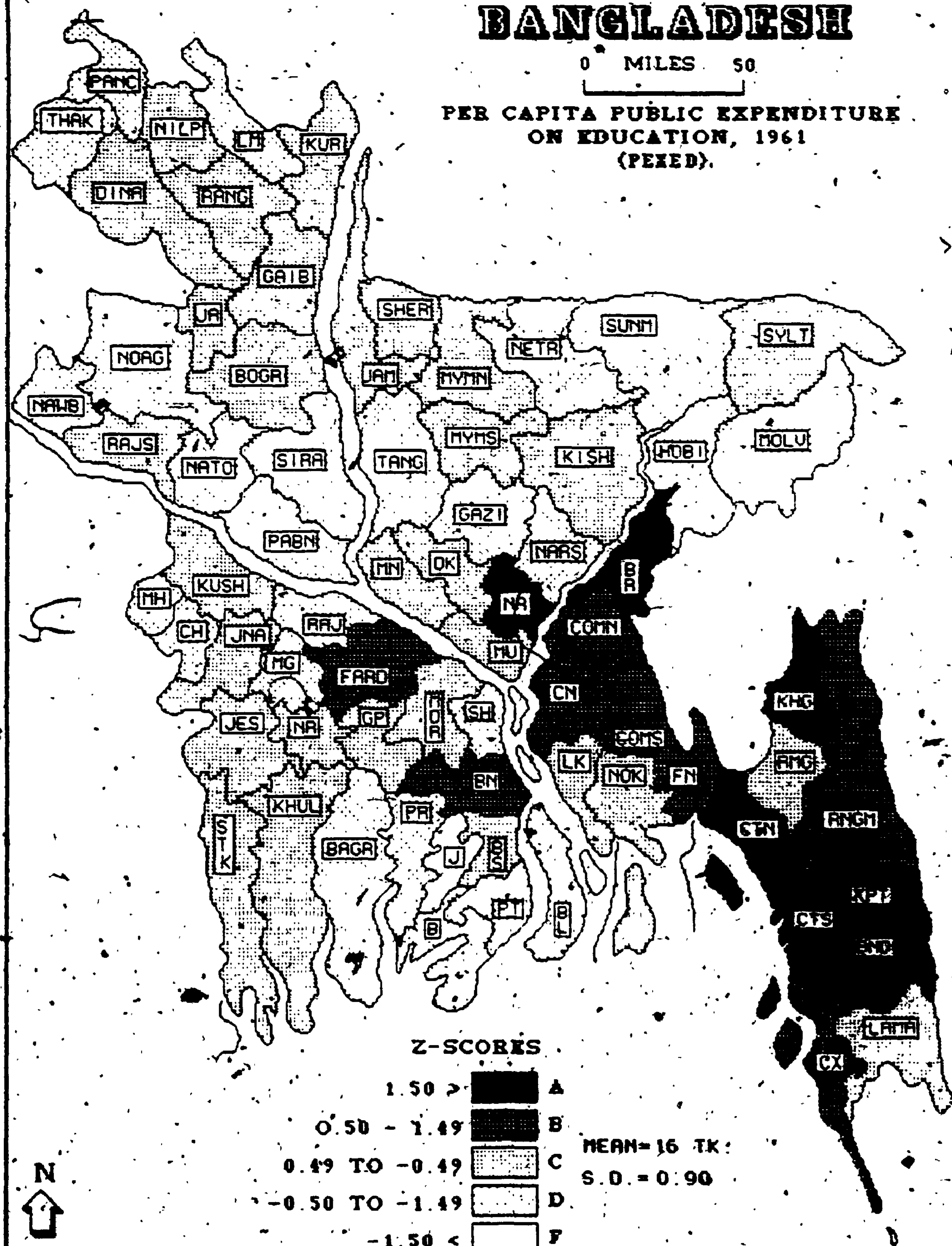

BANGLADESH
0 MILES 50
PER CAPITA PUBLIC EXPENDITURE
ON EDUCATION, 1961
(PEXED).
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
NOAG
NAWB
BOGR
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
KISH
HOBI
MOLU
TANG
GAZI
MN
DK
NARS
NA
BR
COMN
KUSH
MH
CH
JNA
RAJ
MG
FARD
MU
CN
MDR
SH
JES
NR
GP
KHG
COMS
LK
NOK
FN
RMG
KHUL
BN
PR
STK
BAGR
J
BL
PT
B
CTN
RNGM
CTS
CX
LAMA
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 16 TK
S.D. = 0.90
N

Figure 5.14a

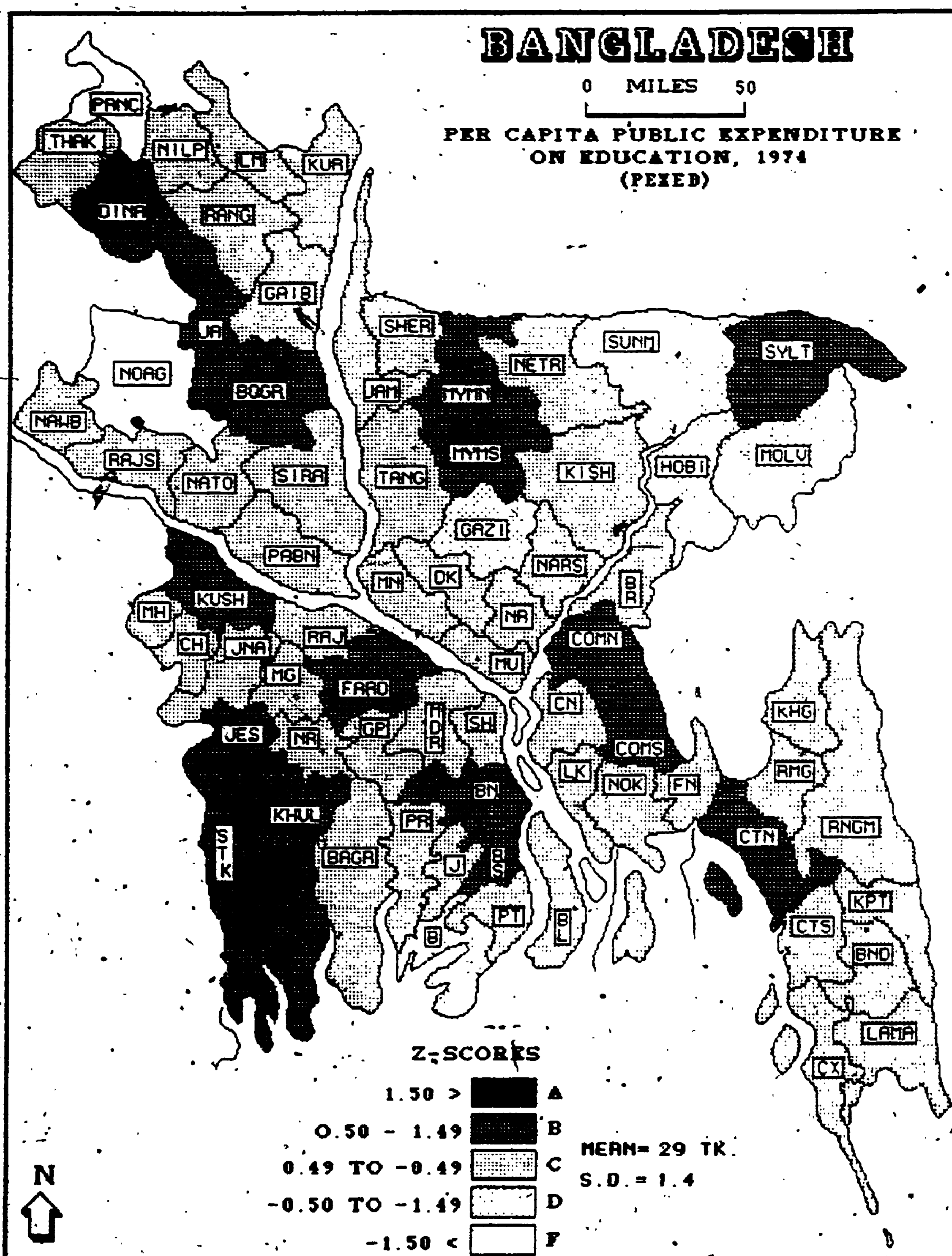

BANGLADESH
0 MILES 50
PER CAPITA PUBLIC EXPENDITURE ON EDUCATION, 1974 (PEXED)
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
SHER
SUNM
SYLT
NETR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
KUSH
MH
NA
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
JES
NR
GP
HDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
CTS
B
BL
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 29 TK
S.D. = 1.4
N

Figure 5.14b

Northern (except Panchagarh and Noagaon) and Southern (except Barguna) Districts. In the Central Division, there were evidences of both relative gain (e.g. Tangail, Narsingdi, Netrokona, Mymensingh north and south) and decline (e.g. Narayanganj). In the East, the Chittagong Hill-Tracts declined relatively including Chittagong south, Feni, Chandpur and Brahman Baria. On the other hand, the depressed basin area including the Districts of Hobiganj and Molvi Bazar remained relatively stable. (Figure 5.14b).

Spatial patterns of 1981 (Figure 5.14c) were even more diffused with respect to high Z values. Darker shades were associated with the initial District cores and a wide spread pattern is recognized along the moribund delta plain. The Chittagong Hill-Tracts, north-eastern hilly areas (including Sylhet, Molvi Bazar and Hobiganj Districts) and lower active delta plain were the regions of relative disadvantage as indicated by low scores (Figure 5.14c) The new absolute range in 1981 of from 40 to 44 Taka by District reflects the fact that there was less internal variation than in 1974.

Temporal changes between 1961 and 1974 (Figure 5.14x) indicate that the Eastern Division as a whole experienced a rate of change much below the national average compared to the Northern and Southern Divisions. Chittagong and Chittagong Hill-Tracts are the key areas reporting such negative changes (Figure 5.14x). Between 1974 and 1981 majority of rural Districts including the Chittagong Hill-Tracts and active delta grew at below the national mean rate. There is, therefore, a suggestion of increasing educational expenditure on a per capita basis in relatively urbanized Districts (Figure 5.14y).

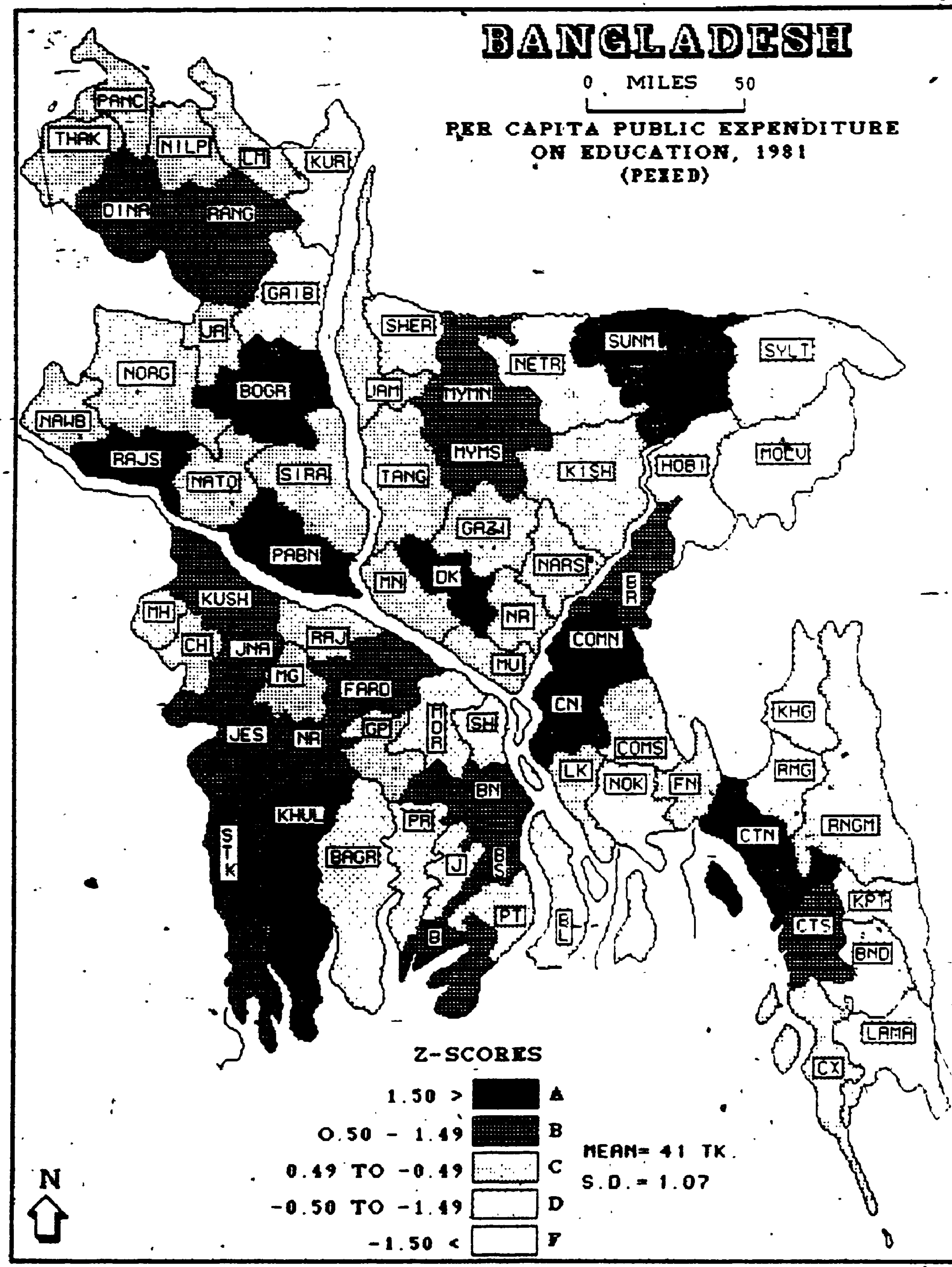

BANGLADESH
0 MILES 50
PER CAPITA PUBLIC EXPENDITURE
ON EDUCATION, 1981
(PEXED)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NORG
BOGR
NETR
JAM
MYMN
NAWB
RAJS
MYMS
KISH
HOBI
MOLV
NATO
SIRA
TANG
GAZI
PABN
MN
DK
NARS
BR
MH
KUSH
NR
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
EL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 41 TK
S.D.= 1.07
N

Figure 5.14c

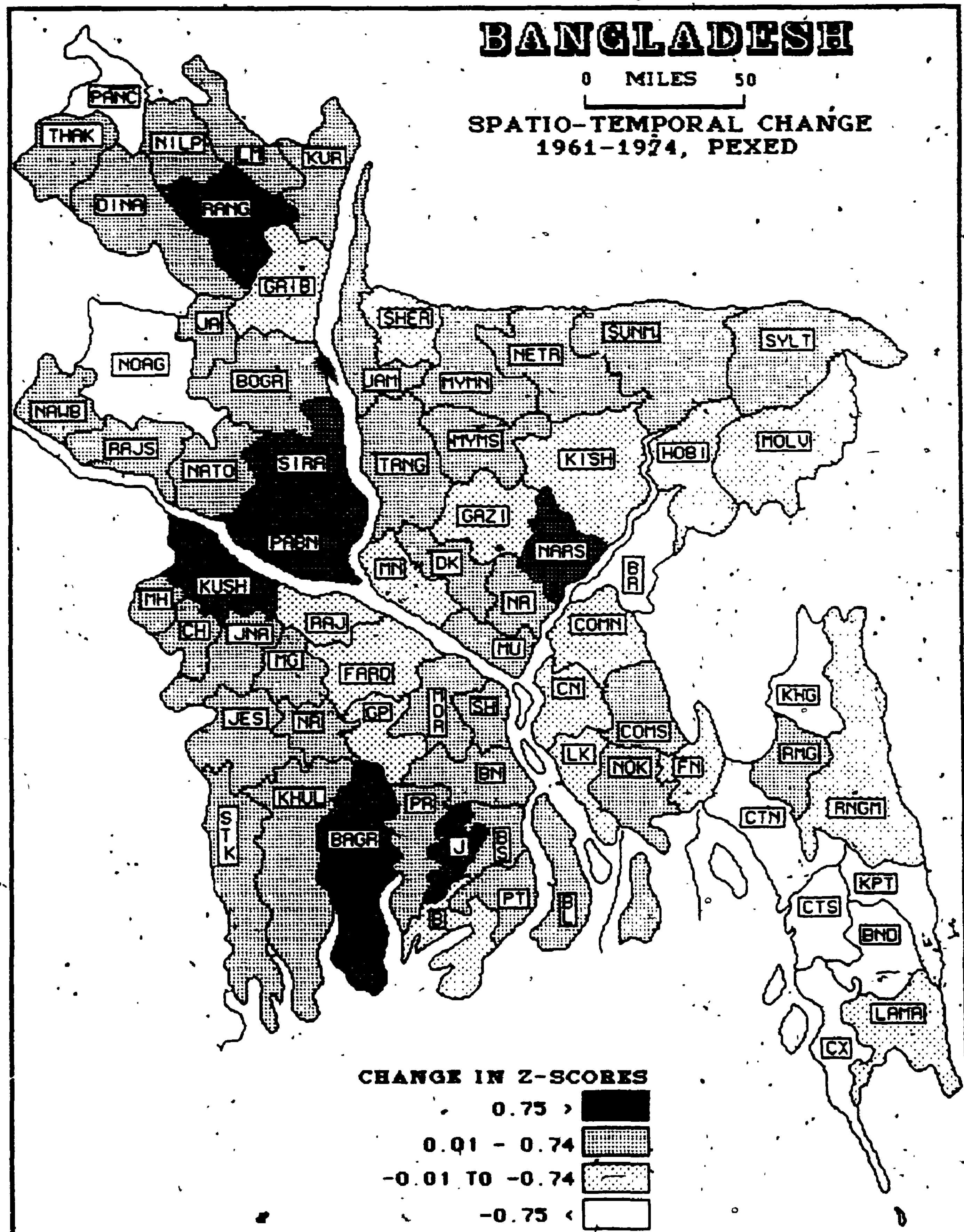

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, PEXED
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
NOAG
NAWB
BOGR
RAJS
NATO
SIRA
PABN
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NA
GP
MDR
SH
KHUL
STK
BAGR
PR
J
BS
BN
PT
B
BL
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
NA
MU
BA
COMN
CN
LK
COMS
NOK
FN
KHG
RMG
CTN
RNGM
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
0.75 >
0.01 - 0.74
-0.01 TO -0.74
-0.75 <

Figure 5.14x

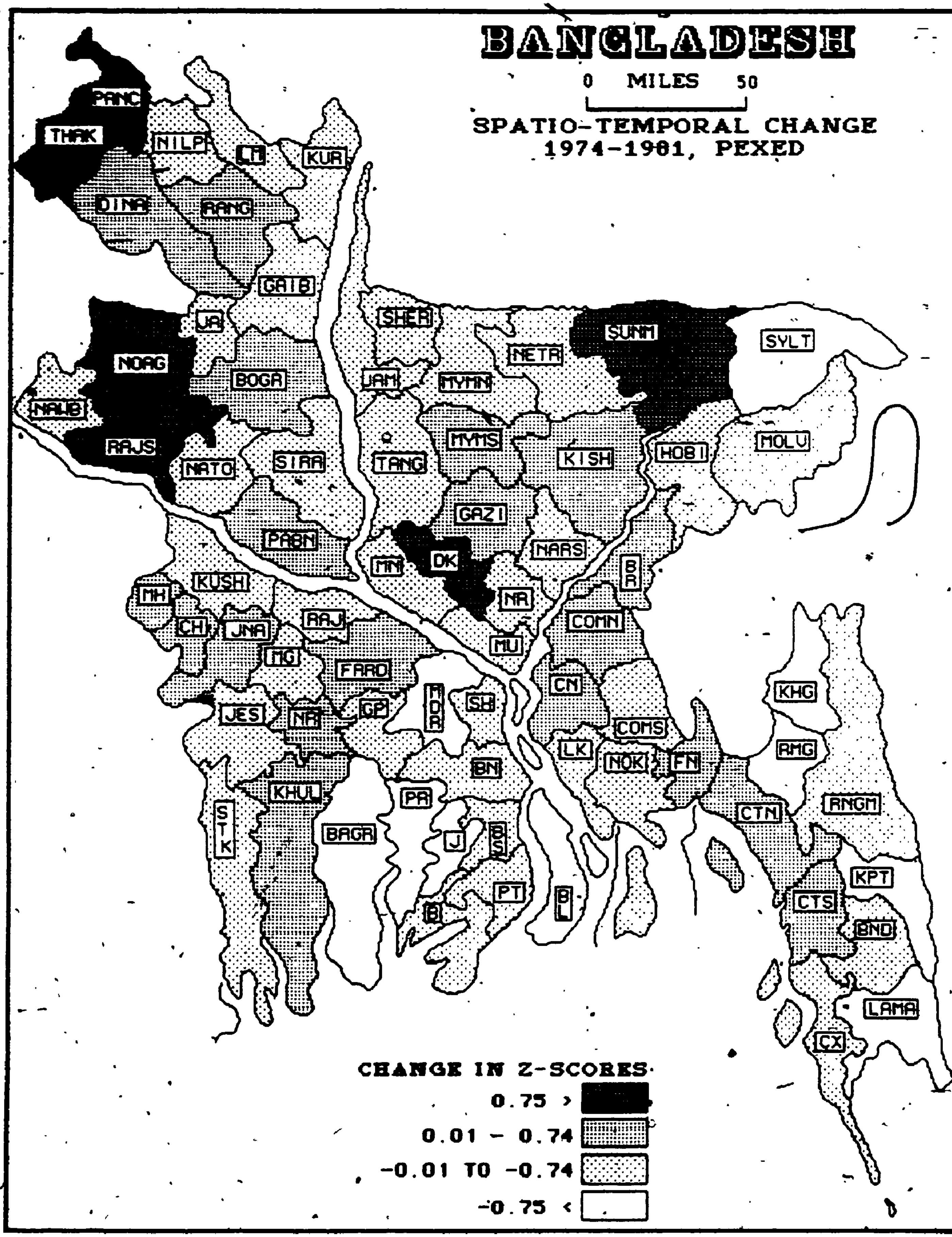

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, PEXED
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
SHER
SUNM
SYLT
NETR
BOGA
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
NARS
MN
DK
BR
NR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
PT
KPT
B
BL
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
0.75 >
0.01 - 0.74
-0.01 TO -0.74
-0.75 <

Figure 5.14y

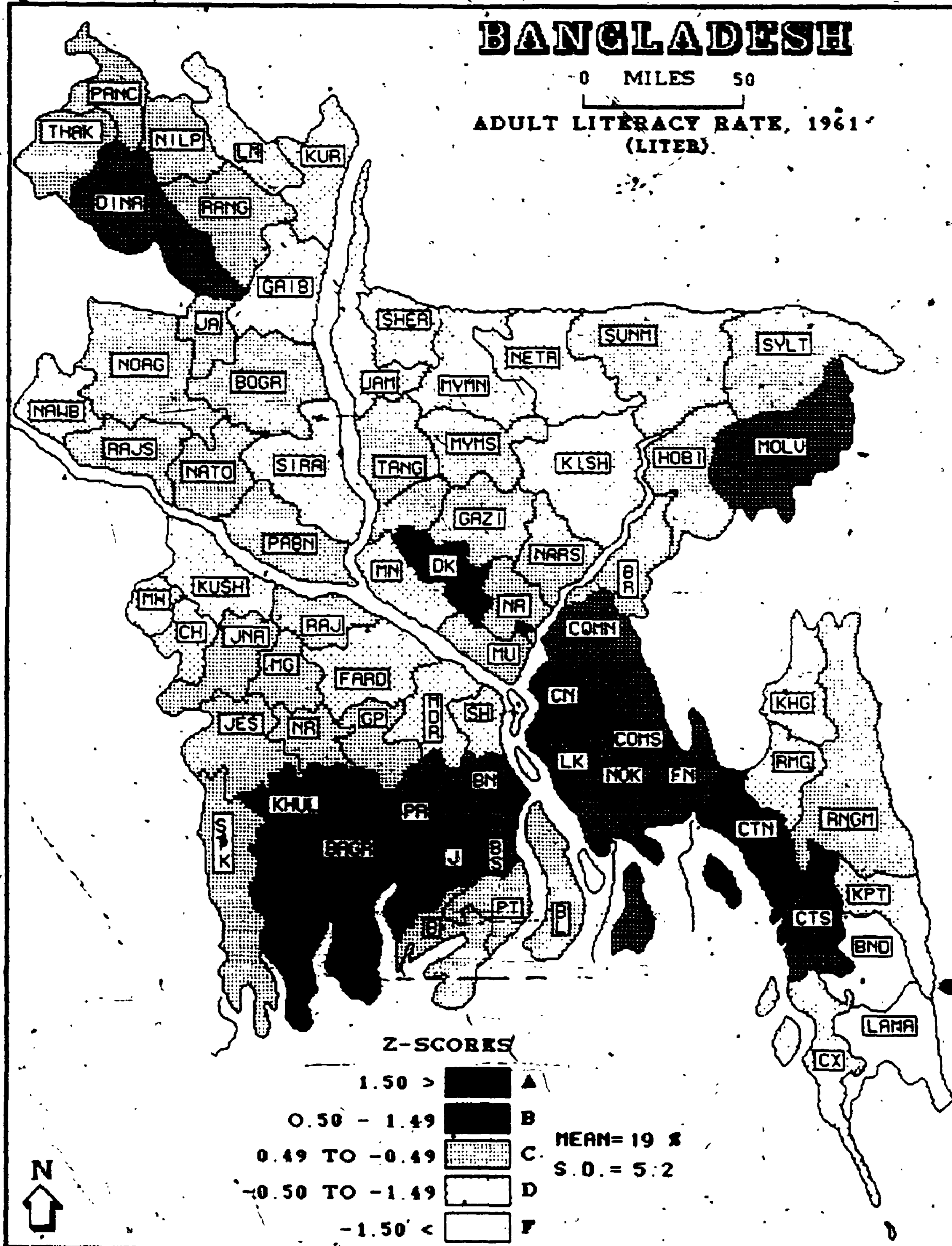

BANGLADESH
0 MILES 50
ADULT LITERACY RATE, 1961
(LITER)
PANC
THAK
NILP
LR
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
MOLV
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
GAZI
PABN
MN
DK
NARS
BR
KUSH
NR
MH
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
BAGH
J
BS
SK
PT
B
B
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 19 %
S.D. = 5.2
N

Figure 5.15a

Adult Literacy Rate- Spatial and Temporal Change

Adult Literacy Rate (LITER) in 1961 (Figure 5.15a) depicts a pattern based on a national mean of about 19 per cent, and an absolute range of from 6 to 33 by District. Relatively high scores are found along the major urban axis (Dhaka-Chittagong) and in the lower deltaic plain representing Khulna industrial belt. Relatively low values are prominent in the Chittagong Hill-Tracts, Brahmaputra flood plain and to some extent in the eastern piedmont alluvial plain (Figure 5.15a). The basic initial patterns did not change very much in 1974 (Figure 5.16a). The piedmont alluvial plain suffered from relative decline including Districts of Nilphamari and Rangpur. Similar decline in relative position of Districts are also evident in the Districts of Pabna and Comilla north. In the Southern Administrative Division, relative improvement are noticed in the Districts of Jessore, Narail and Gopalganj (Figure 5.15b). In 1981 (Figure 5.15c), few Districts along the major urban axis declined in relative importance (e.g. Comilla north and south, Lakshmipur and Noakhali). However, Districts around Dhaka namely, Manikganj, Munshiganj, Narayanganj, Narsingdi and Gazipur gained considerably in relative terms (Figure 5.15c). The new absolute range in 1981 of from 14 to 46 per cent reflects the fact that rates of increase varied considerably. These are indicated by District for the period 1961-1974 (Figure 5.15x) and for 1974-1981 (Figure 5.15y).

Between 1961 and 1974 increases in Adult Literacy Rates above the national mean value were experienced in the Chittagong Hill-Tracts and active delta plain. Between 1974 and 1981 changes above the national average are more remarked and wide spread. Most

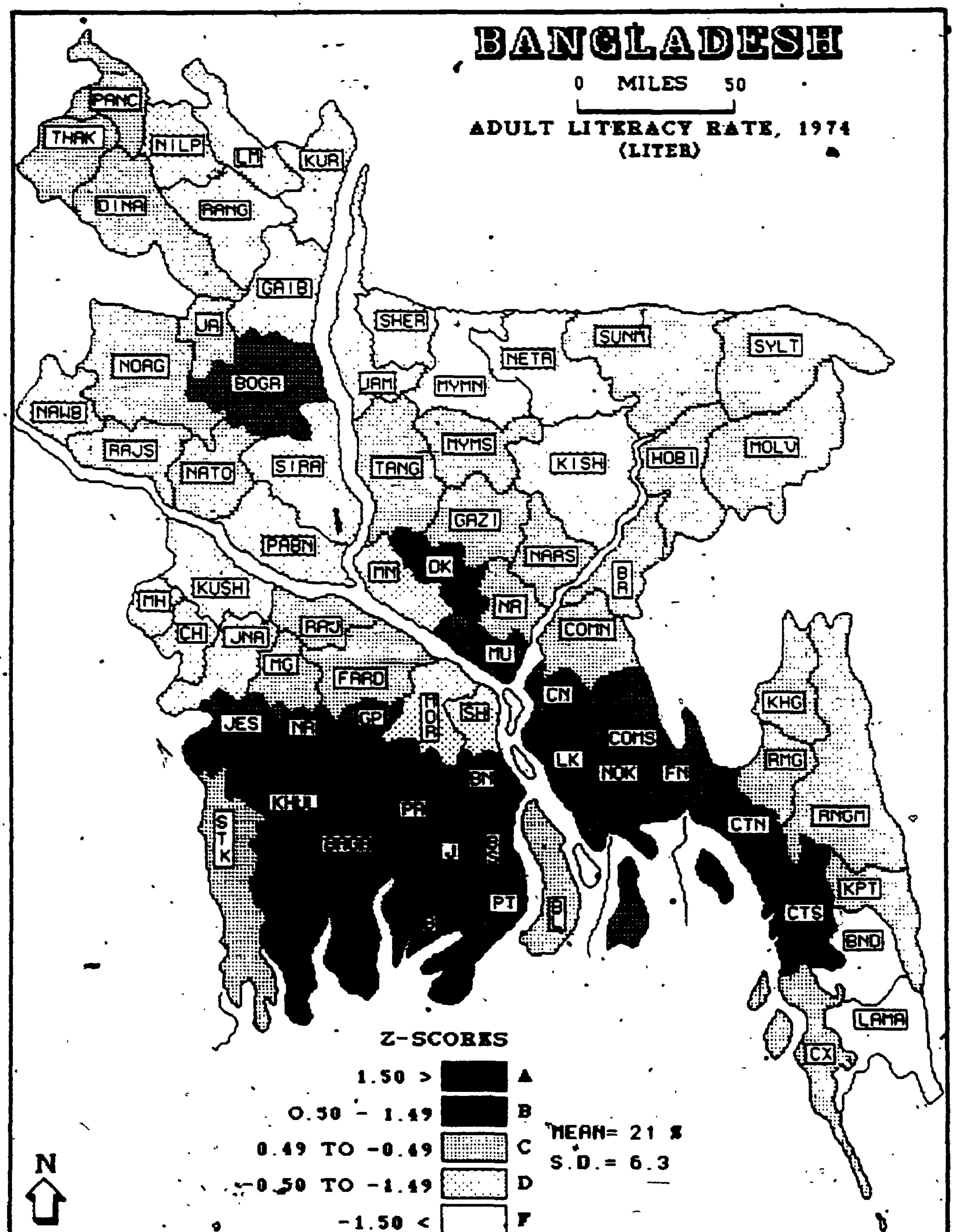

BANGLADESH
0 MILES 50
ADULT LITERACY RATE, 1974
(LITER)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGA
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
NETA
MYMN
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
NR
BR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
JES
NR
GP
SH
COMS
LK
NOK
FN
KHG
RMG
KHU
PR
BN
CTN
RNGM
STK
J
PT
BL
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 21 %
S.D.= 6.3
N

Figure 5.15b

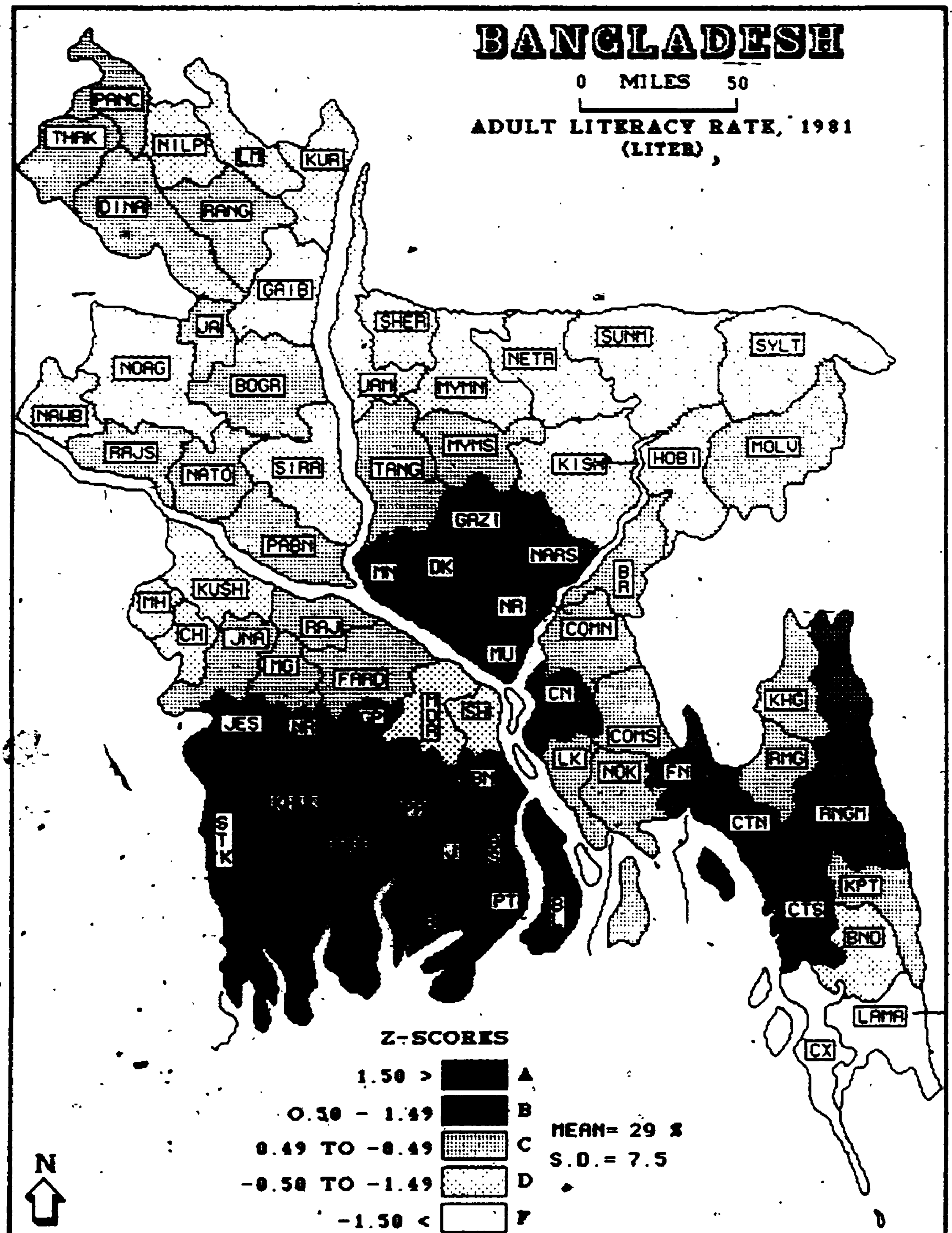

BANGLADESH
0 MILES 50
ADULT LITERACY RATE, 1981
(LITER)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NORG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
NR
MU
KUSH
MH
CH
JNA
RAJ
MG
FARD
COMN
CN
JES
COMS
LK
NOK
FN
KHG
RMG
CTN
RNGM
STK
PT
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 29 %
S.D.= 7.5
N

Figure 5.15c

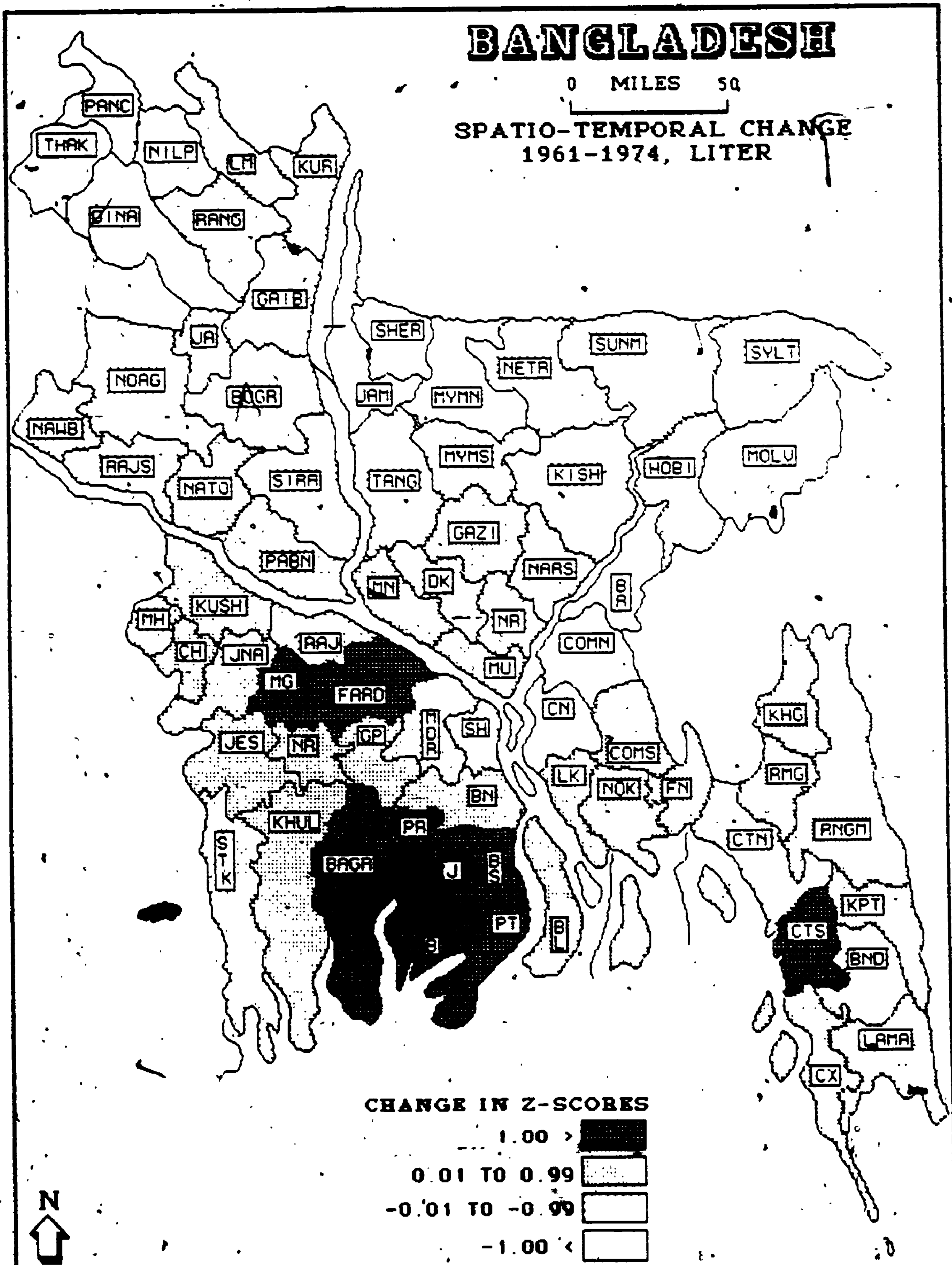

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, LITER
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETA
NOAG
BOGR
JAM
MYMN
NAWB
MYMS
HOBI
MOLV
RAJS
NATO
SIRA
TANG
KISH
GAZI
PABN
NARS
MN
DK
BA
KUSH
NA
MH
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
SH
JES
NR
GP
MDR
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGA
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.15x

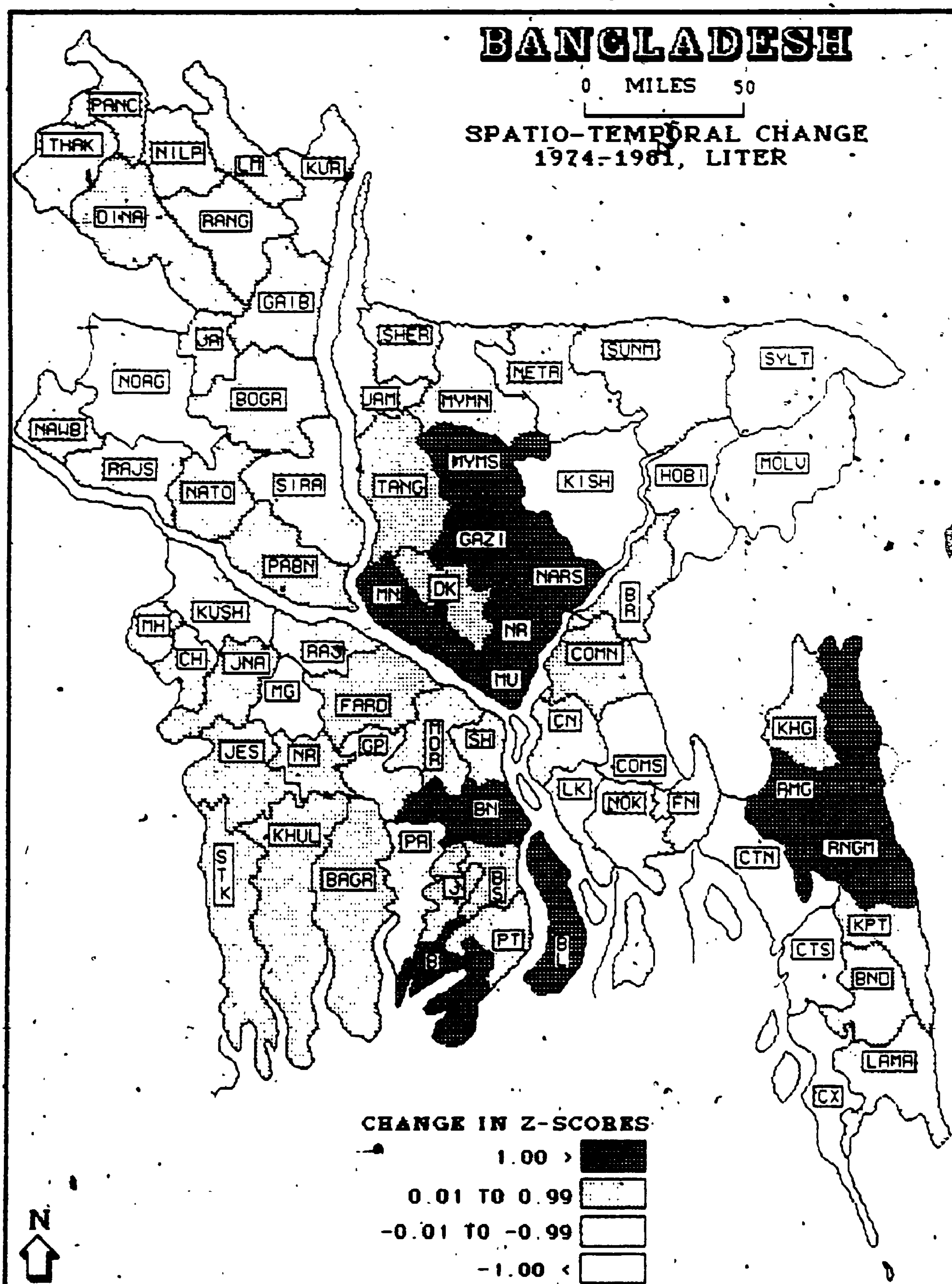

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, LITER
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NAOG
NETR
BOGR
JAM
MYMN
NAWB
MYMS
RAJS
NATO
SIRA
TANG
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
BR
KUSH
MH
NR
CH
JNA
RAJ
COMN
MG
MU
FARD
CN
KHG
JES
NR
GP
MOR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
CTS
B
BL
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.15y

significant changes had taken place in the Central Division, particularly in areas around Dhaka District. In the Eastern Division, a relatively high rate of increase is evident in the Chittagong Hill Tracts, and in the Southern Division- the lower active delta

Central Service Variables

Availability of central services to dispersed population is a goal of most governments in developing countries. Equality in the access of central service per unit population rates as a key indicator in social well-being. For example, banks and post offices cannot be seen as private consumer goods. These are scarce services in LDCs and provision has to be made in conjunction with demand factors.

The initial range of variables collected within the Central Service Category included Total Number of Commercial Banks, Total Number of Post Offices and Total Number of Telephone/Telegraph Offices (from which average number per 50,000 population was calculated). From this initial array, Average Number of Banks per 50,000 Population (AVBNK) was selected for detailed analysis as a key indicator of central services to diospersed population. This is viewed as an important variable to measure the extent of credit facilities. Other variables like Average Number of Post Offices and Public Telephone/Telegraph Offices per unit population are excluded from the analysis. A normal distribution is assumed for the post office. On the other hand, the telephone system is viewed as a rare service and not generally in use by the rural masses.

There is an evidence of improvement in the Average Number of Banks (AVBNK) per 50,000 population (Table 5.1). AVBNK per unit population increased from 0.9 in 1961 to 2.6 in 1981, and as such a total increase of 1.7 over the years. This is, however, a modest change compared to the population growth rate. Although the provision of banks has increased in actual numbers, the pressure of population growth has partially eroded the rate of growth in provision of this service.

A moderately positive association is noticed between AVBNK and variables in the Household Amenity group, including an aspect of tertiary sector employment, namely MANGR (Table 5.2). The direct relationships between AVBNK and other groups are evident as DBATH (.59), TOILT (.56), HYDRO (.56), RADIO (.54) and MANGR (.51). On the other hand, the only negative association occurs with BIRTH (-.52). This patterns of association suggests that the availability of banks per unit population is relatively high in urbanized areas and low in peripheral regions where high Birth Rates are more prominent.

Distribution of Banks- spatial and Temporal Change

Average Number of Banks per 50,000 Population (AVBNK) in 1961 (Figure 5.16a) depicts a pattern based on a national mean of about 0.91, and an absolute range of from 0.1 to 5 by District. Concentration of relatively low scores is found mainly in the Northern Division (particularly in rural Districts) and in the Southern Division (specifically in the active delta plain). Relatively high Z values are observed in a few urbanized Districts (i.e. Dhaka, Narayanganj, Khulna, Comilla, Barisal, Sylhet) including the Chittagong Hill-Tracts probably because of sparse population distribution. In 1974 (Figure 5.16b) the distribution of AVBNK depicts a pattern based on a nationl mean of 1.5 per 50,000 population.

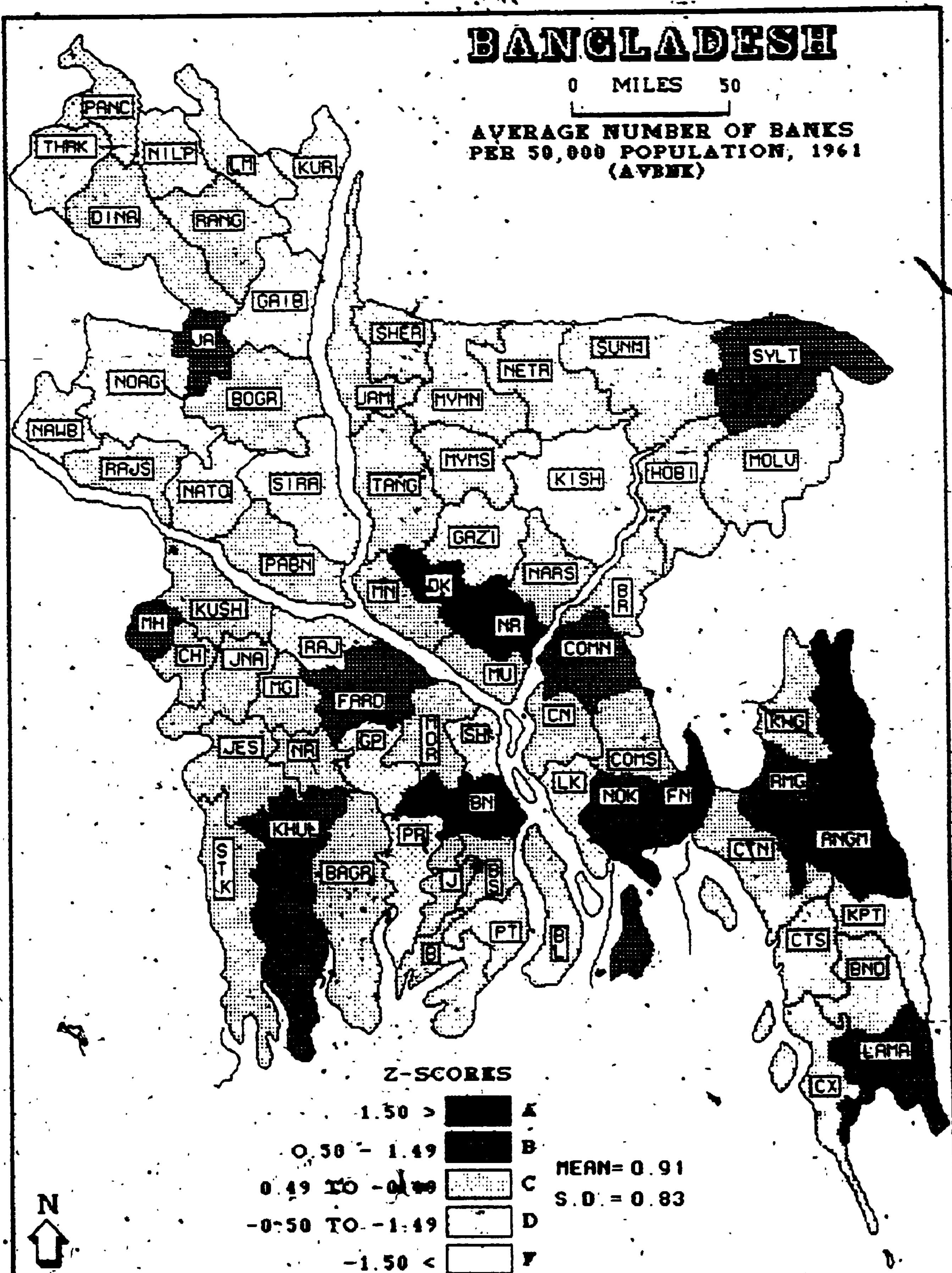

BANGLADESH
0 MILES 50
AVERAGE NUMBER OF BANKS
PER 50,000 POPULATION, 1961
(AVBNK)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NAOG
BOGR
JAM
MYMN
NETR
NAWB
MYMS
KISH
HOBI
MOLV
RAJS
NATO
SIRA
TANG
GAZI
PABN
MN
DK
NARS
BR
MH
KUSH
NR
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
JES
NA
GP
MDR
SH
KHG
COMS
LK
NOK
FN
RMG
KHUL
BN
STK
BAGR
PR
CTN
ANGM
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 0.91
S.D = 0.83
N

Figure 5.16a

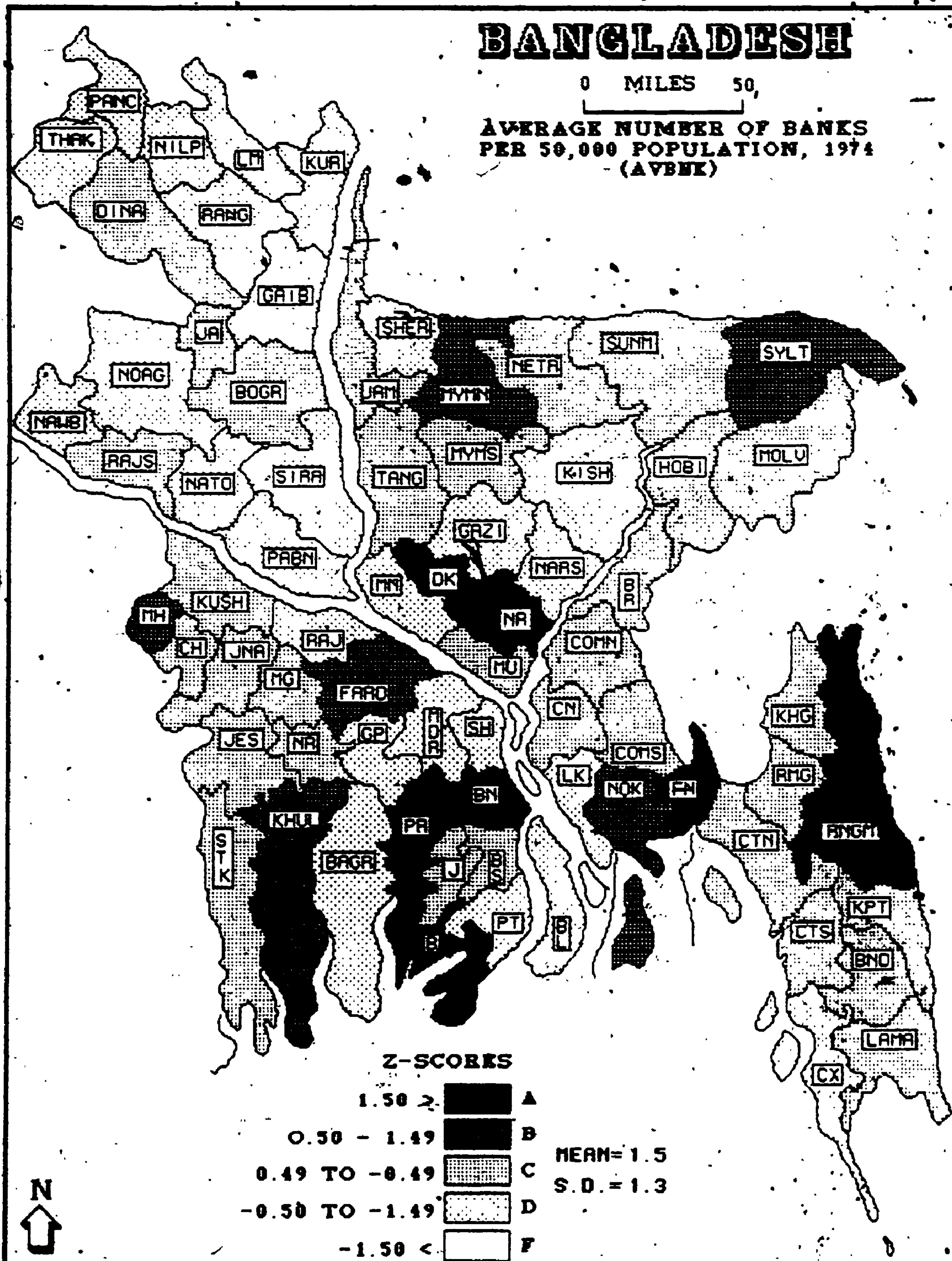

BANGLADESH
0 MILES 50
AVERAGE NUMBER OF BANKS
PER 50,000 POPULATION, 1974
(AVBNK)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
MYMS
RAJS
NATO
SIRA
TANG
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
NA
KUSH
MH
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NA
GP
SH
COMS
LK
NOK
FN
RMG
BN
KHU
PR
CTN
RNGM
STK
BAGR
J
BS
PT
KPT
CTS
BNO
LAMA
CX
Z-SCORES
1.50 ≥ A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 1.5
S.D.= 1.3
N

Figure 5.16b

Relatively low values persisted especially in the Northern Division and the active delta plain, with the exception of Barisal, Pirojpur and Barguna, where the incidence of Z values are the highest. In the Central Division, Districts around Dhaka namely Manikganj and Munshiganj experienced a relative decline compared to 1961 situatation but generally high scores persisted in districts where they existed in the base year However, the relative spatial patterns of AVBNK in 1981 (Figure 5.16c) is quite interesting Relatively high Z values were associated mostly with the initial District cores and low scores were prominent in the rural Districts

Between 1961 and 1974 (Figure 5 16x) increases in AVBNK are noticed in Narayanganj District and active delta plain most significantly. Low level changes are recorded mainly in the Northern Division, part of active and moribund delta in the Southern Division, Dhaka and adjacent Districts including Netrokona and Kishoreganj in the Central Division and including southern Chittagong Hill-Tracts The absolute change map between 1974 and 1981 (Figure 5 16y) indicates that initial District cores were the areas of gain at a rate above the national average, and rural districts were the areas of relative stress recording scores below the national mean

Agricultural Variables

Agriculture is the backbone of developing economies providing the largest share of the gross domestic product (GDP) However, the gap between town and country continues to widen in terms of incomes and service provisions and the agricultural sector in many LDCs is suffering from economic stagnation, and failing to produce sufficient food grains to meet the growing needs of rural masses In-

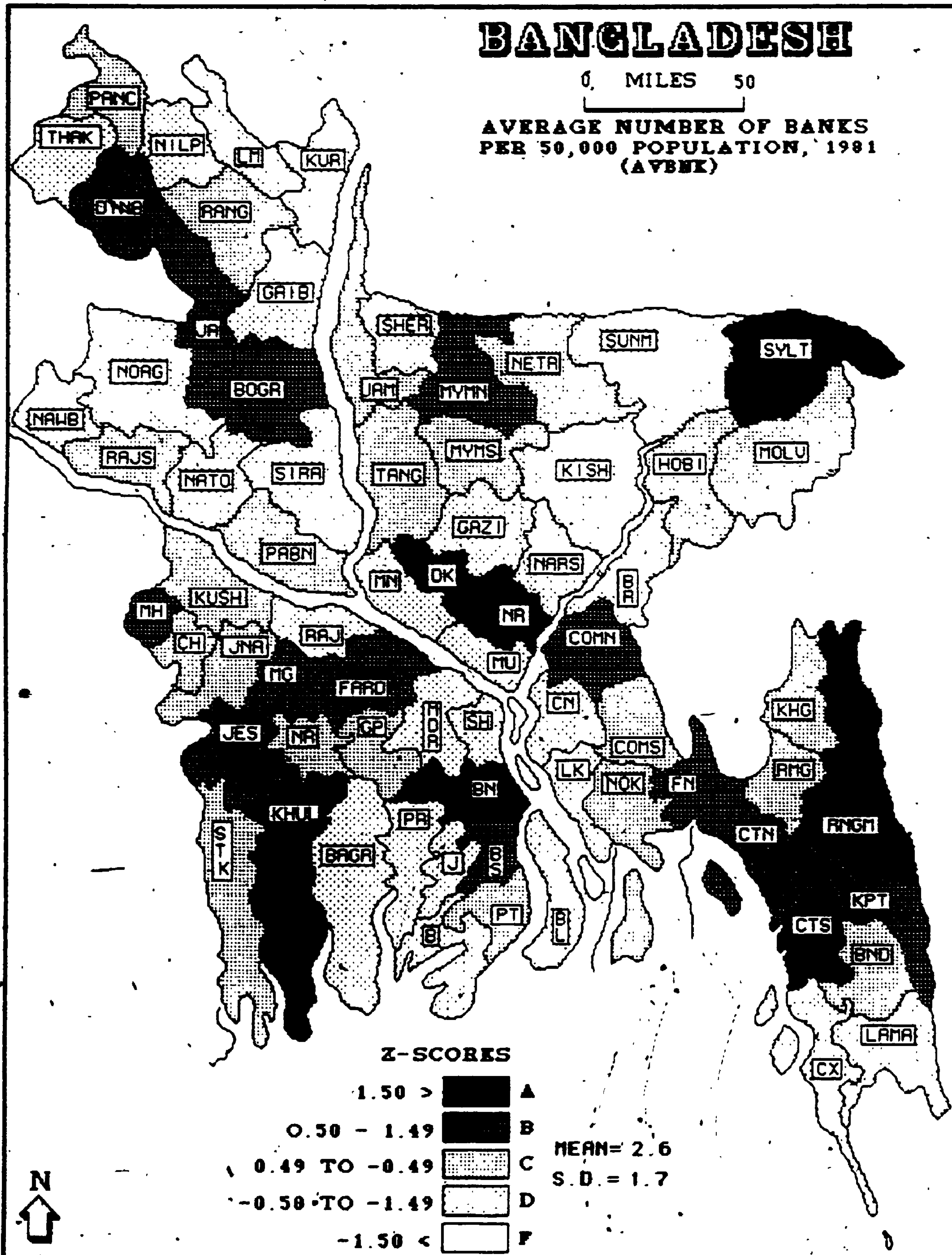

BANGLADESH
0 MILES 50
AVERAGE NUMBER OF BANKS
PER 50,000 POPULATION, 1981
(AVBNK)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
NETR
SUNM
SYLT
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
MN
DK
NARS
BR
MH
KUSH
NR
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 2.6
S.D.= 1.7
N

Figure 5.16c

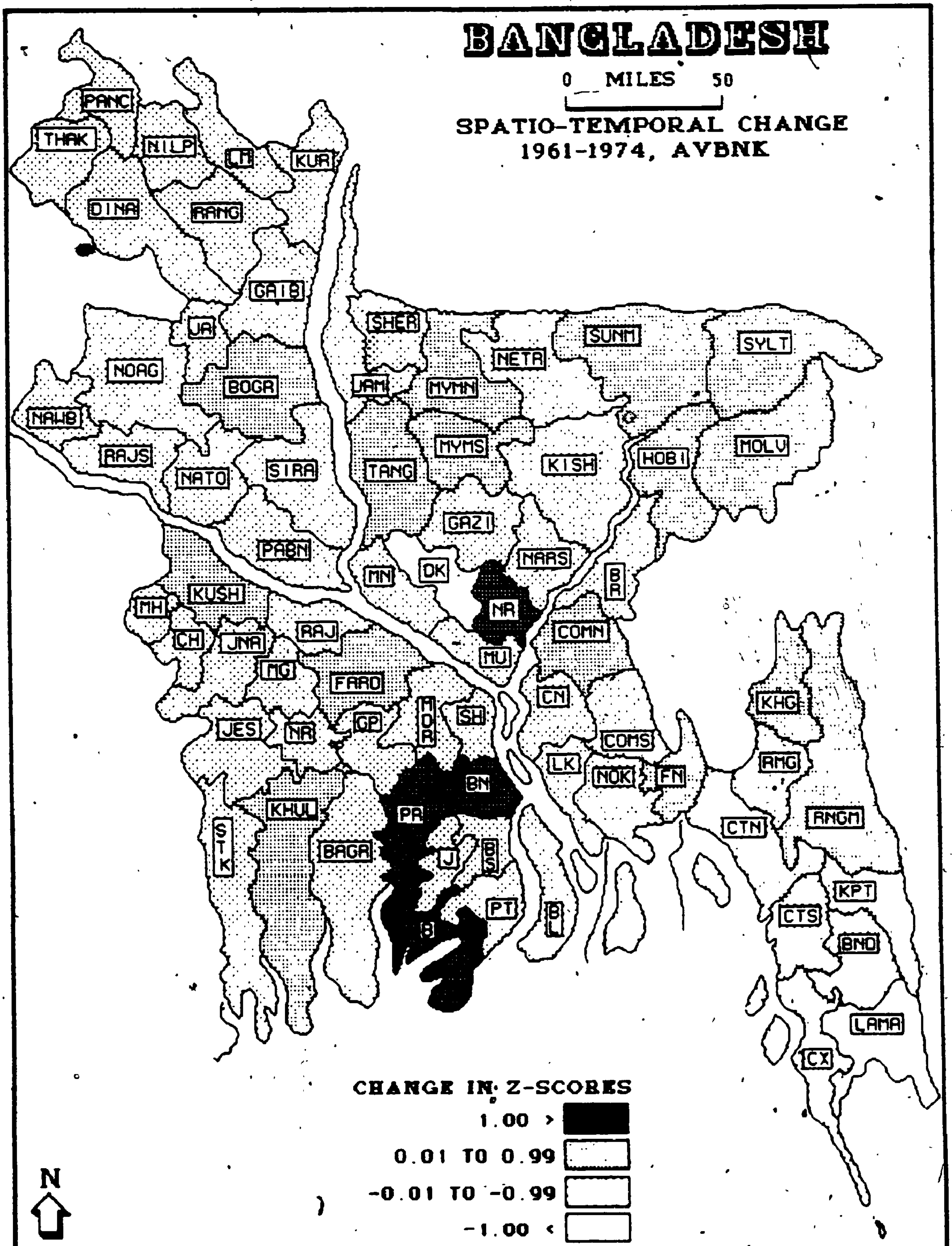

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, AVBNK
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
UR
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
NR
BR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
JES
NR
GP
MDR
SH
KHG
COMS
LK
NOK
FN
RMG
BN
PR
KHUL
STK
BAGR
J
BS
CTN
RNGM
PT
BL
B
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.16x

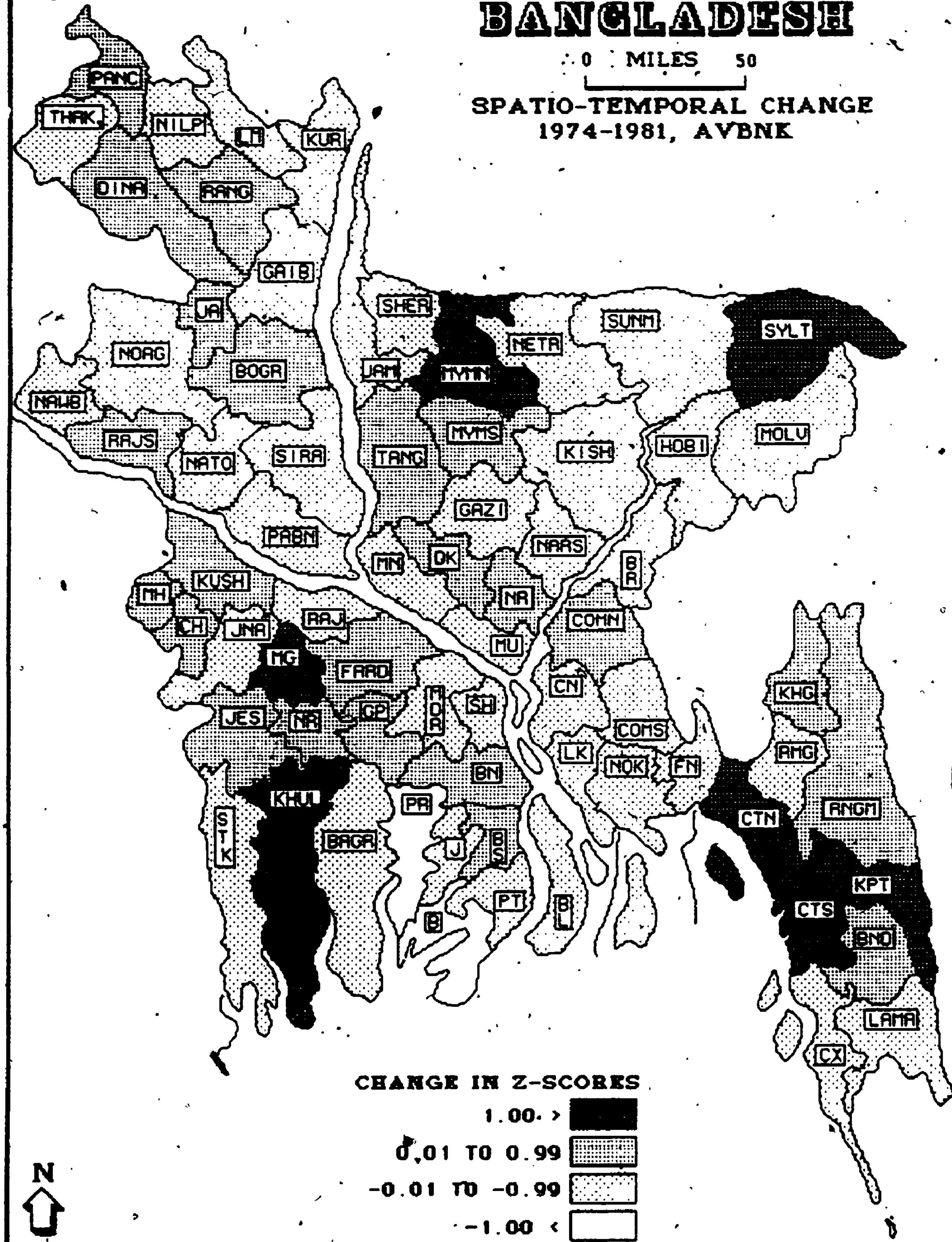

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, AVBNK
PANC
THAK
NILP
LT
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
MYMS
HOBI
MOLV
KISH
NATO
SIRA
TANG
GAZI
PABN
NARS
MN
DK
BR
KUSH
NR
MH
RAJ
COMM
CH
JNA
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.16y

recognition of the predominance of agricultural sector national plans have recently paid greater attention to the rural sector in an attempt to redress the balance of earlier plans which centralized more on industrialization and urbanization.

The initial range of variables collected for this study within the Agricultural Category included Total Agricultural Land Size, Average Farm Size (FRMSZ), Per Capita Agricultural Land (PALND), Percentage of Irrigated Area (PIRIG), Percentage of Double Cropping Area, Percentage of Multiple Cropping Area (PMULT), Average Rice Yield (RICEY), Average Sugarcane Yield, Average Cold Storage Capacity, Per Capita Value Added from Agriculture From this initial array, three, namely Average Farm Size (FRMSZ), Percentage of Irrigated land (PIRIG) and Average Rice Yield (RICEY) were selected for detailed analysis. The use of commercial fertilizer was not collected as it is implicit in the productivity figures.

Average Farm Size (FRMSZ) is an indicator of relative farm prosperity It is assumed that Districts with large farm size are agriculturally more affluent than those where the average sizes are relatively small. It is important to note that the average farm size in Bangladesh has changed a very little over time Within the rural countryside there is still evidence of extreme pressure on limited resources, so ~~that~~ although the Percentage of Irrigated Areas (PIRIG) and Multiple Cropped Areas (PMULT) have risen by 5 4 and 15 6 per cent, respectively, Per Capita Availability of Agricultural Land (ALAND) has fallen and the Average Farm Size (FRMSZ) and Rice Yield (RICEY) have stagnated (Table 5 1)

Within group relationships are quite significant only between FRMSZ and ALAND. These two variables are strongly and positively correlated with each other (.99), and identify a common underlying regularity in the data set. Other variables are rather independent in nature. For example, a weak relationship is evident between PIRIG and other groups. It is observed that PIRIG is very moderately associated with MANGR (.48) SERVE (.45) and HYDRO (.43) suggesting that relatively affluent areas are more likely to have the irrigation facilities. On the other hand, positive association of RICEY with Students Attendence Rate (SATND .68) is very much a product of statistical similarity.

Average Farm Size- Spatial and Temporal Change

Average Farm Size (FRMSZ) in 1961 (Figure 5.17a) depicts a pattern based on a national mean of 2.5 acres and an absolute range of from 0.5 to 6 acres by District. The incidence of larger farms is found scattered across the country representing rural-peripheral Districts (e.g. Panchagarh, Takurgaon, Kurigram, Nwabganj, Natore, Barguna, Patuakhali, Bandarban, Khagrachari, Molvi Bazar and Sunamganj). Relatively low z values are found mainly in the Central Division and along the major urban axis, including Ramgarh, Kapti and Lama Districts in the Chittagong Hill-Tracts. The distribution of Average Farm Size for 1974 (Figure 5.17b) and 1981 (Figure 5.17c) remains a consistent one with slight modifications. With respect to relatively high Z values, the Northern and Southern Divisions are the most favoured regions compared to Central and Eastern Divisions. Further, the incidence of relatively low Z values is concentrated in the Central and Eastern Divisions, particularly along the major urban

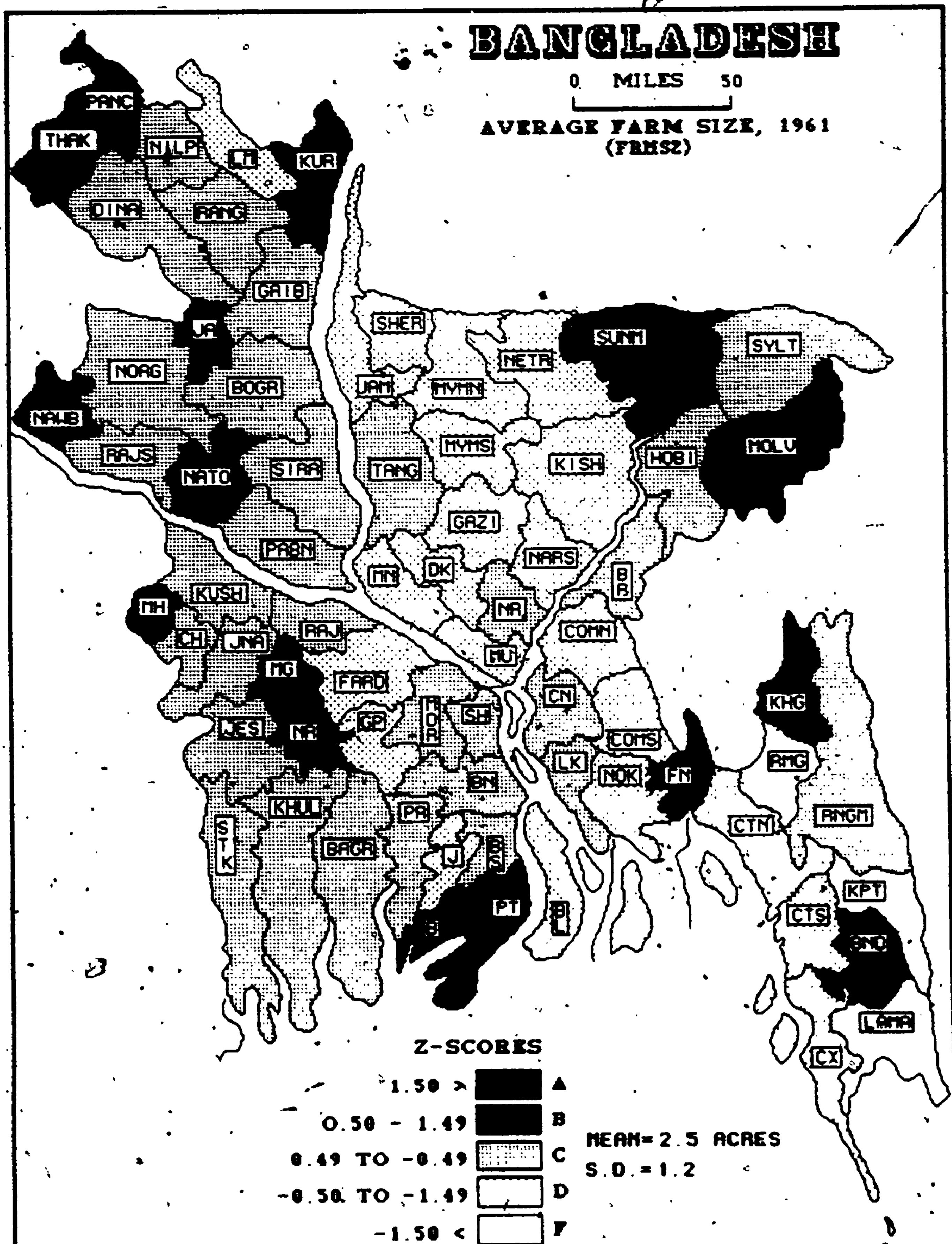

BANGLADESH
0 MILES 50
AVERAGE FARM SIZE, 1961
(FRMSZ)
PANC
THAK
NILPH
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
KISH
HOBI
MOLV
TANG
GAZI
NARS
DK
BR
NA
COMN
MU
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NR
GP
SH
CN
COMS
KHG
LK
NOK
FN
RMG
KHUL
PR
BN
CTN
RNGM
STK
BAGR
J
BS
PT
KPT
CTS
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 2.5 ACRES
S.D.= 1.2

Figure 5.17a

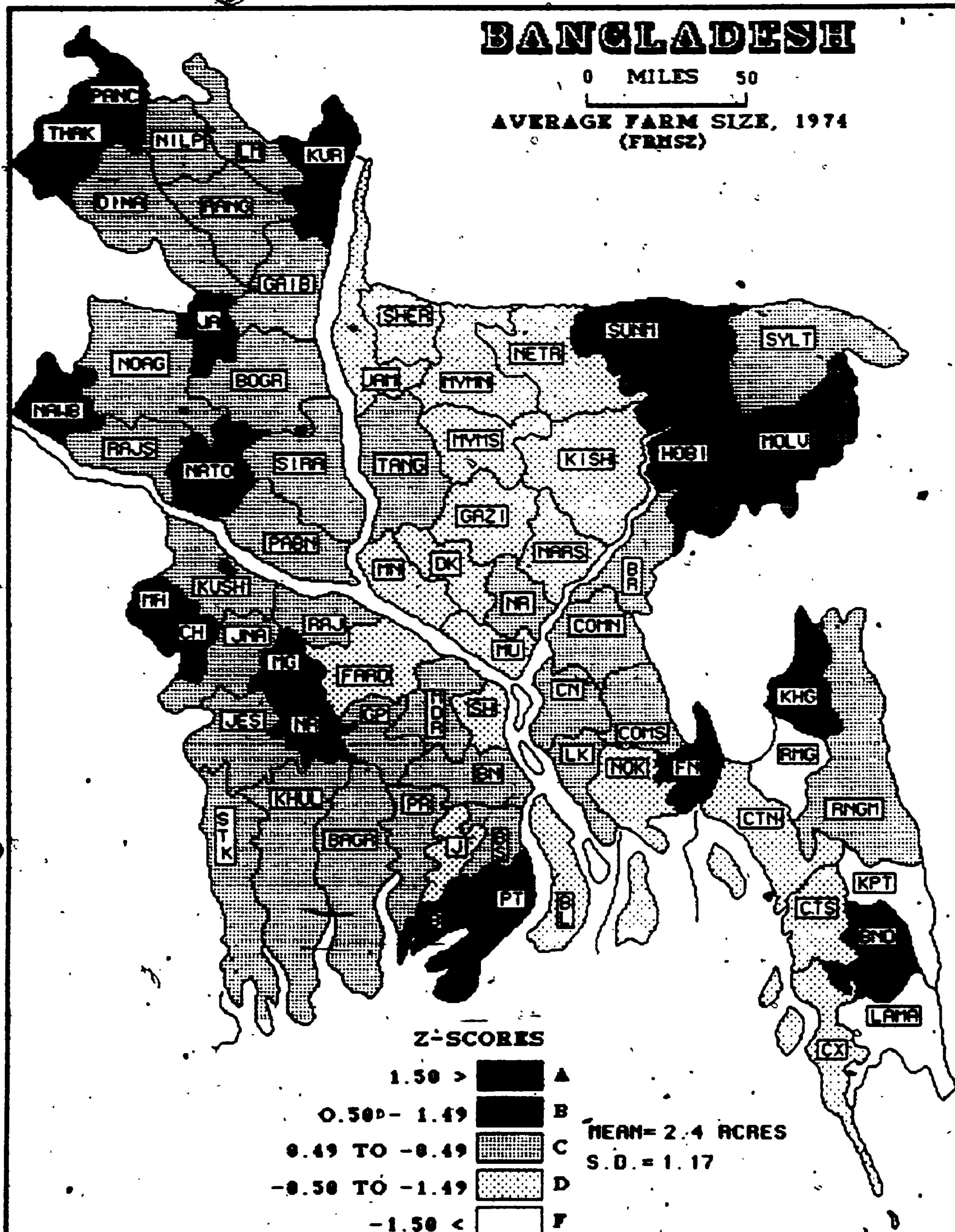

BANGLADESH
0 MILES 50
AVERAGE FARM SIZE, 1974
(FRMSZ)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
SHER
SUNM
SYLT
JR
NORG
NETR
BOGR
JAM
MYMN
NAWB
RAJS
MYMS
HOBI
MOLV
NATO
SIRA
TANG
KISH
GAZI
PABN
NARS
MN
DK
BR
KUSH
MA
NA
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
GP
SH
COMS
LK
NOK
FN
RMG
KHUL
PR
CTN
RNGM
STK
BAGR
J
PT
BL
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 2.4 ACRES
S.D.= 1.17

Figure 5.17b

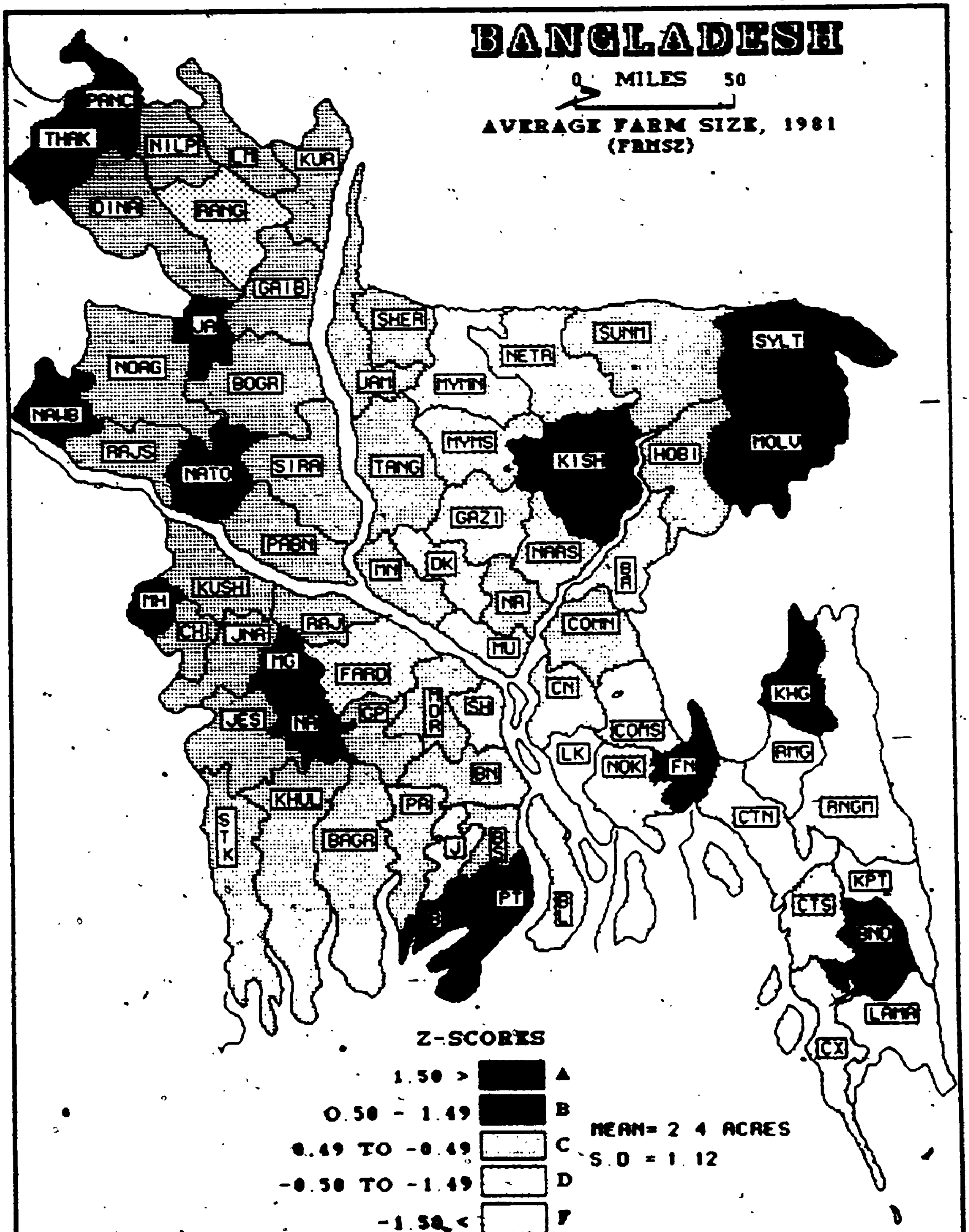

BANGLADESH
0 MILES 50
AVERAGE FARM SIZE, 1981
(FRMSZ)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
NAWB
BOGR
RAJS
NATO
SIRA
PABN
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NR
GP
MDR
SH
KHUL
STK
BAGR
PR
BN
J
PT
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
MN
DK
NARS
NA
MU
BR
COMN
CN
COMS
LK
NOK
FN
KHG
RMG
CTN
RNGM
KPT
CTS
BNO
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 2 4 ACRES
S.D = 1.12

Figure 5.17c

axis. This is the prominent jute belt of Bangladesh representing higher agricultural population density.

Between 1961 and 1974 (Figure 5.17x) an insignificant decline in Average Farm Size is remarked (from about 2.5 to 2.4 acre) Relatively low scores indicate a decline in FRMSZ below the national mean Concentration of low values are observed in the Northern Division, moribund delta in the Southern Division, the eastern Jamuna flood plain in the Central Division and the Chittagong Hill-Tracts in the Eastern Division Between 1974 and 1981 (Figure 5.17y) the major urban axis experienced a negative change along with few other pockets in the upper moribund delta, piedmont alluvial plain depressed basin and the northern Chittagong Hill-Tarcts Rest of the country recorded a change above the national mean.

Rice Yield- Spatial and Temporal Change

Average Rice Yield (RICEY) in 1961 (Figure 5.18a) depicts a pattern based on a national mean of about .4 ton per acre, and an absolute range of from .3 to .7 tons by District Relatively high Z values are pronounced in the Eastern and Northern Divisions. This is probably because of the good soil, increased used of fertilizer, organic content and the shifting cultivation method in the Chittagong Hill-Tracts. Relatively low Z values are remarked in the Southern Division (except Khulna) which is presently in a volatile position because of relatively inferior soil, low lying active deltaic land and a southern saline zone This broad initial pattern remained relatively stable in 1974 with minor exceptions (Figure 5.18b) In 1981 (Figure 5.18c), relatively high Z values are found in the Central Division representing Dhaka, Narayanganj, Narsingdi, Kishoreganj and

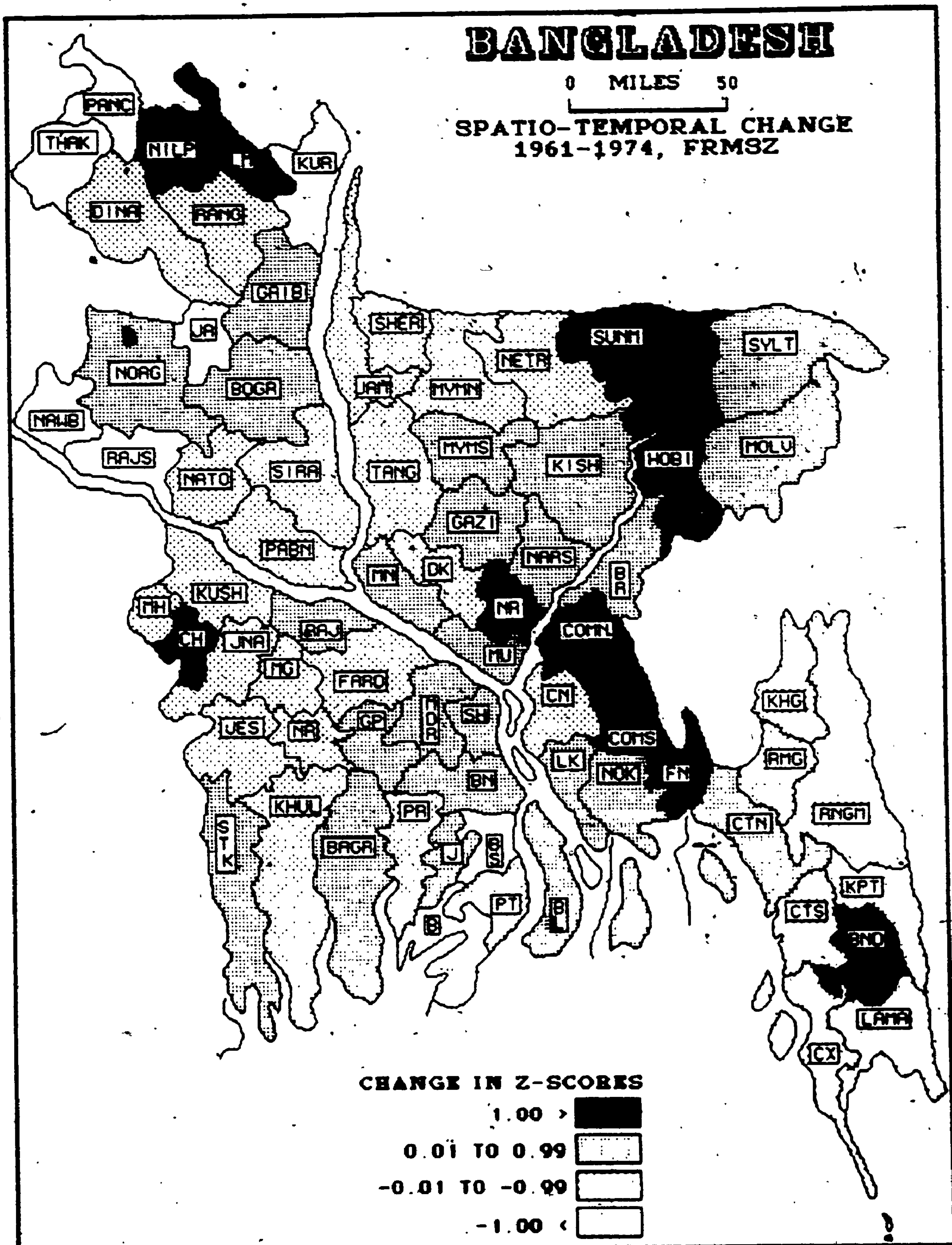

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, FRMSZ
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NAOG
BOGA
NETR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
NA
KUSH
MH
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
KHUL
BN
PR
CTN
RNGM
STK
BAGR
J
BS
PT
BL
B
KPT
CTS
BNO
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <

Figure 5.17x

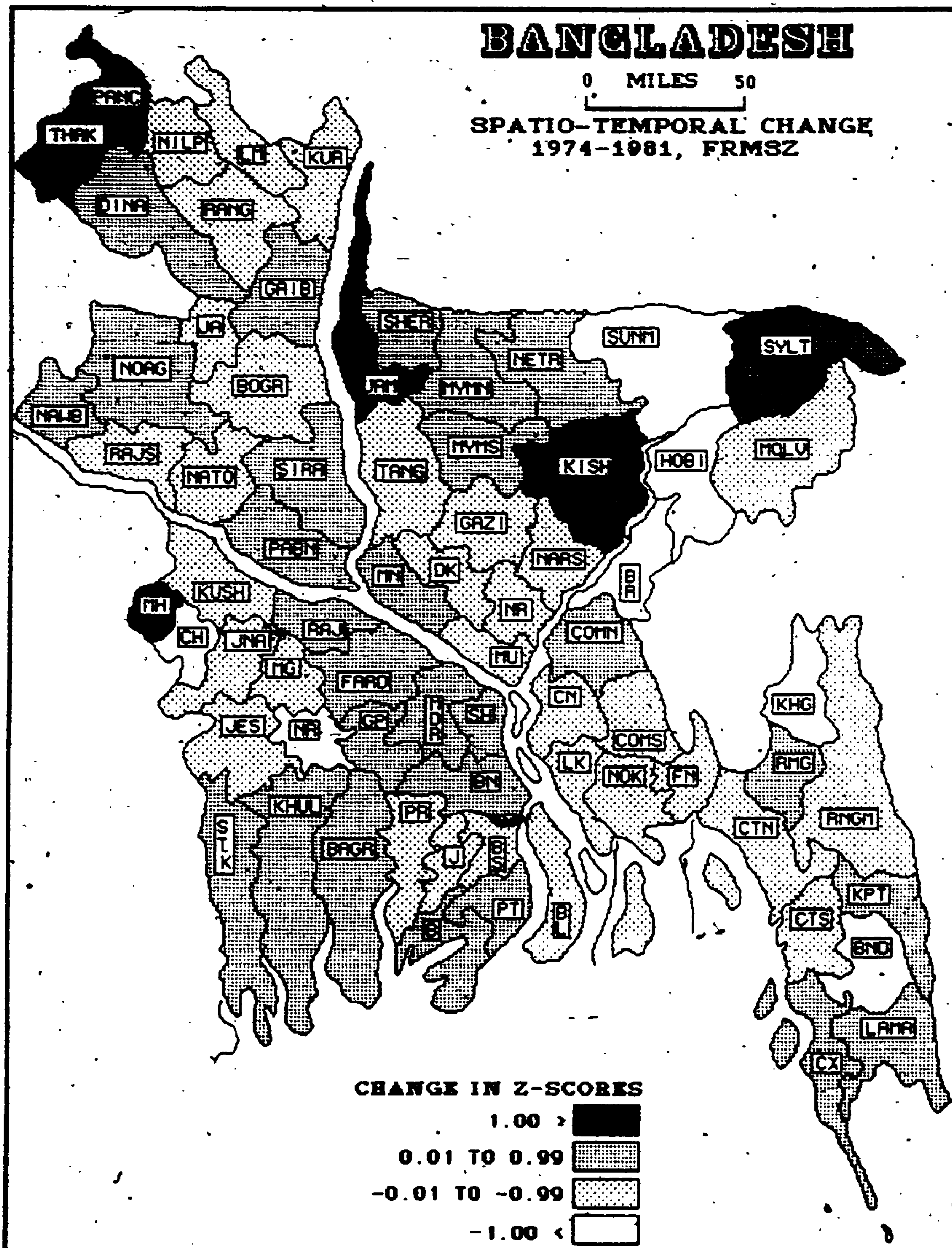

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, FRMSZ
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
NETR
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
KUSH
MH
NR
CH
JNA
RAJ
COMN
MU
MG
FARO
CN
KHG
JES
NR
GP
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
PT
KPT
CTS
BNDI
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <

Figure 5.17y

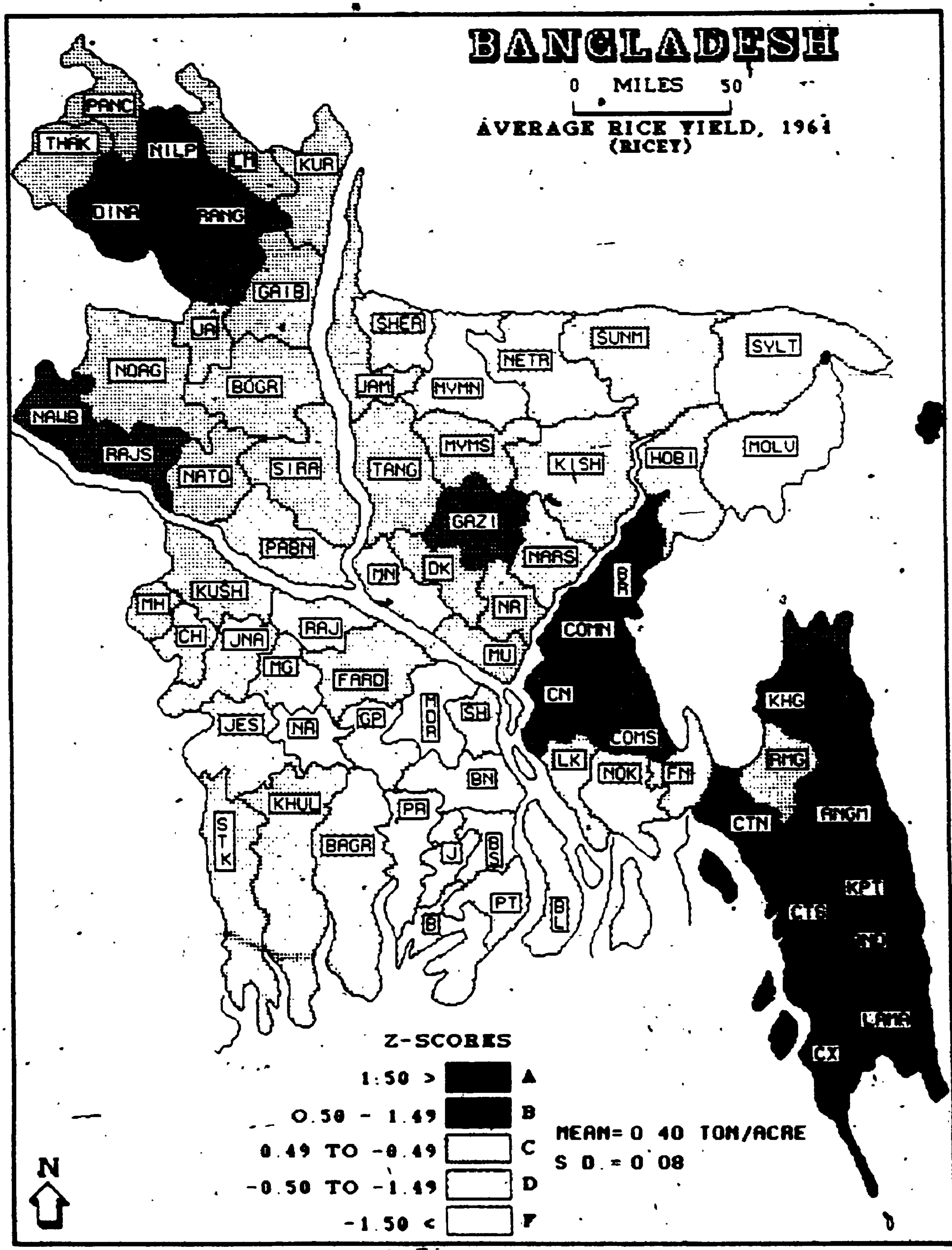

BANGLADESH
0 MILES 50
AVERAGE RICE YIELD, 1964
(RICEY)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
TANG
MYMS
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
NR
MU
BR
COMN
CN
COMS
LK
NOK
FN
KUSH
MH
CH
JNA
RAJ
MG
FARD
MDR
SH
JES
NR
GP
BN
KHUL
STK
BAGR
PR
J
BS
PT
B
BL
KHG
RMG
CTN
ANGM
KPT
CTG
BNA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 0 40 TON/ACRE
S D = 0 08
N

Figure 5.18a

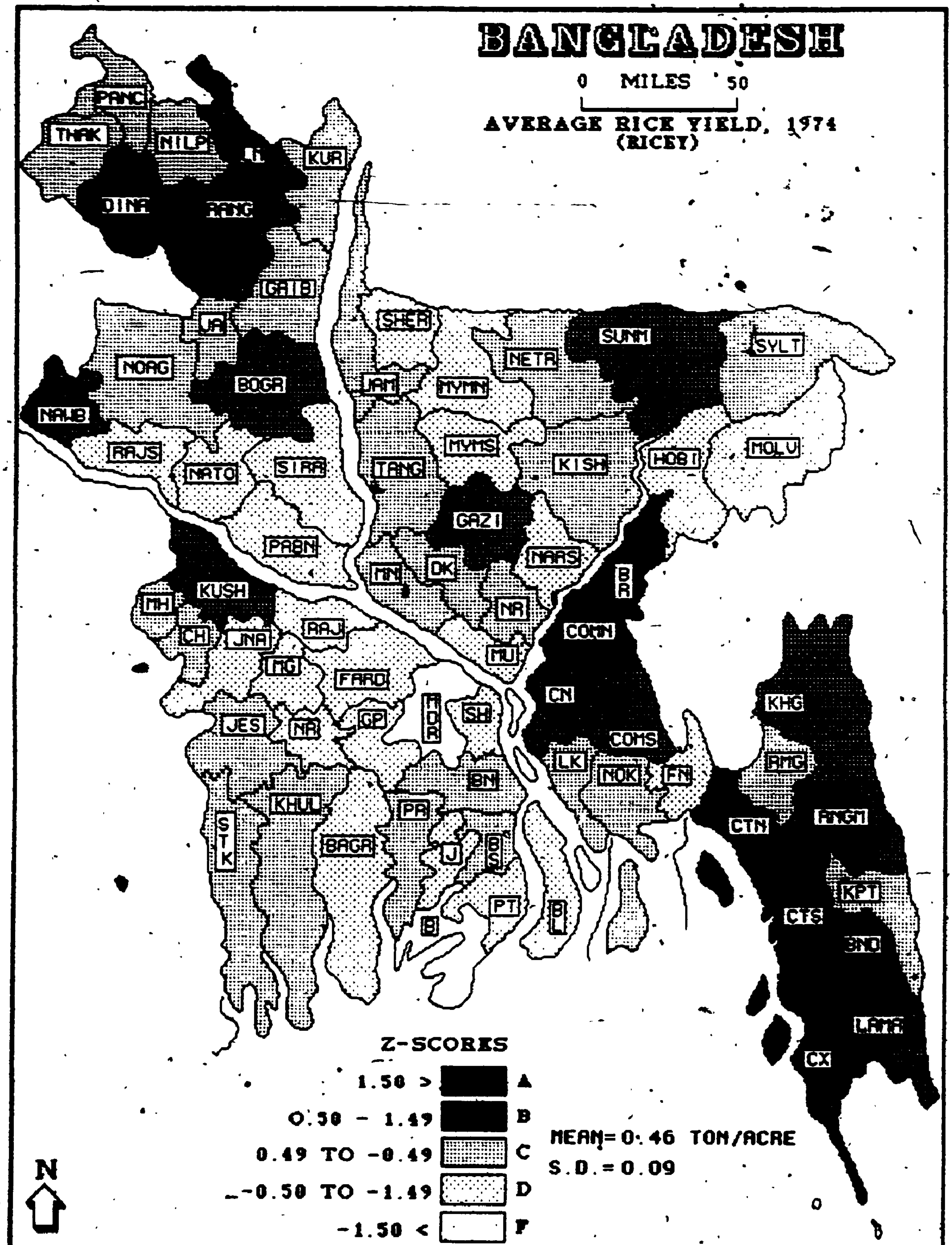

BANGLADESH
0 MILES 50
AVERAGE RICE YIELD, 1974
(RICEY)
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
NARS
MN
DK
NR
BR
KUSH
MH
CH
JNA
RAJ
MG
FARD
MU
COMN
CN
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
KHG
RMG
KHUL
STK
PR
BN
BAGR
J
BS
B
PT
BL
CTN
RNGM
KPT
CTG
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 0.46 TON/ACRE
S.D.= 0.09
N

Figure 5.18b

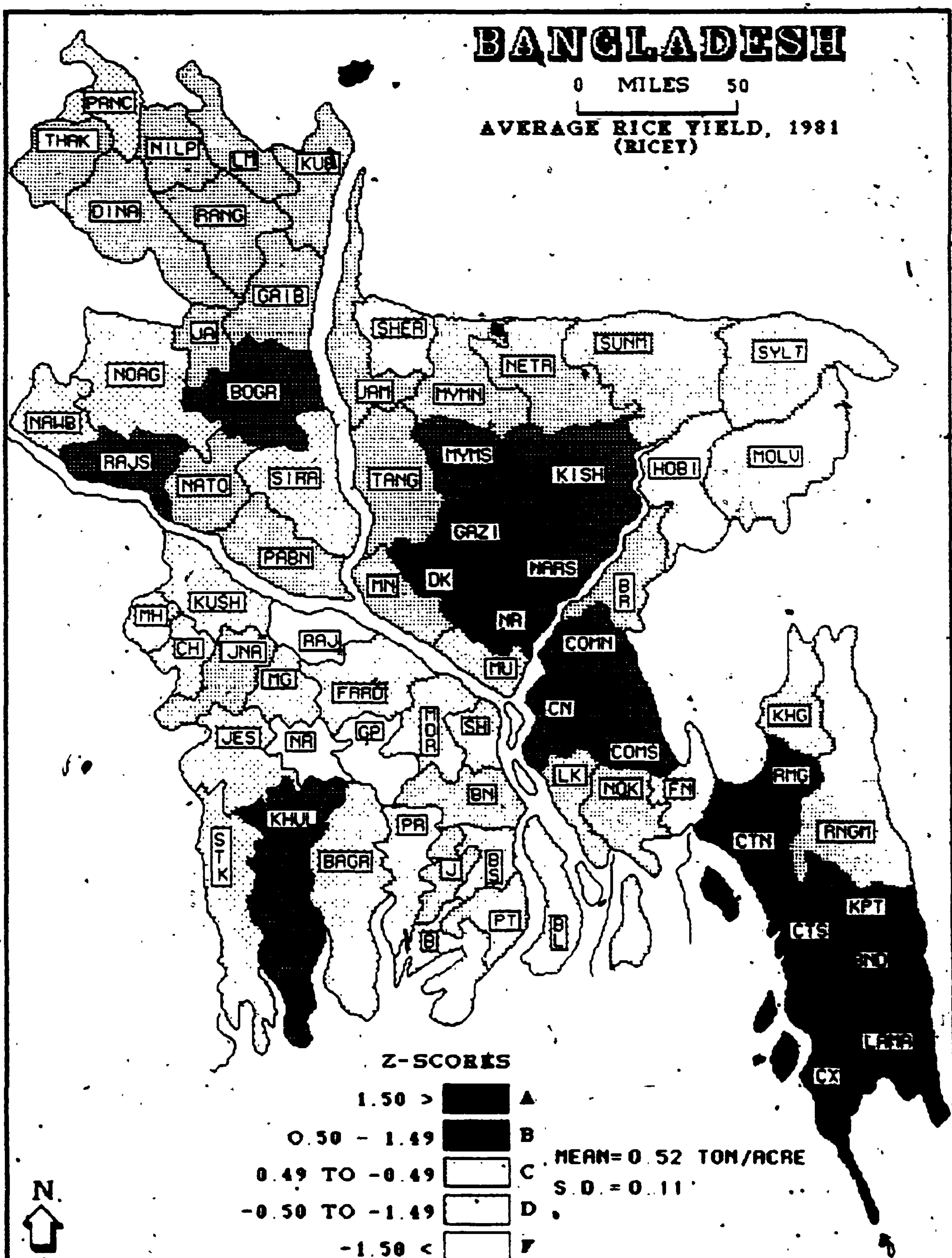

BANGLADESH
0 MILES 50
AVERAGE RICE YIELD, 1981
(RICEY)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
KISH
HOBI
MOLU
TANG
GAZI
NARS
DK
MN
NR
BR
MU
COMN
CN
COMS
LK
NOK
FN
KUSH
MH
CH
JNA
MG
RAJ
FARD
GP
MDR
SH
JES
NR
KHUL
STK
BAGR
PR
BN
J
BS
PT
B
BL
KHG
RMG
CTN
RNGM
KPT
CTS
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 0.52 TON/ACRE
S.D.= 0.11
N

Figure 5.18c

Mymensingh South Districts. In the Eastern Division low values diffused along the major urban axis extending from Comilla North in the north to Cox's Bazar in the south. On the other hand, in the Northern Division, particularly Nilphamari, Dinajpur and Rangpur Districts suffered from a relative decline and the Southern Division remained relatively stable in gross terms The new absolute range in 1981 of from 3 to 9 ton per acre suggests the fact that rates of increase did not vary greatly.

Between 1961 and 1974 (Figure 5.18x) changes in Average Rice Yield (RICEY) below the national average (negative) were experienced mainly in the Northern Division including Nilphamari, Rangpur, Gaibanda, Noagaon, Rajshahi, Natore Pabna and Sirajganj Districts. In the Southern Division Rajbari, Faridpur, Barguna and Bhola Districts experienced low level changes. In the Central Division Mymensingh South and Munshiganj are the only Districts represented low values The southern part of the Eastern Division are also belong to the low level changes category. Temporal changes between 1974 and 1981 (Figure 5.18y) suggests that the Central Division is the region of absolute gain and Eastern, Southern and part of the Northern Divisions are the regions of negative growth in gross terms

Irrigated Land- Spatial and Temporal Change

Percentage of Irrigated Area (PIRIG) in 1961 (Figure 5.19a) depicts a pattern based on a national mean of about 6.8 per cent, and an absolute range of from 0 to 31 per cent by District. It is evident that relatively dark shades are concentrated in the Central and Eastern Divisions with the exception of Chittagong Hill-Tracts. The Northern

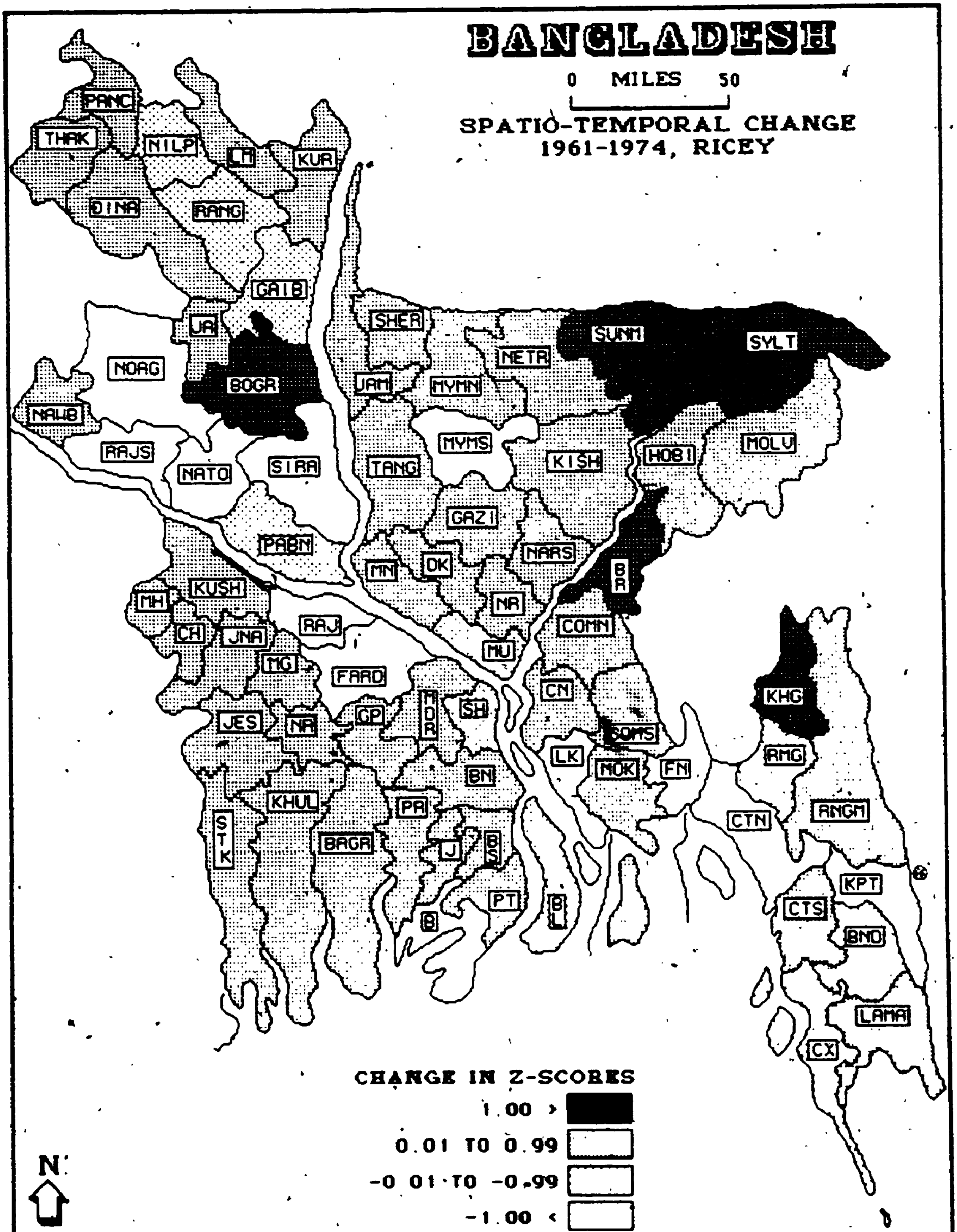

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, RICEY
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
NETR
SUNM
SYLT
JAM
MYMN
MYMS
KISH
HOBI
MOLU
TANG
GAZI
NARS
MN
DK
NR
MU
COMN
KUSH
MH
CH
JNA
RAJ
MG
FARD
CN
KHG
SH
JES
NR
GP
MDR
SOMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
PT
BL
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.18x

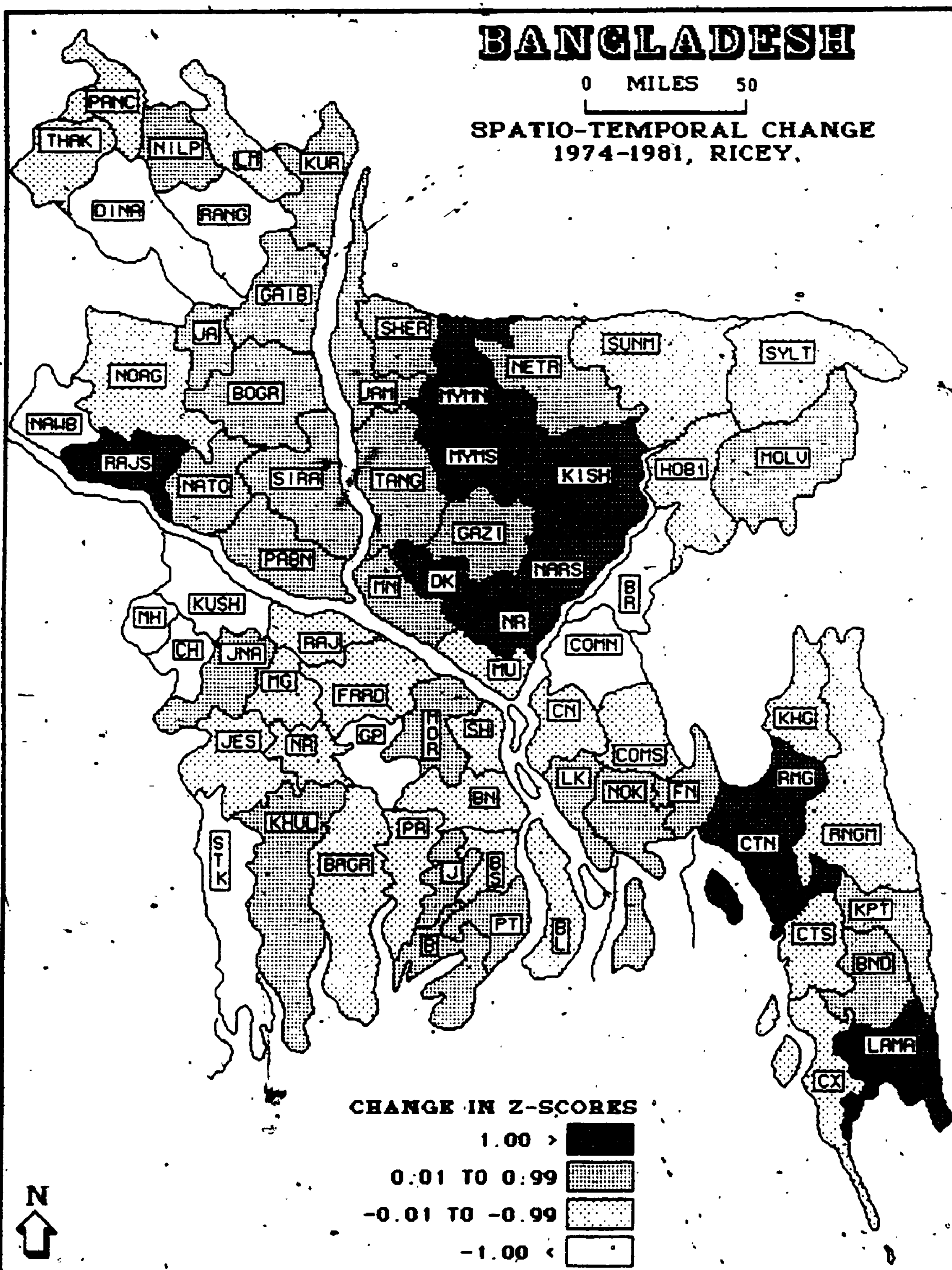

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, RICEY.
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
KISH
HOBI
MOLV
TANG
GAZI
DK
NARS
MN
NR
BR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
JES
NR
GP
MDR
SH
COMS
KHG
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
PT
BL
B
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.18y

310

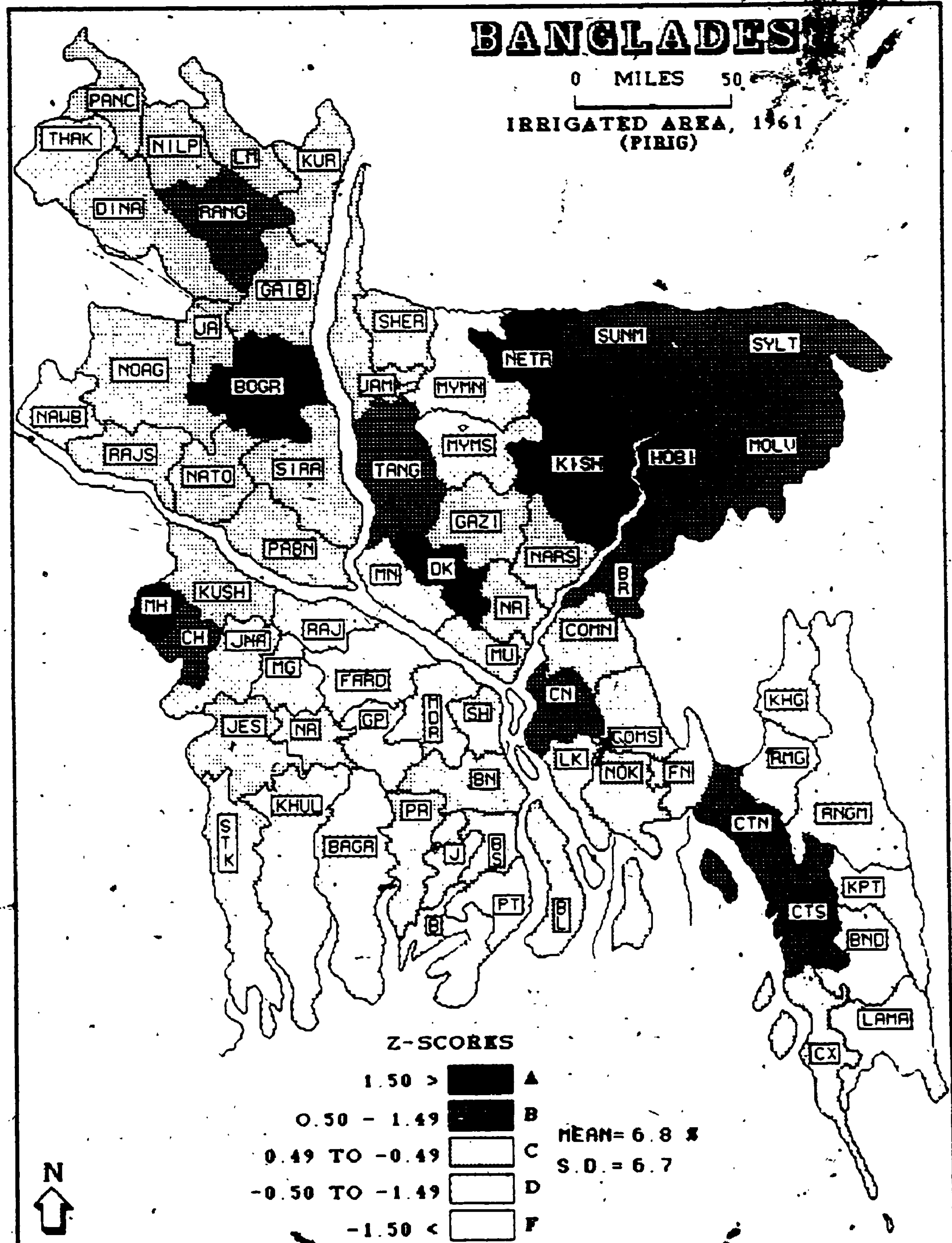


Figure 5.19a

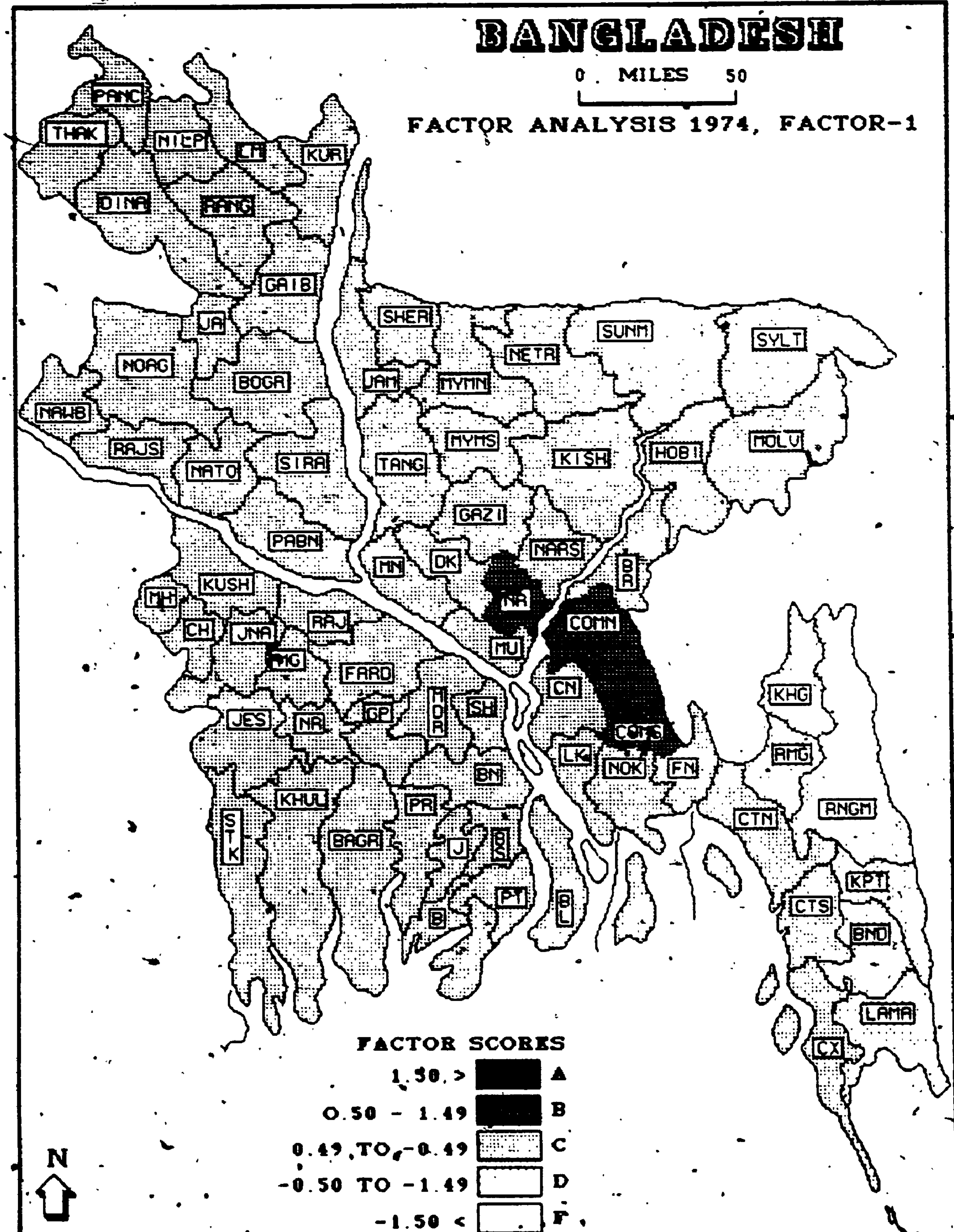

BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1974, FACTOR-1
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BA
NR
KUSH
MH
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

Figure 6.1b

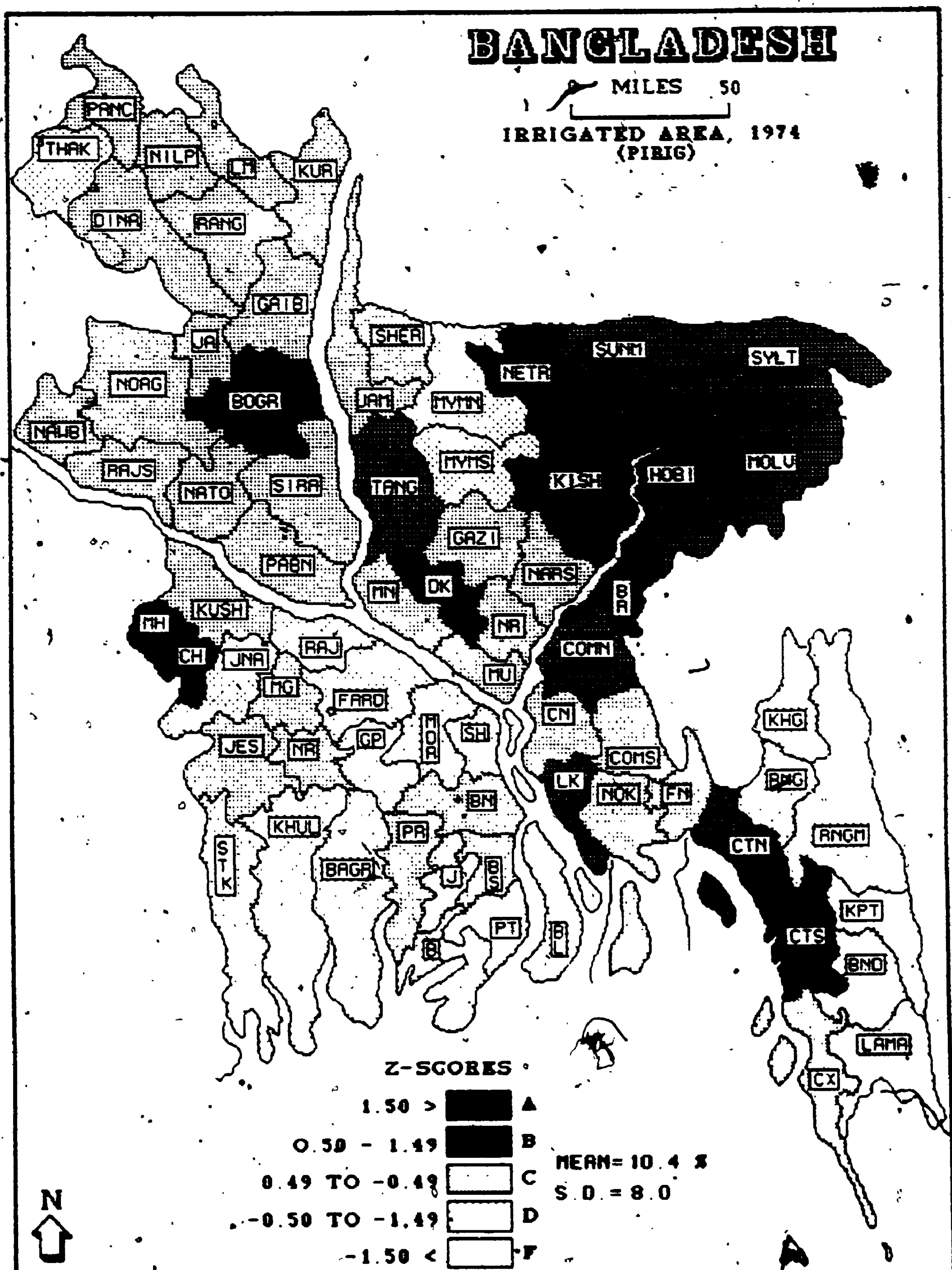

BANGLADESH
0 MILES 50
IRRIGATED AREA, 1974
(PIRIG)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
MYMS
MOLV
RAJS
NATO
SIRA
TANG
KISH
HOBI
GAZI
PABN
NARS
MN
DK
BA
MH
KUSH
NR
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
MOR
SH
COMS
LK
NOK
FN
BNG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN= 10.4 %
S.D.= 8.0
N

Figure 5.19b

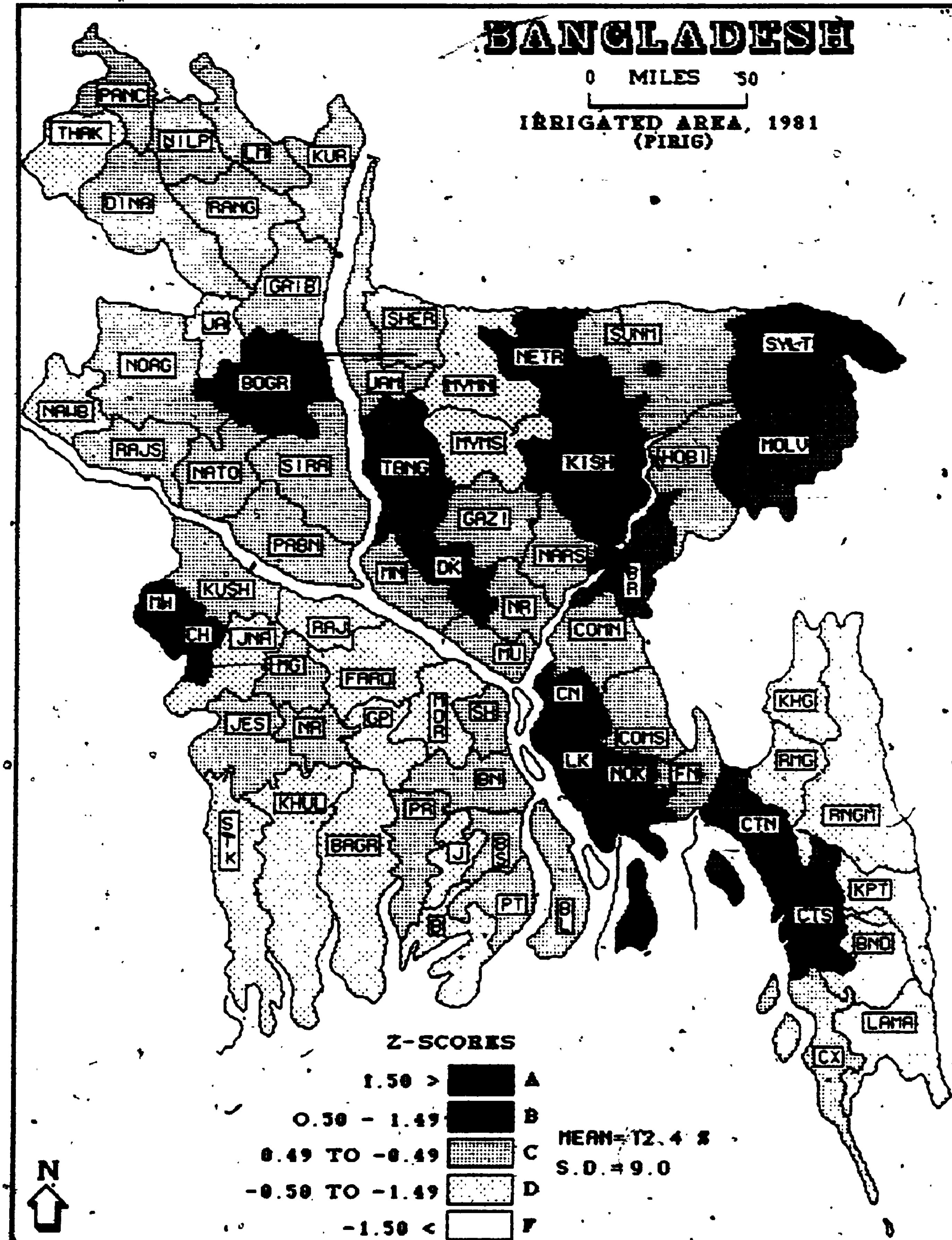

BANGLADESH
0 MILES 50
IRRIGATED AREA, 1981
(PIRIG)
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
MYMS
KISH
HOBI
MOLV
NATO
SIRA
TANG
GAZI
PABN
MN
DK
NARS
BR
KUSH
NR
MH
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
KHUL
BN
STK
PR
CTN
RNGM
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
Z-SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
MEAN=12.4 %
S.D.=9.0
N

Figure 5.19c

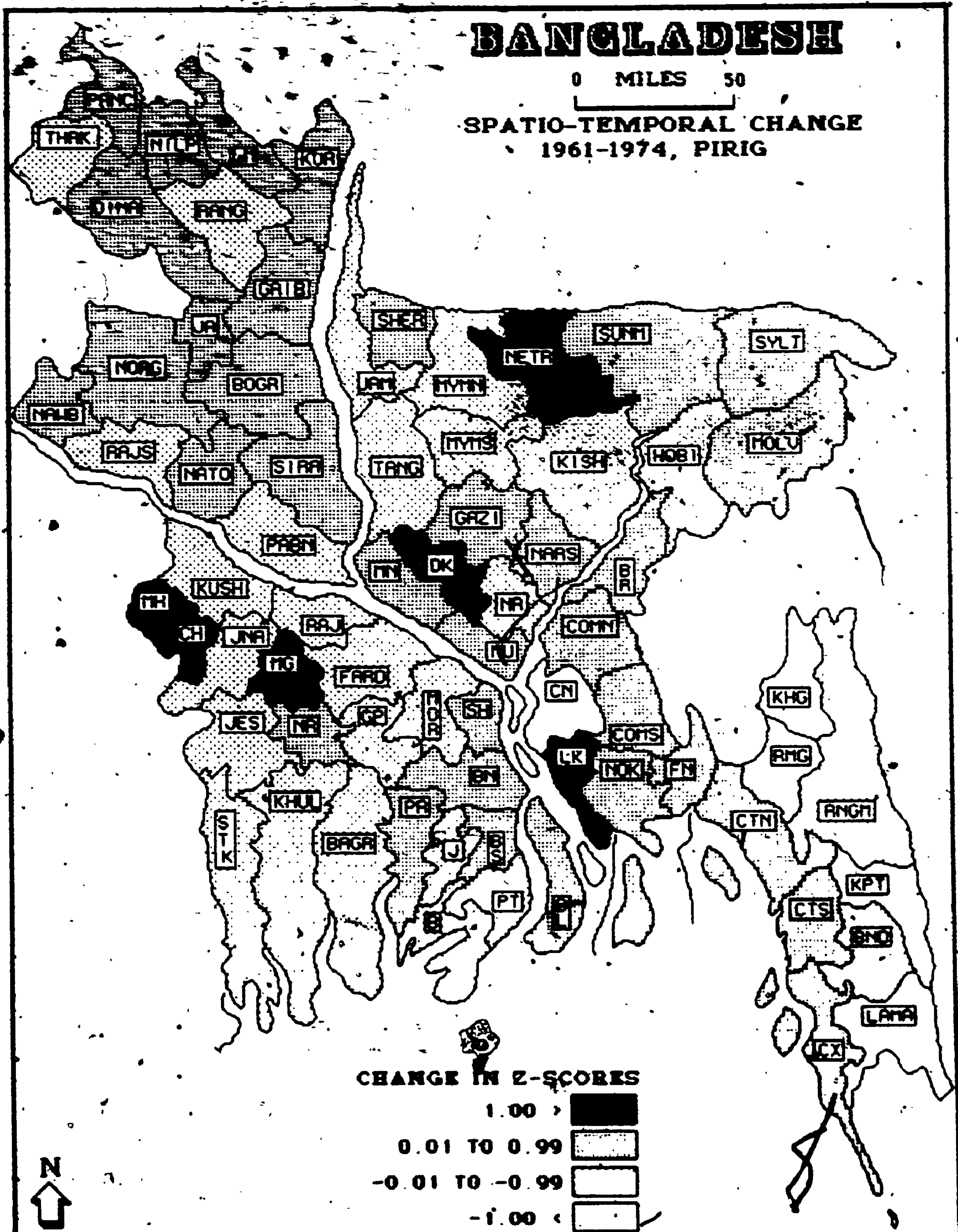

BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, PIRIG
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
KISH
HOBI
MOLV
TANG
GAZI
DK
MN
NARS
BA
NR
COMN
MU
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NR
GP
MOR
SH
CN
LK
COMS
NOK
FN
KHG
RMG
KHUL
PR
BN
STK
BAGR
J
BS
CTN
ANGM
PT
KPT
CTS
BND
LAMA
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

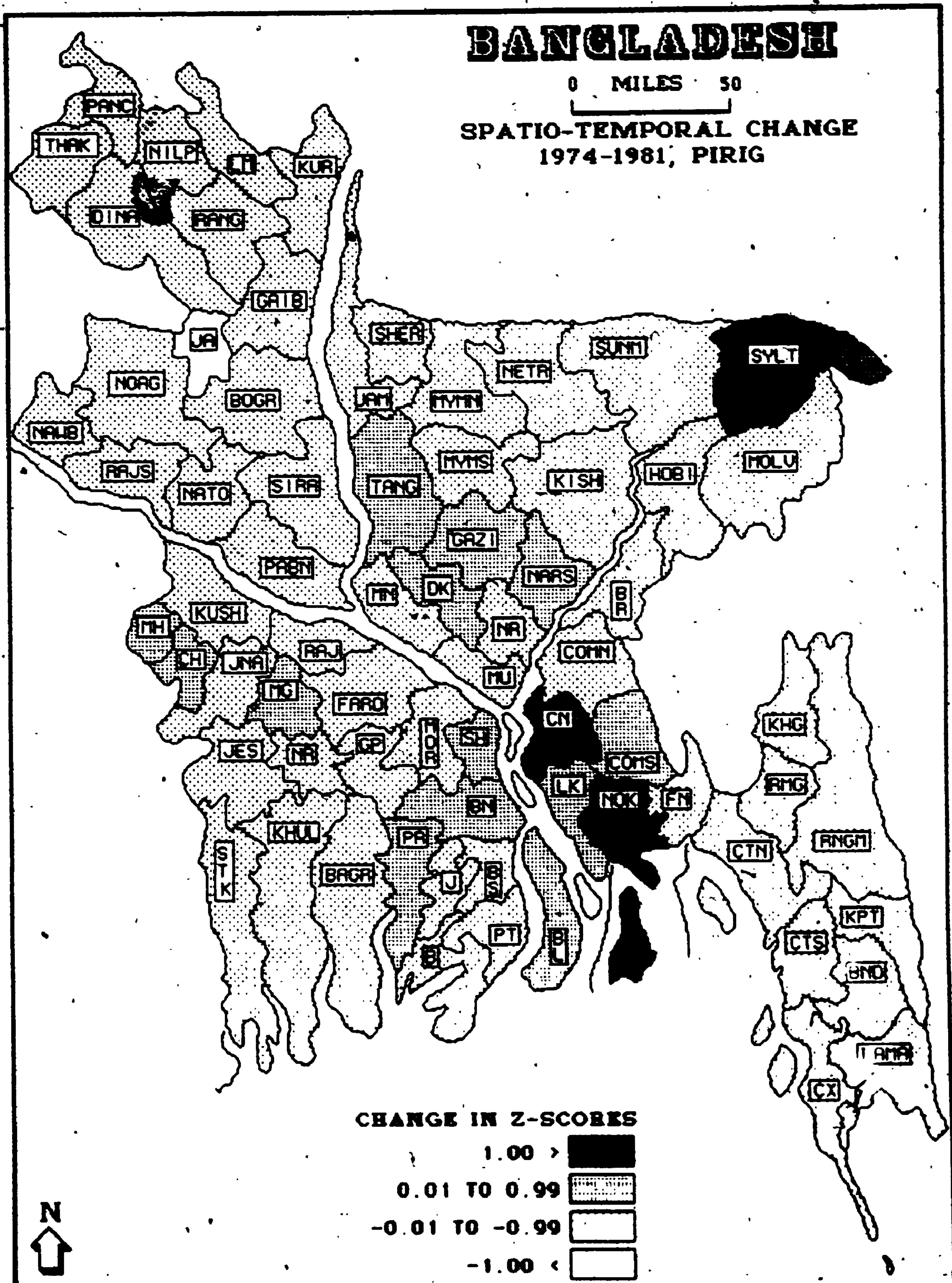
Figure 5.19x

indicates that the Central and Eastern Divisions are the most favoured regions where changes above the national average were most significant (Figure 5.19y).

Conclusions

Univariate analysis of some selected development indicators has been presented. This indicates that each individual variable and each group of variables has a specific pattern of spatial and temporal change. Most of the individual variables exhibit spatial patterns strongly associated with either the physiographic base of the country or provide some reinforcement of an 'urban' versus 'rural' district dichotomy.

It must be noted that there are eight groups of variables in the list. A selection of 19 variable depictions provides illustration of some individually critical dimensions of development in Bangladesh during the study period. The only variable for which insignificant change was recorded over the 1960-1980 period was average farm size. All other variables, whose gross characteristics are recorded in Table 5.1, show some change, with the majority being positive in nature vis a vis the general concept of development. On the other hand, the list reveals that the 'improvement' was generally very modest. In some cases there was substantial regional variation in both the absolute values and degree of change, and there is often little consistency between two inter-censal periods. Nevertheless, individual variable analysis provides some clues to underlying directions of change.


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, PIRIG
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
MYMS
RAJS
HOBI
MOLV
NATO
SIRA
TANG
KISH
GAZI
PABN
NARS
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DK
BR
KUSH
NA
MH
COMN
CH
JNA
RAJ
MU
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
TAMR
CX
CHANGE IN Z-SCORES
1.00 >
0.01 TO 0.99
-0.01 TO -0.99
-1.00 <
N

Figure 5.19y

Demographically, although population numbers and densities continued to increase, there were significant drops in both birth and infant mortality rates, the latter especially after 1974, which may be related to increased levels of investment in and provision of health care facilities. Increases in the dependency ratio might seem to belie demographic improvement, but it must be remembered that labour force involvement may begin as early as 10, especially in agriculture. Employment generally has seen a significant drop in the proportion engaged in agriculture and modest increases in other categories, although overall income increases have been very modest. While the non-agricultural employment provides some evidence of spatial concentration in those Districts associated with major urban centres, there is much more diffuse pattern (including rural districts) associated with both household characteristics and health and educational variables.

Housing stock in Bangladesh is still marked by widespread use of insubstantial materials (i.e. bamboo and mud). However, there are indications of the spread of household amenities including both bath and toilet facilities and of electricity into rural areas. The spread of electricity and the possession of a radio represent the largest individual changes recorded and whose impact has broad significance. In the key areas of health and education there is some evidence of improvement. Increased expenditure in both areas has resulted in more hospital beds, physicians and nurses, and more high schools, respectively, per 50,000 population. Infant mortality and illiteracy rates have dropped, although school attendance has fluctuated.

Regional mapping indicates that each of the patterns involving public investment has been widespread and certainly not confined to specific growth areas. On the other hand, within the rural countryside there is still evidence of extreme pressure on resources, so that although irrigated areas, multiple cropped areas and rice yield have risen, per capita availability of agricultural land has fallen. However, it must be remembered that the period under review is largely one of rural neglect and Residual Social Policy Figures suggest some modest improvement in social conditions despite the economic problems. What one is searching for is evidence of modest improvement, despite lack of policy, which may suggest a more sustainable direction than that of economically oriented, sectoral approaches. In this sense, one turns from the 'confusion' of the individual variable array to attempts at composite analysis (Chapter 6).

CHAPTER 6

Dimensions of Development and Change

Introduction

This chapter presents the first phase of the composite analysis, i.e. factor analysis- of development in Bangladesh. The main purpose in using factor analysis is to collapse selected variables into a smaller number of recognizable basic dimensions of development which distinguish districts and can be used to group them. In what follows we take a large number of criteria (M=31), more than half of which (18) have been individually analyzed in Chapter 5, across the observation units (N=71), for three distinct time periods (i.e. 1961, 1974 and 1981) to study dimensions of development and change in Bangladesh between 1960-1980. By using a combination of factor output and other forms of dimensional analysis (i.e. mapping of factor scores), we are able to conclude: (a) how many distinct dimensions (different types) of 'development' are actually encompassed by the many individual criteria (variables), and (b) what regional pattern of 'socio-economic development (advantage/disadvantage)' is evidenced by each type. Then, by a process of interpretation which depends upon our understanding of the principles by which the social and economic attributes of Bangladesh are spatially organized (including reference to individual variable analysis in Chapter 5), we may determine what relationships these types and their spatial patterns bear to the physical and human structure of the national geographic space. From the dimensions and their patterns over time and space one can postulate the effects of policies.

It must be noted that the univariate analysis (Chapter 5) quantifies and describes patterns of some key variables, many of which were highly inter-correlated. But the extent to which variables in each of the broad categories actually combine into a distinct pattern of variations cannot be established without multivariate analysis. Further, no single variable can be cited as the valid 'uniform criterion' by which to decide in favour of one basic division of districts over another and, no clear concensus exists among social scientists concerning the proper theoretical approach to this issue. The problem, therefore, suggests the need for a composite analysis which can provide the basis for synthesis either confirming or changing the findings of the preceding chapter (Chapter 5).

Therefore, the objective of composite analysis is to produce a systhesis based on a multivariate appraisal. To this end, factor analysis is used in this chapter as an initial approach. Factor analysis is a suitable technique for the examination of areal variations and relationships in a multi-dimensional phenomenon such as development (Berry, 1965a). The technique is helpful primarily in organizing, reducing and simplifying a complex statistical data set by creating a number of hypothetical factors or major underlying dimensions. Every factor analysis involves a "boiling-down" operation in which we find out how many underlying dimensions of variation express the "meat" of a much larger number of initial variables, many of which tell related stories and are therefore highly correlated. Secondly, factor analysis includes a "rotation" process by which the underlying variables are transformed mathematically so as to have the maximum intrinsic meaning. As a result, factors represent concise descriptions of patterns or associations of attributes across the set of observation units (see Chapter 4).

Dimensional analysis (i.e. mapping of relative spatial patterns) supplements the factor analysis, enabling precise measurements to be provided of the location of all original observations on the principal factor scales (the underlying dimensions of variation) and simultaneously on several of the scales, to see whether distinctive regional patterns exist. The combination of factor and dimensional analysis, we submit, solves the measurement problem identified earlier (see Chapter 4).

As noted above, factor analysis allows groups to be discussed on a composite basis. The first part of this analytic chapter, therefore, deals with the choice of factoring models together with terminologies, namely factor output, the factor matrix and the effects of varimax rotation. The second part of the chapter is devoted to a presentation of the results; the factors, the composite patterns and the interpretation of temporal change, resulting from factor analysis of development criteria in Bangladesh 1960-1980.

Types of Factor Analysis and Choice of Models

The term factor analysis is not a unitary concept. There are several types of factor analysis which are discussed in the literature (Thurstone, 19471; Lawley and Maxwell, 1963; Rummel, 1970; Mulaik, 1972; Gorsuch, 1974; Nie et al., 1975; Harman, 1976; Kim and Mueller, 1978). There have been many views as to the nature of dimensions that emerge from such analysis. Some see factors as composite explanatory variables that account for the variation in the data matrix, and assign the factor a causal meaning (Johnston, 1971). However, this is a minority view in both developmental and ecological application. More modest is the claim that factors represent concise descriptions of patterns of associations of attributes (composite) across observations (Nie et al., 1975, Harman, 1976, Kim and Mueller, 1978). This latter view is adopted in this analysis, and factor analysis is here seen as a technique applied at the composite descriptive level. Factor analysis will yield a reduced set of grouped variables (factors/dimensions) whose spatial and temporal differentiation will suggest the characteristics and direction of development in Bangladesh during the study period. The factors are seen as key elements through which an interpretation of the components and direction of change may be made. In addition, the factor scores provide a means of indexing the data, for use in further analysis (Chapter 7).

When a number of equally accurate solutions are available in factoring methods, the question arises, how should a choice be made among these possibilities? The prefered types of factor solutions are determined on the basis of two general principles 1) statistical simplicity, and 2) scientific meaning (to best reproduce the observed correlations). If one were to make a choice entirely upon statistical considerations, the natural approach would be to represent the original set of variables in terms of a number of principal components, determined in sequence so that at each successive stage the component accounts for a maximum of the variance. Principal

Component analysis is similar to factor analysis in that both methods allow for data reduction. The choice between the two depends on the researcher's overall objective. One way to differentiate between the two is to say that factor analysis represents the covariance structure in terms of a hypothetical causal model, whereas principal component analysis summarizes the data by means of a linear combination of the observed data. In sum, the principal component analysis is oriented toward explaining variance, the factor analysis is toward explaining covariance. Therefore, whether a solution employs defined factors or inferred factors depends on whether the existence of unique variance is assumed. One differs from the other depending on whether the correlation matrix is altered before performing the factor analysis. All inferential factoring techniques replace the main diagonals of the correlation matrix with communality estimates before factoring (Kim and Mueller, 1978).

However, there are specific situations in which the correlation matrix cannot be altered prior to the use of principal axis factoring with iterations (see SPSS manual). This usually happens in calculating the inverse of a correlation matrix for an improved communality estimate. It must be pointed out that only the square matrix has the inverse. But, not all the square matrices are invertable, provided that the determination of the matrix is zero. Such a square matrix is called singular. If a correlation matrix is nearly singular then principal axis factoring without iterations (PA 1 type) is the most likely approach to be adopted. In this study, we have used PA 1 type of solution as an important option available in the SPSS-X Manual. 'R mode' of analysis is employed with normal varimax rotation of all factors and with eigenvalues exceeding unity (greater than 1.00). In order to avoid a multicolinearity effect and to achieve the inversion of the data matrix, some variables whose per cent value might add up to unity and create zero determinant situation were dropped out from the original variable list at the very beginning. To save both time and space, mathematical details for the factoring procedures are not described. For particulars, readers are referred to consult the SPSS Manual (Nie et al., 1975).

Factor Output

Factor analysis usually implies some knowledge as to the number of common factors underlying the variables in the research problem. In turn, the number of factors depends on the selected variables and the smallest eigenvalue specified. On the basis of the observed correlation of variables discussed in Chapter 5 (Table 5.2), a number of underlying dimensions emerged from the set of thirty one variables. Setting the smallest eigenvalue at greater than 1.00, application of factor analysis to 31 variables for the 71 District data, over three time periods, resulted in output consisting of seven factors/dimensions (Table 6.1).

Factor Matrix

Certain aspects of the factor output require some elaboration in order to facilitate the interpretation. These include Factor Loadings, Eigenvalues, Percent Variance, Communalities, and Rotation.

The first output of the factor analysis is an Unrotated Factor Matrix (Table 6.1). Depending on the number of factors identified, the output consists of several columns, each grouping variables within

TABLE 6.1

UNROTATED FACTOR MATRIX: FACTOR LOADINGS FOR ANALYSIS OF SPACE-TIME AGGREGATE DATA

VARIABLES	FACTOR-1	FACTOR-2	FACTOR-3	FACTOR-4	FACTOR-5	FACTOR-6	FACTOR-7
HYDRO	0.86						
RADIO	0.86						
SERVE	0.85						
MANUF	0.84						
PEHCS	0.84	-0.48					
BIRTH	-0.83			0.31			
AGRIC	-0.83						
PEXED	0.82	-0.46					
INCOM	0.79	-0.53					
DBATH	0.78	0.48					
TOILT	0.75	0.49					
MANOR	0.71	0.35					
AVBNK	0.68						
LITER	0.61					-0.32	
AVNRS	0.55	0.44					
PCCST	0.49		0.45				
PIRIG	0.48			-0.38		0.39	
PCSST	0.44		0.32			-0.35	
DPNDR		-0.61		0.52	0.39		
DOJOB		0.61				0.31	
HRBRK	0.49	0.59			0.38	-0.32	
AVDOC	0.56	0.57					
AVHBD	0.41	0.55	0.32				
HWBRK	0.39	0.46			0.37	-0.36	0.31
ALAND			0.88	-0.35			
FRMSZ			0.87	-0.37			
AVSCH	0.41		0.37	0.51	-0.41		
SATND		-0.35		0.34	0.69		
INFNT	-0.43			0.33	0.46		
PMULT		-0.33		-0.41		0.41	-0.32
RICEY	0.44					0.31	0.53

the set of independent factors. Across, the entries, in the factor columns, are the correlation coefficients between each factor and the observed variables. These coefficients are the Factor Loadings, each of which indicates the influence of a given variable on the resultant factor. Thus, Factor Loadings may be interpreted more easily by squaring each of them. Each squared loading represents the proportion of the total unit variance of a variable which is explained within a specific factor, after allowing its contribution to all other factors.

Table 6.2 depicts the overall factor analytic results in terms of Eigenvalues (the sum of square factor loadings), the Percent of Total Variance for the respective factors and the Cumulative Percent of Variation accounted by all factors. The Eigenvalue measures the amount of variation explained or accounted for by a factor. The Percent of Total Variance explained by a factor is derived by dividing the Eigenvalue by the number of variables and multiplying the quotient by 100. Both the Eigenvalues and the Percent Variance explained are important in factor interpretation because they measure the strength and comprehensiveness of a factor. Only factors with the eigenvalues of one or greater are normally considered (Kim and Mueller, 1978; Abdullah, 1979).

Another very important aspect of factor analysis is the value of the Communality as shown in Table 6.2. Each variable has Communality which is the sum of the squares of its loadings. The Communality indicates the proportion of the total unit variance explained by all the common factors taken together. The difference between unity and the Communality is the uniqueness of the

TABLE 6.2

COMMUNALITY OF VARIABLES, EIGENVALUE AND THE PERCENTAGE OF VARIATION EXPLAINED BY THE FACTORS

VARIABLES	MEAN	STD. DEV.	COMMUNALITY	FACTOR	EIGENVALUE	% VARIATION	CUM %
HWBRK	5.2	4.3	0.75	F-1	11.4	37	37
HYDRO	18.9	13.1	0.81	F-2	4.1	13	50
DBATH	9.1	9.1	0.89	F-3	2.4	8	58
TOILT	7.5	8.1	0.83	F-4	1.9	6	64
RADIO	36.5	19.3	0.83	F-5	1.8	6	70
MANGR	2.1	1.2	0.81	F-6	1.3	4	74
SERVE	8.9	3.3	0.83	F-7	1.1	3	77
AGRIC	69.5	11.6	0.74				
MANUF	13.5	5.1	0.82				
INCOM	674.4	106.6	0.97				
PEHCS	11.2	5.2	0.96				
PEXED	29.1	10.5	0.94				
LITER	22.9	7.6	0.61				
RICEY	0.5	0.1	0.76				
SATND	26.8	13.7	0.82				
DPNDR	109.9	4.3	0.89				
BIRTH	41.5	4.5	0.87				
INFNT	140.3	22.7	0.61				
DOJOB	38.9	15.2	0.66				
AVHBD	8.6	17.5	0.72				
AVNRS	1.1	1.6	0.67				
AVBNK	1.6	1.5	0.59				
AVSCH	4.9	4.2	0.74				
PCSST	2.7	1.6	0.53				
PCCST	0.2	0.2	0.58				
PIRIG	9.8	8.3	0.64				
PMULT	23.6	20.4	0.65				
ALAND	0.5	0.2	0.95				
FRMSZ	2.5	1.1	0.95				
HRBRK	2.7	3.3	0.86				
AVDOC	3.9	5.2	0.88				

variable or the variation which is not attributed to the common factors analyzed. The lower the Communality of a variable, the greater the uniqueness of that variable.

Effects of Varimax Rotation

Varimax Rotation of the (orthogonal) principal axes or factors (Table 6.3), graphically speaking, moves each factor axis into a position so that projections from each variable into the factor axes are either near the extremities or near the origin. The method operates by adjusting the factor loadings so that they are either near +/- one or zero. As will be seen from the rotated matrix (Table 6.3), and compared with the unrotated matrix (Table 6.1), each rotated factor has fewer significantly high variable loadings (The less significant ones, lying below +/- 0.30 are omitted from the table). In the process, percent variance explained is redistributed among each of the factors. Thus, in Table 6.3, the rotated factors 4, 5, 6 and 7 have gained more strength and become more interpretable as a result. The relative strengths of factor 1, 2 and 3 have been reduced to some extent but they also have become more interpretable because many of the intermediate loadings of unrotated factors have been reduced in significance. Thus, factor rotation aids in factor interpretation and the following interpretation of the analysis for Bangladesh is based on the rotated factor matrix (Table 6.3).

Factor Interpretation

Besides indicating the weight of each factor in explaining the observed variables, the matrix of rotated factor loadings (Table 6.3) provides the basis for grouping the variables into common factors.

TABLE 6.3

VARIMAX ROTATED FACTOR MATRIX: FACTOR LOADINGS FOR ANALYSIS OF SPACE-TIME AGGREGATE DATA

VARIABLES	FACTOR-1	FACTOR-2	FACTOR-3	FACTOR-4	FACTOR-5	FACTOR-6	FACTOR-7
PEXED	0.93						
PEHCS	0.92				0.32		
INCOM	0.86				0.46		
RADIO	0.85						
HYDRO	0.85						
BIRTH	-0.83		-0.37				
MANUF	0.82						
SERVE	0.76						
AGRIC	-0.71	-0.31					
LITER	0.62						
INFNT	-0.59				0.45		
PCSST	0.44					-0.41	
AVDOC		0.91					
AVHBD		0.79					
AVNRS		0.77					
TOILT	0.42	0.56	0.51				
DBATH	0.46	0.55	0.54				
AVBNK	0.51	0.53					
PCCST		0.45		0.45			
HWBRK			0.84				
HRBRK		0.38	0.83				
MANGR	0.38	0.5	0.51			0.35	
FRMSZ				0.97			
ALAND				0.96			
DPNDR					0.86		
SATND					0.83		
PIRIG	0.31					0.66	
PMULT	0.38					0.64	
AVSCH	0.41	0.44				-0.53	
RICEY	0.33						0.76
DOJOB	-0.47	0.32					0.51

Each variable may be assigned to that factor in which it has the high loading i.e. with which it shows the closest linear relationship. However, a problem may arise where the loadings of a variable on two factors are very close. For example, the Percentage of Dwellings Reporting Bath Facilities (DBATH) and the Percentage of Dwellings Reporting Toilet Facilities (TOILT) are closely loaded on both factor 2 and 3 (Table 6.3). In such a situation, it has been suggested that those variables be assigned to the factor with which they are judged (subjectively) to have the closest affinity (Abdullah, 1979)

To facilitate factor interpretation and increase the visual impression of the factor patterns, Table 6.3 lists first the variables that have relatively high loadings on each factor ranging from 1 to 7 successively Variables assigned to a factor facilitate the "identification" of that factor, a reasonable explanation of the underlying forces that a factor may be interpreted to represent must be given. Thurston (1961) makes this requirement clear when he agrees that the derived variables (factors) are of scientific interest only in so far as they represent process or parameters that include the fundamental concepts of the science involved The "science" involved here is socio-economic development It is complex in so far as each of the distinct set of variables has "something" to contribute to its meaning and interpretation Factor analysis helps to disentangle the complexity and to produce less complex, interpretable and meaningful dimensions of the complex phenomena that is socio-economic development

As noted above, factor analysis of 31 socio-economic characteristics of 71 Districts of Bangladesh over three distinct time periods has produced 7 dimensions/ Factors or patterns (Table 6.3). The 7 factors explain about 77 per cent (cumulative) of the variance in the original data set (Table 6.2). In other words, as far as these 71 districts are concerned, the 31 characteristics group to differentiate them in seven different ways. Factor scores computed on each dimension and for each observation are used to identify the dominant spatial patterns. This is because the scores order the observations and are amenable to standardized mapping. The scores of each district on each of the seven factors by sequence number 1-71 for 1961, 1974 and 1981 are recorded in Appendices II, III & IV. The class intervals chosen to differentiate the factor scores are similar to those used in the univariate analysis (Chapter 5).

Each of the 7 factors may be considered statistically and empirically significant. Even the weakest factor has an eigenvalue greater than 1.00. However, the order of factors (1 to 7) is also important. The first and second factors each group a number of variables (12 and 7 on a primary basis, respectively) and together account for about 50 per cent of the original variance. In contrast, the relative strength and comprehensiveness of each of the other five factors is much less. Each of the latter groups only 2 or 3 primary variables and accounts for much less variance (Tables 6.2; 6.3). Correspondingly, although there are 7 significant factors/dimensions (i.e. Factor 1: General Socio-Economic Structure, Factor 2: Health Care and Facilities, Factor 3: Housing Structure, Factor 4: Agricultural Structure, Factor 5: Rural Dependency, Factor 6: Agricultural Intensification and Factor 7: Rice Productivity), there is no doubt that Factor 1 is the most important. In the following interpretation all Factors are examined, and the results presented, including dimensional mapping of factors 1 to 4, but the greatest significance is attached to Factor 1.

Factor 1: General Socio-Economic Structure

Twelve key variables with high communalities, an eigenvalue of 11.4, and other significant regularities (correlations) identify Factor 1 as the dominant, most significant dimension of development Factor 1, named General Socio-Economic Structure, accounts for about 37 per cent of the total variation in the data set The classificatory name for Factor 1 reflects the combination of both economic and socially meangful variables In factor labelling, emphasis is given to the factor taxonomy based on the observation of predictably related variables. This broad based factor seems to indicate positive changes in socio-economic structure and well-being across the whole country, but this development is somewhat disassociated with the agricultural sector and distinct from specific improvements in either health or education, the variables of which load higher on other factors

Out of the total set of 31, twelve variables load high (+/- 0 50 or greater) on Factor 1 Nine variables load high positively, namely PEXED (+ 93), PEHCS (+ 92), INCOM (+ 86), RADIO (+ 85), HYDRO (+ 85), MANUF (+ 81), SERVE (+ 76), LITER (+ 62) and AVBNK (+ [illegible]) indicating a broad dimension of "General Socio-Economic Well-Being" Reinforcing the positive socio-economic direction are the negative associations in Factor 1 of the indicators of underdevelopment/disadvantage, notably, BIRTH (- 83), AGRIC (- 71) and INFNT (- 59) The presence of both positive and negative loadings on Factor 1 suggest a strong bypolar relationship between "well-being" and "disadvantage". While one increases the other is forced to decrease. Since these variables are related indicators of development, these various attributes, when consolidated, form the most important dimension of development.

Although the thrust of the analysis is on the description of the spatial and temporal characteristics of composite measures and not speculation about causal links between diverse variables, some brief comments on the structure of Factor 1 are in order. For example, the relatively high positive loadings of INCOM, MANUF and SERVE, indicate the means through which cash income is earned and a higher standard of living achieved. The material outcome is evidenced by the positive loadings of RADIO and HYDRO on Factor 1 and may also be confirmed by examining their high positive inter-correlations (Table 5.2). The relationship supports the notion that household amenity is directly related to income and is observed as a function of employment in the non-agricultural sector of the economy. On the other hand, the positive loadings of PEXED, LITER and PEHCS on Factor 1 indicate an underlying regularity in the public expenditure patterns as exhibited by education and health. The per capita public expenditure on education and health measure the investment in infrastructure of the social aspects of development. Their positive associations with other indicators of development such as per capita income, non-agricultural employment and household amenity suggest that economic prosperity is closely related to social prosperity. In other words, advantage is realized through expansion of the secondary and tertiary sectors of the economy. This generates increases in per capita income and household amenities which are backed by government through the provision of improved health and education. It must be noted that quality of health and education together represents a socio-cultural dimension of development which has a definite role in contributing to the national economic development. General investment, however, may not prelude spatial variation in the social sector, as is illustrated in the case of health care and facilities, Factor 2

In contrast to the mutually reinforcing positive relationships (above), the negative loading of AGRIC on Factor 1 indicates the close association of agricultural employment with low cash income and its inverse relationship to the indicators of development. We must stress that in Bangladesh, although the agricultural sector is the most dominant sector of the economy, nevertheless, its development is problematic because of small land area compared to the large population size. Per capita availability of agricultural land is very low (less than 0.5 acre). Further, there is a skewed distribution of land ownership: About 30 per cent of rural households are landless, and another 30 per cent own less than 1 acre of land, which effectively means that they cannot support themselves on the output of the holding. Although absolute numbers of agricultural labour force have increased (as a function of the generally high level of population increase in the rural sector), the proportion of people engaged in agriculture has gradually declined simply because of excessive pressure on limited agricultural land. It is estimated that about 30 per cent of the rural labour force suffers from unemployment (Islam, 1978). Negative loading of AGRIC on Factor 1 reflects the negative drag on the development process of the agricultural sector which includes not only those with land, but the huge agricultural labour force which has only partial employment and which has experienced a falling trend of average real wages in agriculture, which were 50 per cent lower in 1975 compared with 1963. Similarly, increases in money wages were more than offset by a dramatic rise in the cost of living (Islam, 1978). On the other hand, mechanization of agriculture is virtually impossible due to the presence and dependence of a huge rural labour force and because of the enormous subdivision and fragmentation of holdings. Present agricultural practice is largely at the subsistance level with food (rice) production as the main occupation. Chances for the improvement of general agricultural income and employment are very slight. Changes that are taking place in the agricultural sector are structural, and related to new inputs and output. They are identified as a set of 3 less significant dimensions (Factors 4, 6 and 7, below) and are distinct from General Socio-Economic Structure.

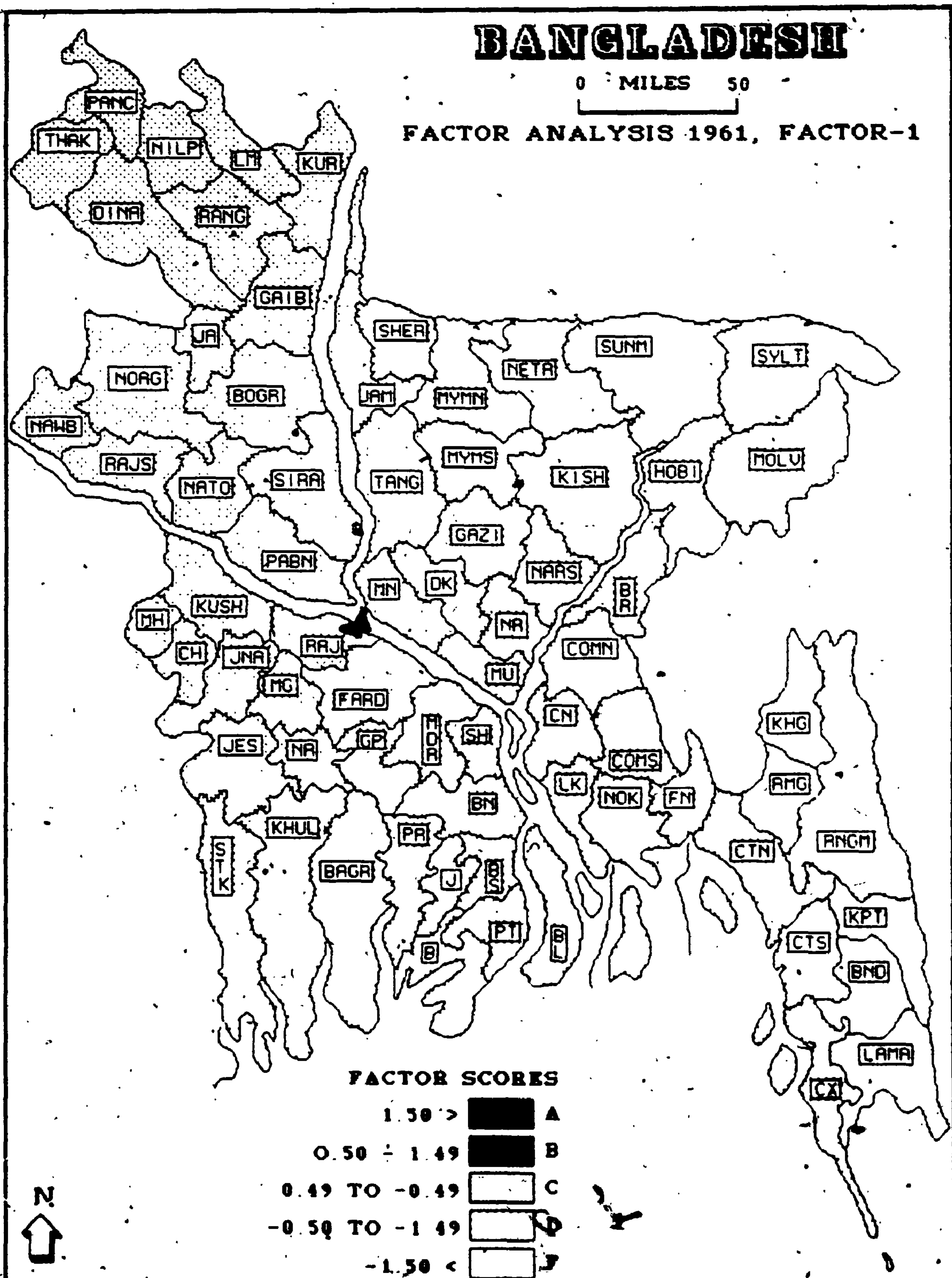
The negative impact of agricultural employment (or unemployment) is matched by the demographic variables of birth (BIRTH) and infant mortality (INFNT) rates, which also record high negative loadings on Factor 1. The cumulative relationship of these negative forces of development may be explained by pointing to the mechanism of the vicious circle of poverty (Chapter 2, theory of cumulative causation). However, although this is most acute in the rural-agricultural context, Factor 1 exhibits a pattern that is general to both urban and rural districts, such that while it excludes the agricultural sector in terms of structure (e.g. "large scale farming"), operation (e.g. irrigated land/area under multiple cropping) and performance (e.g. rice productivity), the condition of the population at large is a function of the interplay of the more general variables-positive and negative.

It is generally agreed that the process of development involves transition from a traditional agrarian economy to a relatively more modern situation in both economic and social terms Some of the identifiable aspects of modernization are rising levels of production and consumption, emergence of a non-agricultural economy, decline in birth and infant mortality rates and an improvement in the quality of education and health. In addition, an important aspect of development is the shift in demographic characteristics from conditions of relatively high birth and infant mortality rate to those of relatively low birth and infant mortality In other words, the process of development is accompained by both fertility and mortality declines Ideally this should be complemented by a shift in agricultural employment from a relatively high percentage to lower level It has been observed that both the birth and infant mortality rates in Bangladesh have declined which may be due to the combined effects of quality of public health and improvements in education However, birth and infant mortality rates remain high by global standards reflecting that Bangladesh is still in its initial phases of development Similarly, the agricultural labour force has declined proportionally but has (as in so many developing countries) increased in actual numbers

Factor I incorporates all these relationships, but emphasises the close positive associations between employment, income, household amenity, quality of education and health which are among the quantifiable results or benefits of the socio-economic development process of an individual or a household aggregated at district level. Furthermore, despite the negative loadings, the factors exhibits a composite positive tendency over time.

Factor 1- Spatial and Temporal Change

Most significant, in terms of the investigation and in support of some measure of development in Bangladesh is the uniform spatial distribution of "General Socio-Economic Structure" and its gradual positive change over time as illustrated by the dimensional mapping of the factor scores by district. The first map, for 1961 (Figure 6.1a), indicates a generally negative but uniform factor scoring for the whole country, with the exception of very low scores in the extreme south-east (Eastern Administrative Division) in the Chittagong Hill-Tracts. This situation reflects a generally homogeneous surface for Bangladesh in 1961, at a level of general socio-economic development below the national mean for the 20 year study period (i.e. a low base level). It must be noted that, although there were some internal variations in the 1961 pattern which may be interpreted by referring to selected individual variables (e.g. household amenities- HYDRO, Figure 5.5a, RADIO, Figure 5.6a, DBATH, Figure 5.7a, non-agricultural employment i.e. MANGR, Figure 5.8a, per capita income/INCOM, Figure 5.10a and adult literacy rate/LITER, Figure 5.15a) and which show some correlation with more urbanized districts (i.e. initial district cores or the major urban axis, Figures 4.2 & 4.3). Nevertheless, the low levels of input (Table 5.1) act to place all


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1961, FACTOR-1
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
SHER
SUNM
SYLT
NETR
JA
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
KUSH
MH
NR
CH
JNA
RAJ
COMN
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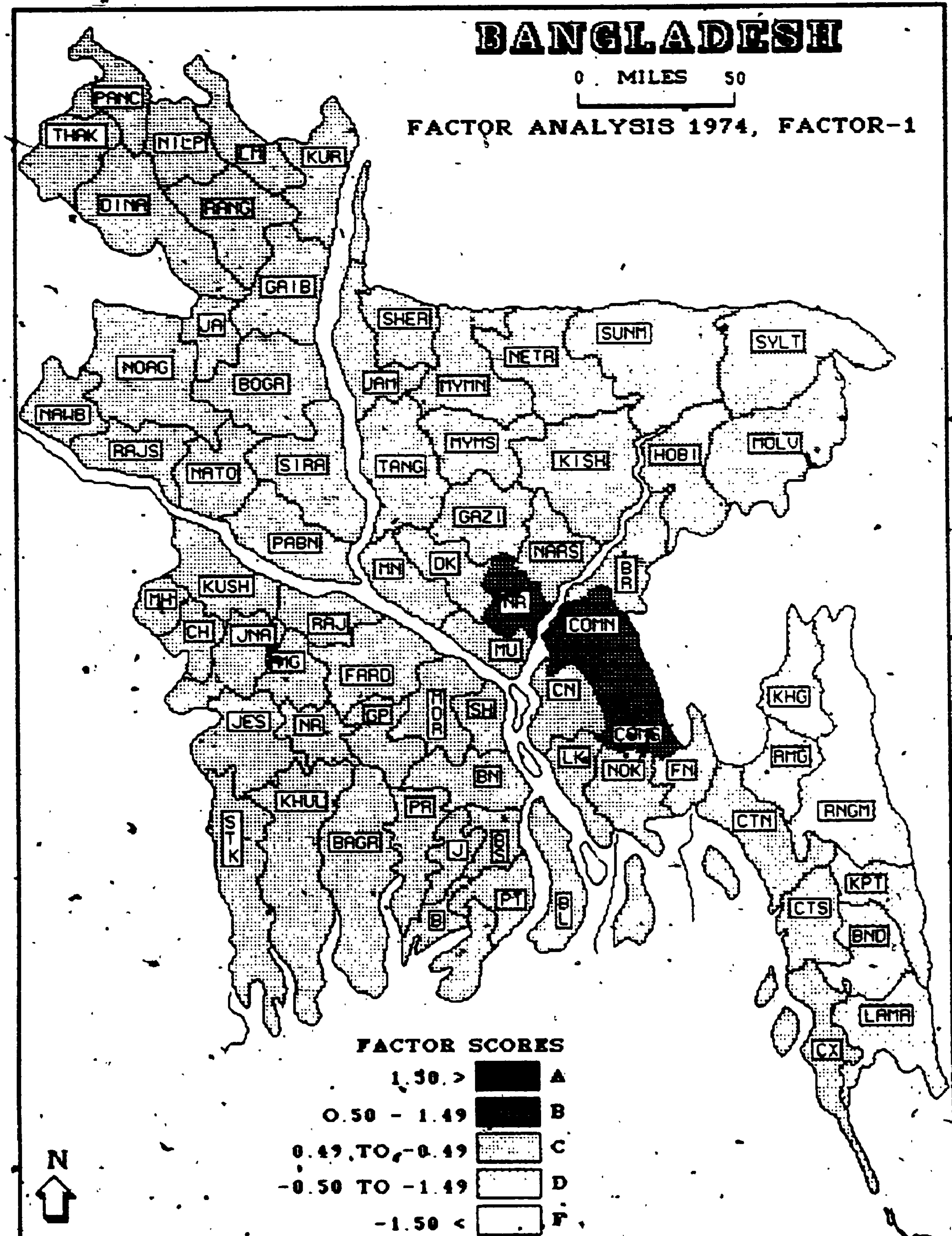
MG
FARD
CN
KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
FACTOR SCORES
1.50 >
A
0.50 - 1.49
B
0.49 TO -0.49
C
-0.50 TO -1.49
D
-1.50 <
F
N

Figure 6.1a

districts of Bangladesh below the national mean (20 years national average, Table 6.2). Thus Factor 1 in 1961 depicts a condition of general socio-economic disadvantage across the national territory. To give a more specific example, the percentage of dwellings reporting electricity (HYDRO) was much below in 1961 (about 6.4 per cent, Table 5.1) compared to the national average for 20 years period (about 19 per cent, Table 6.2). The Chittagong Hill-Tracts, however, emerge as a particularly disadvantaged area mainly due to the very low Z scores recorded for some household amenity variables (e.g. HYDRO, Figure 5.5a; RADIO, Figure 5.6a), non-agricultural employment (e.g. MANGR, Figure 5.8a), per capita income (INCOM, Figure 5.10a), per capita expenditure on health care services (PEHCS, Figure 5.11a), and adult literacy rate (LITER, Figure 5.15a) and relatively very high Z scores for birth rate (BIRTH, Figure 5.2a), dependency ratio (DPNDR, Figure 5.3a), percentage of labour force engaged in agriculture (AGRIC, Figure 5.9a) and infant mortality rate (INFNT, Figure 5.13a).

By 1974 (Figure 6.1b) the general level of loading of all districts records an increase to a medium level, although the Chittagong Hill-Tracts remain lower and small areas of slightly higher scores are recorded in the Comilla and Narayanganj Districts, lying between the Dhaka and Chittagong urban cores. To illustrate the general tendency, it may be noted that while none of the districts in Bangladesh registered a positive loading on Factor 1 in 1961 (Appendix II), by 1974, nearly 50 per cent of the districts (34 out of 71 districts) recorded positive loadings and loadings for all districts recorded a positive change in direction. In 1974, Ramgarh and Bandarban were the only two Districts where negative scores exceeded 1.00. On the other hand,


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1974, FACTOR-1
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
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NARS
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KUSH
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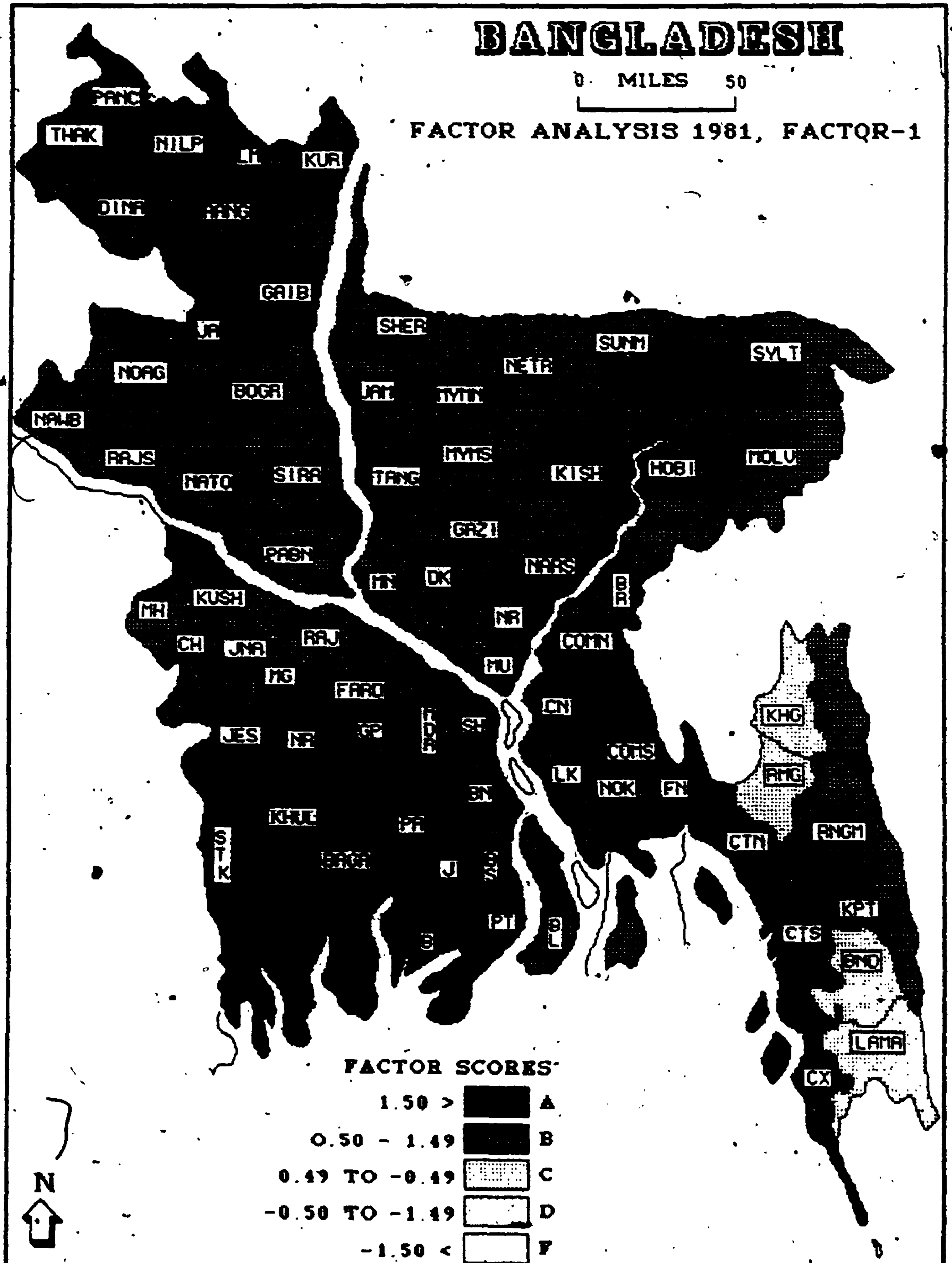
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
STK
PR
CTN
RNGM
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
N
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F

Figure 6.1b

although, Comilla and Narayanganj Districts recorded somewhat higher scores than the national average, the distinct pattern (Figure 6.1b) should not be over emphasized Reference to Appendix III reveals rather weak positive loadings (less than1 00) on Factor 1 which means that the Districts are not significantly different from many other surrounding ones

Finally, in 1981 (Figure 6 1c), the loadings for Factor 1 are positive for 70 of 71 Districts and high everywhere, except for parts of the Hill-Tracts The initial zone of slightly higher scores (1974) has expanded to include most of the Dhaka-Chittagong axis (although not Dhaka District itself) and Khulna and Bagerhat Districts in the south-west (Southern Administrative Division) It must be noted, however, that the emphasis that appears in Figure 6 1c on the urban axis and the Khulna industrial belt must also be qualified None of the districts in Bangladesh experienced any negative scores in 1981, with the exception of Bandarban District in the Hill-Tracts (Appendix IV), and out of 70 positively scored districts some 46 appear as significant judged by scores of greater than 1.00 (Appendix IV) On the other hand, the only district that recorded score greater than 2 00 is Comilla North In all other cases, the internal variation between the major urban axis and the rest of the country is minor and not statistically significant. Furthermore, with the exception of Bandarban District, the rest of the Chittagong Hill-Tacts experienced a medium level of positive change. Therefore, the major characteristic is that the whole country recorded a positive position in 1981 as measured by Factor 1.


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1981, FACTOR-1
PANC
THAK
NILP
KUR
DINA
GAIB
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
DK
NARS
MH
KUSH
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CH
JNA
RAJ
COMN
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FARD
CN
JES
SH
LK
NOK
FN
BN
RMG
PA
CTN
RNGM
STK
J
KPT
PT
CTS
BND
LAMA
CX
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

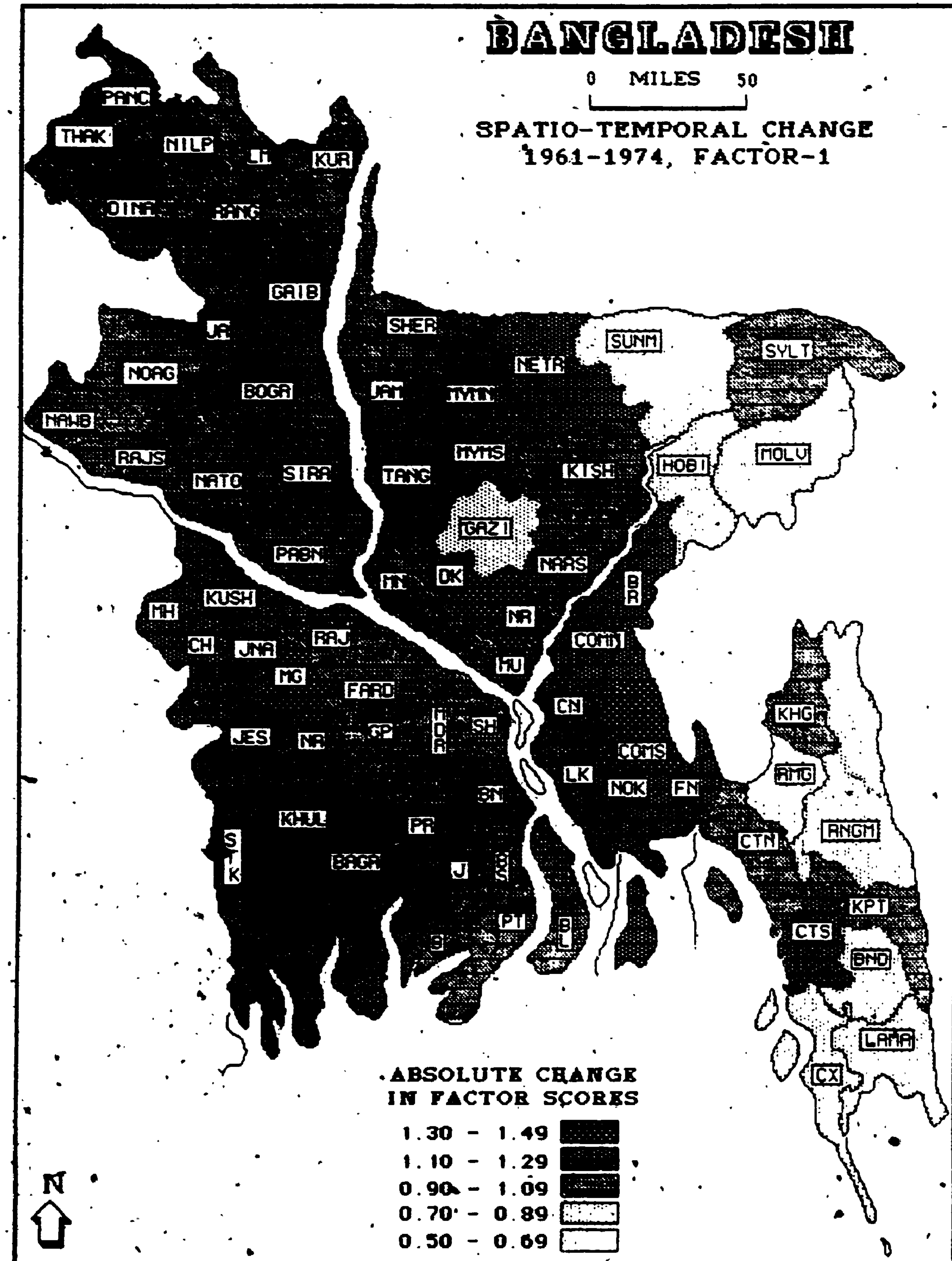
Figure 6.1c

However, some explanation is warranted for the apparent distinctive position of a few districts, (i.e. Chittagong Sadar North, Chittagong Sadar South, Comilla North, Comilla South, Chandpur and Narayanganj) that emerged slightly higher in rank order, along with Khulna and. Bagerhat Districts in the Southern Division From a demographic perspective, these Districts represent regions whose very high population density include both rural and urban elements and where there is a concentration of industrial, commercial, administrative and cultural activity. This is most emphasised in the presence of a continuous, elongated belt of more developed districts linking the two metropolitan centres of Dhaka and Chittagong along the major transportation route of the country. Dhaka is the capital of Bangladesh; Chittagong is the largest sea port and the centre of the second largest industrial and business agglomoration Narayanganj is another primate city within, greater Dhaka and stands out as possessing almost all jute mills in Bangladesh and as the largest river port for the export of jute products. The relative isolation of Khulna from Dhaka is partly due a lack of an effective transportation network between east and the west. There is no east-west inter-connector on the Padma-Jamuna river system to bridge the gap between two urban centres Therefore, no development axis is identified along the Dhaka-Khulna route.

Together with the cities, the districts along the Dhaka-Chittagong axis and the Khulna area form what may be termed the "core region". But the districts forming the "core region" are far from totally urban in nature. They represent both urban and rural characteristics. In fact, the apparent "core region" is only weakly distinguished in Factor 1 in its composition with respect to the general socio-economic structure of the country, where there is a greater degree of uniformity across the country reflecting that the increase in socio-economic well-being that seems to have occured has been experienced by the country in general

Relatively lower rates of growth in districts in the Chittagong Hill-Tracts, namely Khagrachari, Ramgarh, Bandarban and Lama Districts seems to be either because of their relative isolation due to remoteness or to their low level of population density compared to the rest of the country The exception of Rangamati may be explained by the fact that traditionally this District has served as the capital of Hill-Tracts

The key significance afforded to Factor 1, however, is in terms of its direction over time which is interpreted to suggest that a broad dimension of positive change affected the whole country over the study period. Temporal changes recorded between 1961-1974 (Figure 6 ix) are all positive, albeit to a considerably different degree The majority of the country received changes in factor scores ranging from +0 90 to +1 49 with 29 Districts (including a mixture of rural and urban, over + 1 10). The exceptions are found in the Chittagong Hill-Tracts, the north-eastern hilly region (Hobiganj and Molvi Bazar Districts), Gazipur District and Sunamganj District in the depressed basin. Although these areas reported relatively minor changes in factor scores (ranging from +0 50 to +0 89) nevertheless, they too are positive in direction As a result, a slow but steady growth is indicated. Despite a civil war in 1971, the general level of positive change is considerable for the country as a whole. It must also be


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, FACTOR-1
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
DK
NARS
KUSH
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JNA
RAJ
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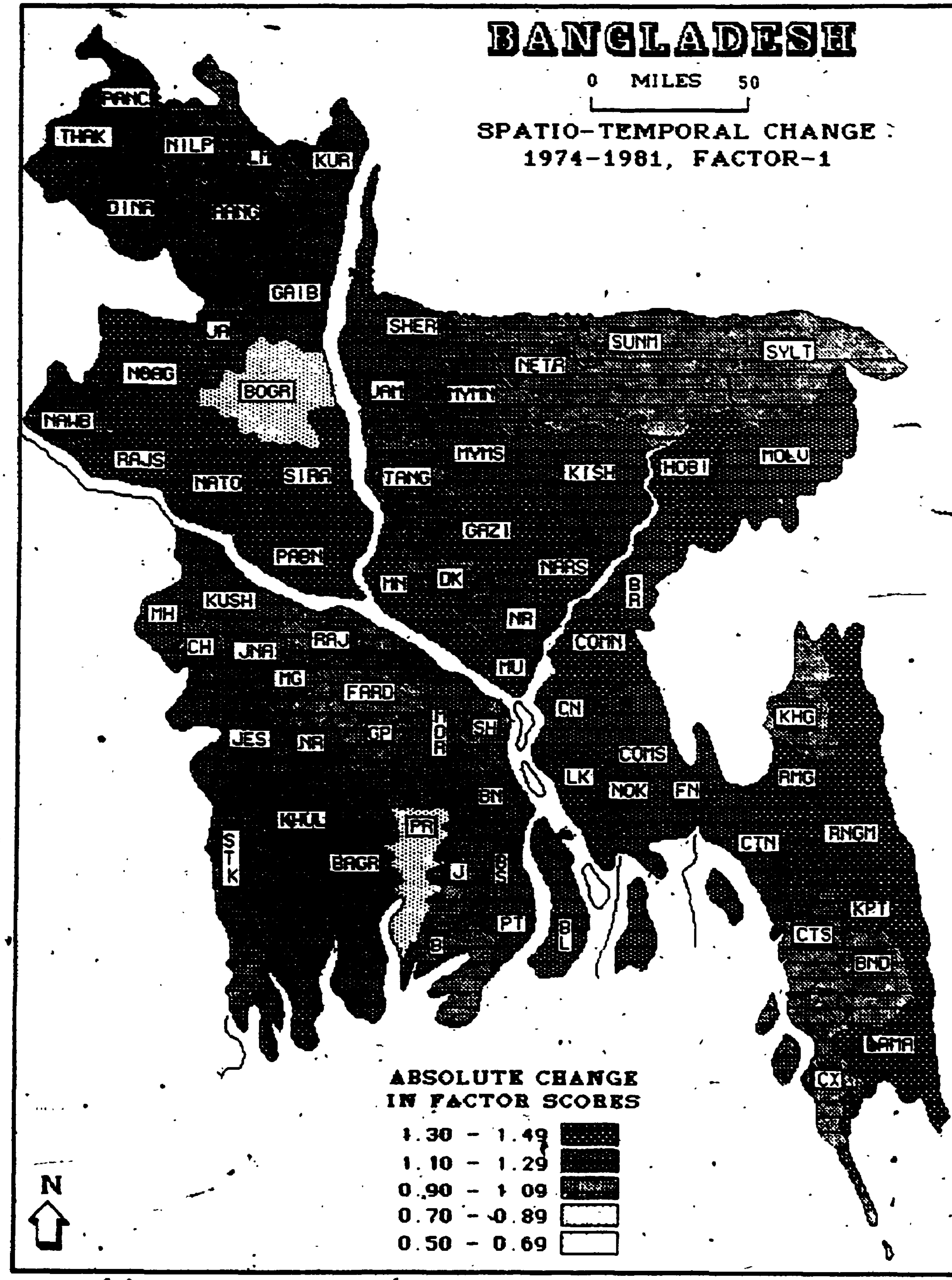
COMS
LK
NOK
FN
RMG
KHUL
PR
CTN
RNGM
S T K
BAGR
J
PT
KPT
CTS
BND
LAMA
CX
ABSOLUTE CHANGE
IN FACTOR SCORES
1.30 - 1.49
1.10 - 1.29
0.90 - 1.09
0.70 - 0.89
0.50 - 0.69
N

Figure. 6.1x

remembered that the time period between 1960 and1970 was dominated by the Pakistani neo-colonial development policy, residual and peripheral in nature (Chapter 3)

Temporal changes in the post independence period between 1974-1981 (Figure 6.1y) are even more significant. With the exception of Bogra and Pirojpur Districts (where changes are recorded between +0.70 to +0.89), the whole country experienced a high positive change in factor scores, ranging from +0.90 to +1.49 Given the new government policy of Bangladesh since 1974, and the increased influence of UN stimulated policies in the later decade, such an improvement in the general socio-economic structure is quite considerable

The most encouraging aspect, however, remains the general improving scores for all Districts and Factor 1 provides the best indication that, over the 1960-1980 period none of the districts reported any negative change The major dimension trend therefore, has been one of positive development, albeit at a comparatively low level. This finding supports hypotheses 2a and 2e (Chapter 1, pp 23-25) With respect to composite variable assessment, it was expected that this would reveal a changing pattern of regional development over the study period in which increasing numbers of districts would evidence the effects of development, and that the overall "measure" of change would incorporate a higher degree of integration of districts within the national fabric It was also expected, however, that the relative positive change in Bangladesh would be of moderate dimensions, and would reinforce the need for greater emphasis on integrated regional development in future Factor 1 supports


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, FACTOR-1
PANC
THAK
NILP
KUR
DINA
GAIB
SHER
SUNM
SYLT
NETR
NAWB
BOGR
JAM
MYMN
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLU
GAZI
PABN
MN
DK
NARS
KUSH
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FARD
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JES
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COMS
LK
NOK
FN
RMG
KHUL
PR
STK
BAGR
J
CTN
RNGM
PT
KPT
CTS
BND
BAMA
CX
ABSOLUTE CHANGE
IN FACTOR SCORES
1.30 - 1.49
1.10 - 1.29
0.90 - 1.09
0.70 - 0.89
0.50 - 0.69
N

Figure 6.1y

hypotheses and represents the most important empirical finding of the study.

Each of the remaining six factors, however, are also significant, and introduce more specific spatial and temporal variation to the major dimensional pattern of Factor 1. The other dimensions of development relate to more specific aspects of Health (Factor 2), Housing Structure (Factor 3), Agricultural Structure (Factor 4), Rural Dependency (Factor 5), Agricultural Intensification (Factor 6) and Rice Productivity (Factor 7)

Factor 2: Health Care and Facilities

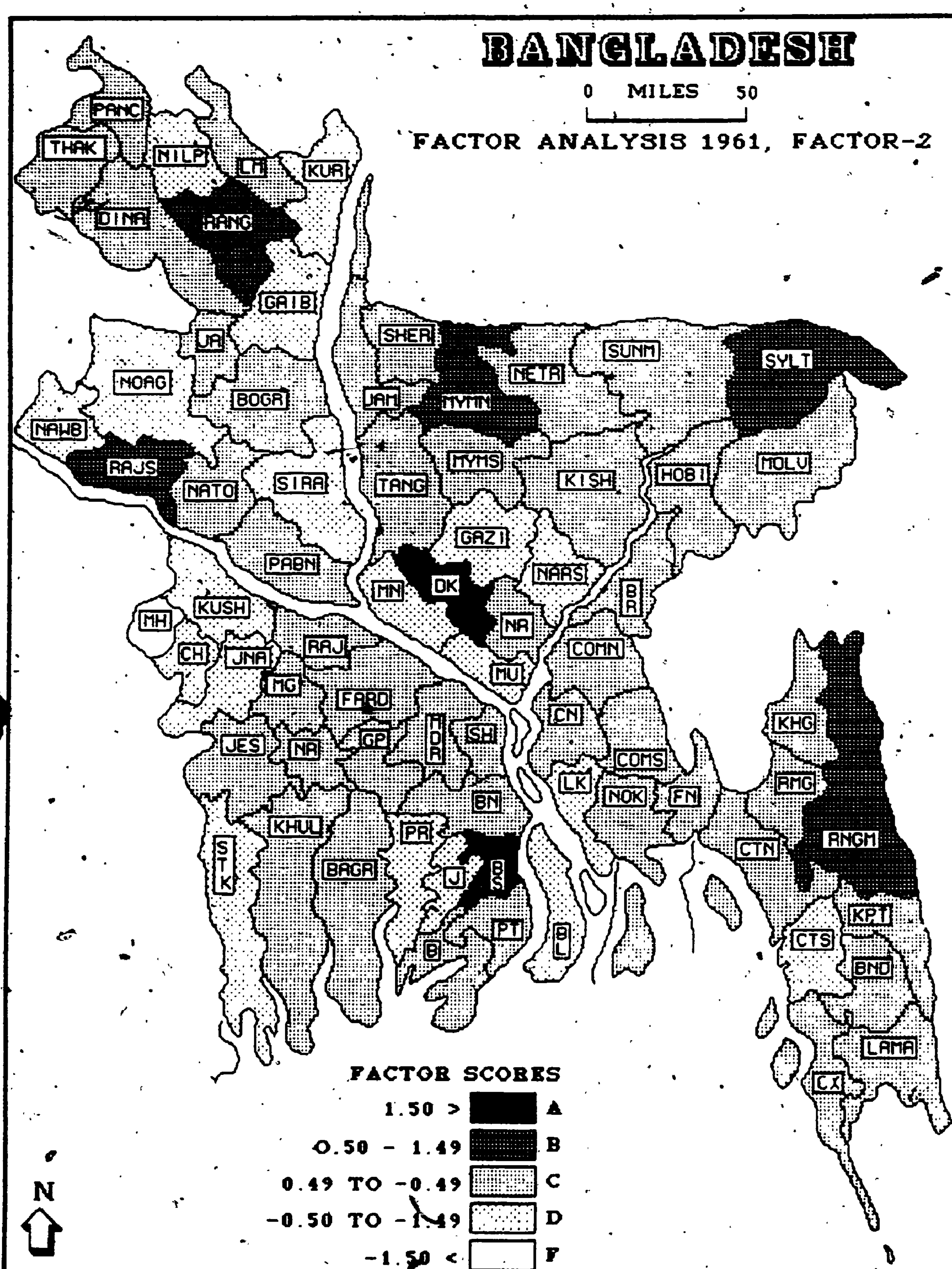
The second dimension of development is Factor 2 (Table 6.3), which is marked by a narrower set of variables than Factor 1, an eigenvalue of 4.1 and an explanation of 13 per cent of total variation. Clearly identified are the positive incidence of doctors (AVDOC), hospital beds (AVHBD) and nurses (AVNRS) per 50,000 people, hence the designation of the Factor as Health Care and Facilities. Other significant variables include household amenities (TOILT, DBATH), the availability of banks (AVBNK), and employment in the managerial (MANGR) sector. Overall, however, this dimension is more narrowly defined than Factor 1.

In concrete terms, Factor 2 correlates positively with AVDOC (+.91), AVHBD (+.79), AVNRS (+.77), TOILT (+.56), DBATH (+.55), AVBNK (+.53) and MANGR (+.50). Variables that load high on Factor 2 are classified into two broad groups such as loadings ranging (+/-) .50 to (+/-) .74 are placed in one category and loadings indicating (+/-) .75 and above are placed in a separate group. For an easier interpretation of Factor 2, loadings lying below +/- (.50) are ignored. Giving consideration to the classification scheme it is evident that the variables that load high (+/- .75 and above) are those related to Health Care and Facilities and those of lower rank related with household amenities. Since, TOILT, DBATH and MANGR also load at greater than 0.50 on Factor 3, these variables are given less weight in the labelling process of Factor 2. Further, the association of these variables (household amenities) with Factor 3 is easier to interpret than their association with Factor 2. However, an exception is AVBNK which is moderately loaded on Factor 1 in the first instance and again on Factor 2. As a result, AVBNK is interpreted primarily within Factor 1 (above).

Although relatively weak loadings are generally ignored, a weak negative correlation of AGRIC (-.31) on Factor 2 is interpreted to mean that the Districts with higher provision of health care and facilities possibly have a lower percentage of agricultural employment and vice-versa. Health care facilities are rather scarce resources and distributed very selectively by the government across the country, and with some mainly 'urban' districts having the initial advantage due to facilities established prior to 1960. The nature of health care, therefore, gives potential for both temporal and spatial variation, which is, in fact, well illustrated in the dimensional mapping of Factor 2. Therefore, districts which are more agriculturally oriented are more likely to be neglected in the provisions of Health Facilities. It must be noted that although there is a positive relationship between health care services (i.e. physicians) and facilities (i.e. hospitals)- the former is more private than public. The demand for physicians in Bangladesh is constrained by a fee-for-service relationship so that although predominantly rural-agricultural areas have a considerable demand for health care services they may not be available because of inability to attract physicians as well as the lack of health care facilities (i e hospitals) However, the factor scores suggest that there are internal variations even among the advantaged districts (Appendix II)

Factor 2- Spatial and Temporal Change

Scores for Factor 2 (Health Care and Facilities), in 1961, are shown in Figure 6 2a and confirm the degree of localization in a few districts at the start of the study period The highest scores are found in the capital (Dhaka District), and five other widely scattered urban districts (Rangpur and Rajshahi in the Northern Division, Mymensingh North in the Central Division, Sylhet and Rangamati in the Eastern Division and the anomalous case of Barisal South in the Southern Division) Localization of Health Care and Facilities in just 7 districts largely reflects the fact that specific facilities were established by public policies prior to 1960 One additional reason for the Rangamati District's prominance is due its sparse population distribution that increases the level of service provision per unit of population. Dhaka stands out as the best supplied District (5 15), followed by Barisal South (3 9) and Mymensingh North (1 2). The four other higher districts record scores of less than 1.00 The initial spatial structure of Factor 2 indicates that relatively advantaged Districts were those that had long been provided with medical college and superior hospital facilities Districts reporting a high level of


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1961, FACTOR-2
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
SHER
JAM
MYMN
NETR
SUNM
SYLT
MYMS
TANG
KISH
HOBI
MOLV
GAZI
PABN
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DK
NARS
BR
NR
KUSH
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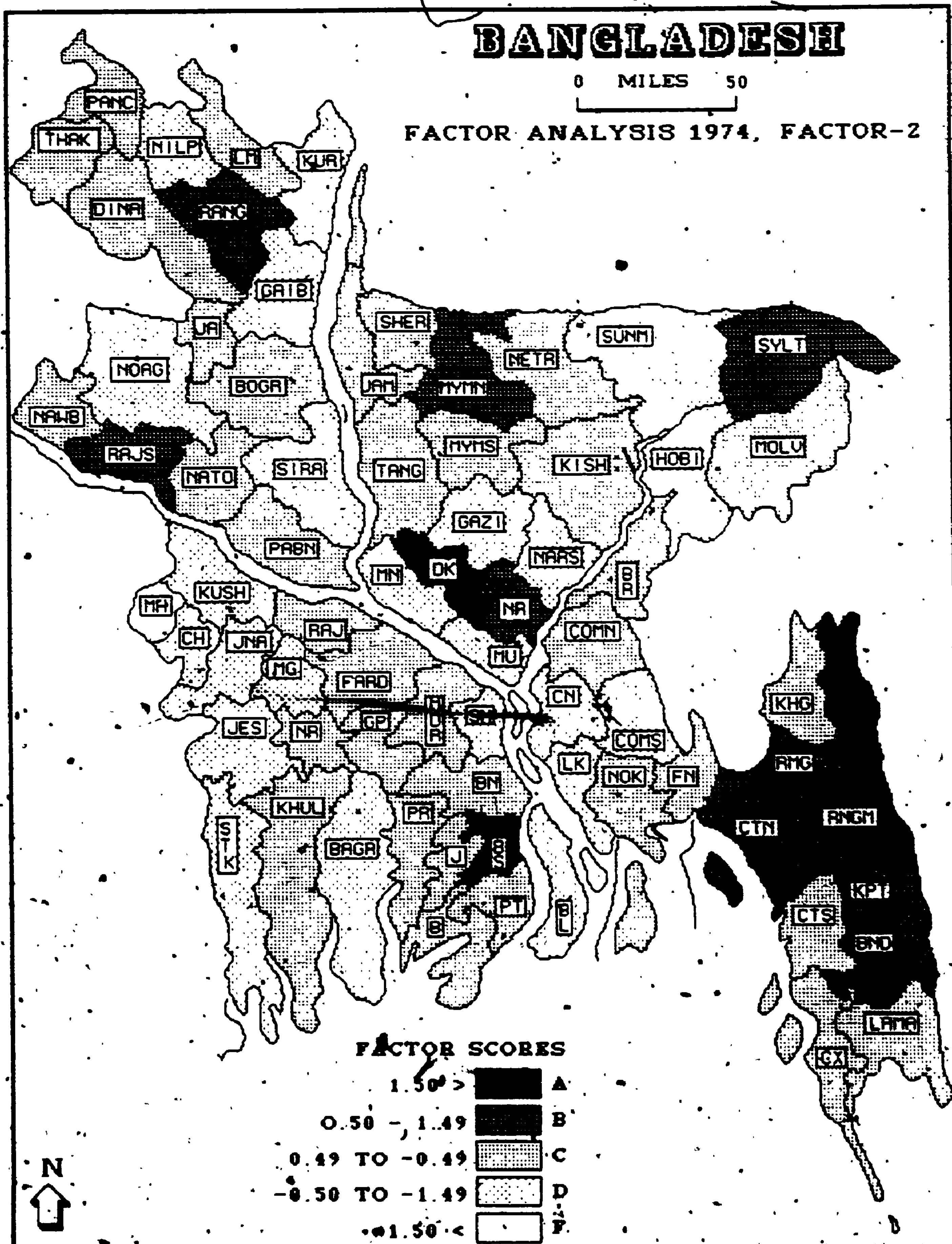
CH
JNA
RAJ
MU
COMN
MG
FARD
CN
JES
NA
GP
MDR
SH
COMS
KHG
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

Figure 6.2 .

health service provisions in 1961 were a very selective set of Districts, and significantly excluded both Chittagong and Khulna. This explanation may be confirmed by refering to the Z score distribution of average number of physicians per 50,000 population/AVDOC (Figure 5.12a). Although Chittagong and Khulna Districts scored positively high in the distribution of AVDOC in 1961 (including also Kushtia and Fridpur Districts), a general lack of hospital beds (AVHBD) and nurses (AVNRS) per 50,000 population were the decisive factors for their exclusion from the advantaged group. In fact, Khulna still (1980s) lacks a medical college and superior hospital facilities compared to other urbanized districts. On the other hand, the master plan of Chittagong Medical College and Hospital was initiated in the early 1960s. As a result Chittagong did not show up prominently until after1961. It must be noted that average number of physicians per 50,000 population (AVDOC) may be considered as a private consumer service. However, hospital beds and registered nurses may not be treated as private, rather they are public goods and services, at least in the context of Bangladesh. Although there is a relationship between doctors, hospital beds and nurses, the latter two were the most dominent factors in giving a localized shape to the distribution of Health Care and Facilities.

In 1961, pockets of disadvantage with respect to relatively low scores (below the national mean) are found in the Central Division mainly concentrated in the districts around Dhaka (Munshiganj, Manikganj, Gazipur, and Narshingdhi), in the Northern Division where two pockets of relative disadvantage occured in the Districts around Rajshahi and Rangpur (Nawabganj, Noagaon, Serajganj, Gaibandha, Kurigram and Nilphamari) and in the Southern Division where a continuous belt of relative disadvantage formed in the moriband delta plain (along the India-Bangladesh border) extending from the District of Kushtia in the north to Satkhira in the south and including Meherpur District which recorded the lowest score Another pocket of disadvantage is noticed in districts around Barisal South, namely Perojpur, Jhalokati and Bhola (Figure 6 2a) Pockets of disadvantage centred around four advantaged districts (i.e. Dhaka, Rajshahi, Rangpur and Barisal South) suggest that health care facilities were not sufficiently developed to have influence beyond the local population. Overall, however, in 1961 the majority of the rural districts (over 40) recorded a condition close to the national mean.

The relative spatial pattern of scores on Factor 2 remained relatively stable in 1974 (Figure 6.2b), with only the additions of Narayanganj, Chittagong North, and 3 other districts in the Chittagong Hill-Tracts (Ramgarh, Kapti and Bandarban) to the ranks of high-scoring districts. Overall, however, the 1974 distribution records an expansion of negative scores (low level of health care facilities), especially in the South and Eastern Divisions Sunamganj, Hobiganj, Chandpur and Comilla South Districts in the Eastern Division and the moribund delta in the Southern Division, including Bagerhat, Jessore and Magura Districts suffered a relative decline, while the Northern Division remained disadvantaged in broad terms. However, there was a moderate expansion of positive scores in association with urbanized districts (i.e. Chittagong and Narayanganj) and sparsely populated areas (i.e. the Chittagong Hill-Tracts)


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1974, FACTOR-2
PANC
THAK
NILP
LA
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MOLV
HOBI
KISH
MYMS
TANG
GAZI
NARS
DK
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MA
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FARD
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SH
CN
COMS
LK
NOK
FN
KHG
RMG
CTN
RNGM
KPT
CTS
BND
LAMA
CX
KHUL
BAGR
STK
PR
BN
J
BSO
PT
B
BL
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

Figure 6.2b

In 1981 (Figure 6.2c), the incidence of high scores on Factor 2 again depicts a pattern somewhat similar to that of 1961 and 1974. However, there is evidence of relative improvements in Thakurgaon, Dinajpur, Narail, Barisal North, Khagrachari and Lama Districts and the incidence of low scores is greatly reduced in the moribund delta. In the Eastern and Central Divisions, Hobiganj and Munshiganj Districts both gained, whereas Kishoreganj District experienced a relative loss. A relative decline is also noticed in Chittagong North District; this is probably because of excessive population pressure on limited health care facilities in 1981, which in turn, reduces the level of service provision (per unit of population) in this district. Although Chittagong North is the second largest urbanized district in the country, its health service facilities did not grow at a rate which kept pace with population growth. On the other hand, Khulna District without any medical college facilities, exhibits little or no change in terms of the relative spatial pattern. Factor scores (Appendix IV) suggest that although number of districts representing medium to upper medium condition increased to some extent by 1981, it is those initially advantaged and some hilly districts which experienced the maximum gains. For example, Bandarban scored highest (5.3) followed by Dhaka (5.2), Kapti (3.0), Barisal South (2.5), Rangamati (2.5) and Mymensingh North (2.2) Districts. Districts recording scores from 1.00 to 1.99 are Sylhet, Rangpur and Ramgarh. All other 1981 positively scored districts have values below 1.00.

Reflecting the uneven distribution of Health Care and facilities at the three points in time, the changes over the two time periods also exhibit an uneven pattern. However, the greater distinction is in

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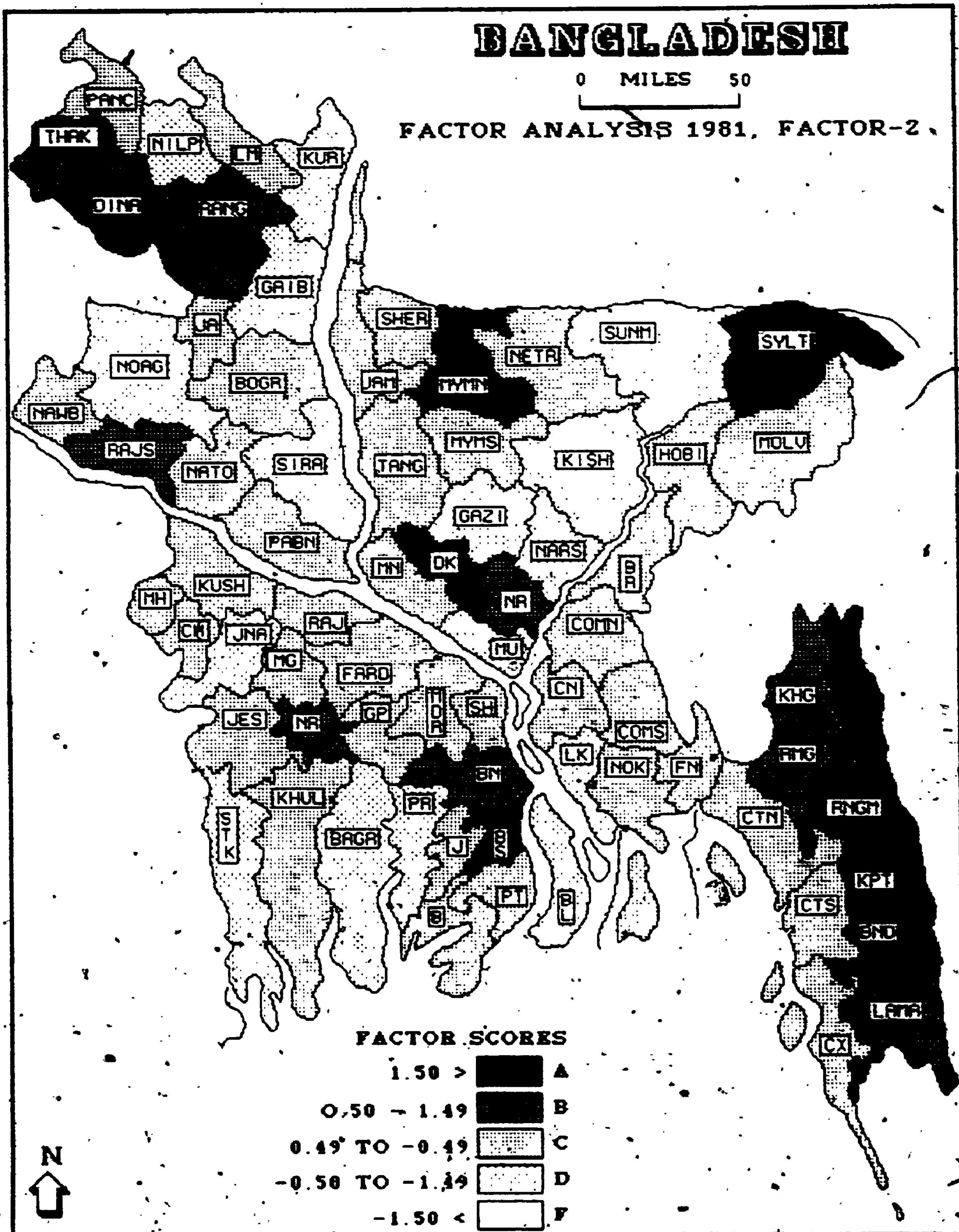
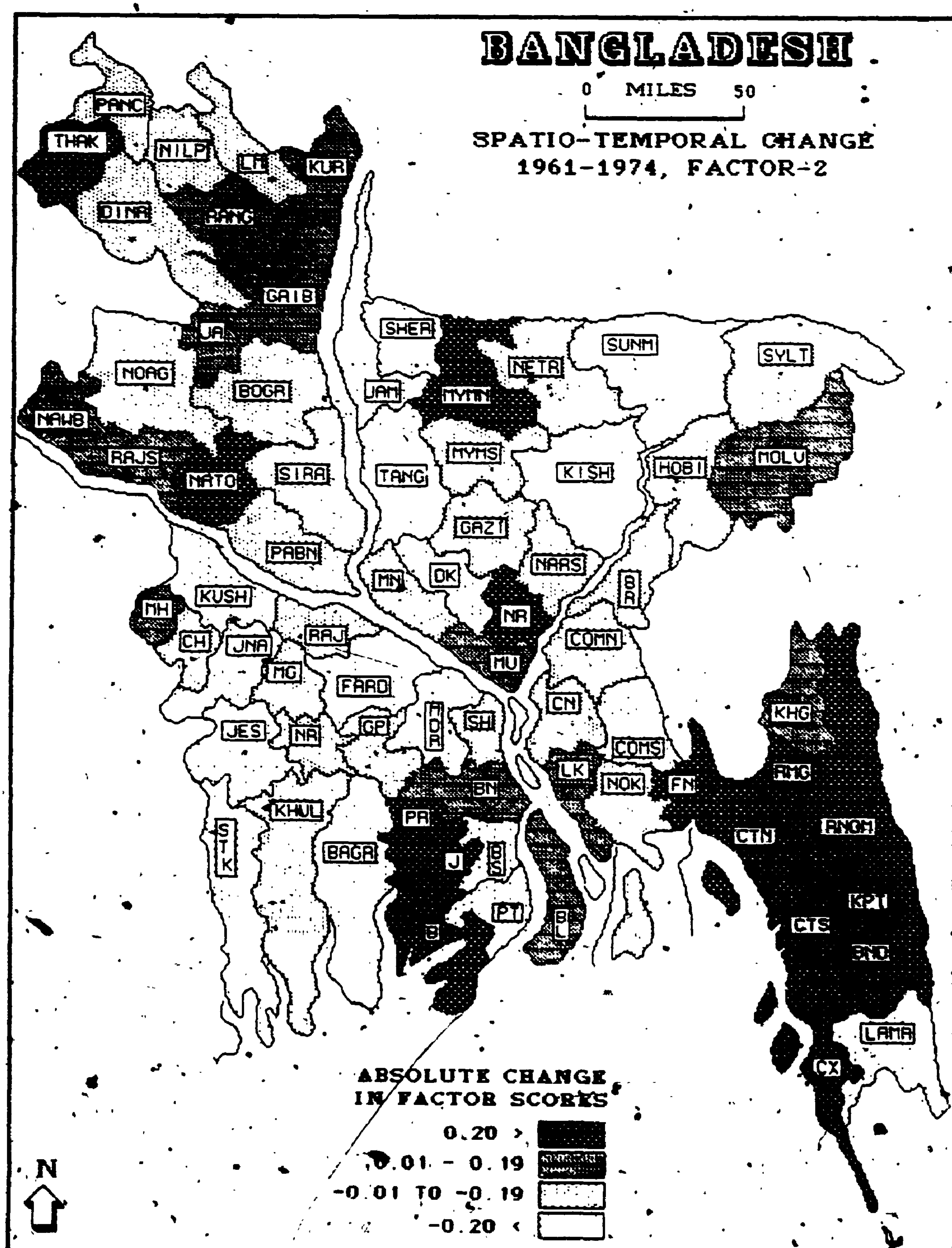


Figure 6.2c

the direction of change in the two time period. It should be marked, however, that the dimensions of change are less than those identified for Factor I. Between 1961 and 1974 (Figure 6.2x) the greatest positive changes occured in Chittagong North, Chittagong South, Cox's Bazar, Mymensingh North, Narayanganj, Natore, Thakurgaon, Pirojpur, Jhalokati, Barguna Districts, and the Chittagong Hill-Tracts, a mixture of urban and rural districts. Change in the Hill-Tracts reflect the provision of some service to a much less densely populated region. Similar positive changes at a lesser degree are also noticed in the lower active delta (Barisal North, Bhola) and in the Northern Division (Rangpur, Kurigram, Gaibanda, Jaipurhat, Nawabganj and Rajshahi Districts). However, temporal changes below the national average were recorded for a majority of all districts. The greatest extent of decline occured in the Southern and Central Divisions and to a lower extent in the Northern and Eastern Divisions. It is interesting to note that Dhaka also experienced a negative change.

In contrast, between 1974 and 1981 (Figure 6.2y) positive changes are more common and significant, indicating that majority of the districts (54 of 71) in Bangladesh experienced an increase in Health Care and Facilities at a rate above the national average. With the exception of 3 small pockets (Kishoreganj, Gazipur and Narsingdi Districts in the Central Division, lower active delta and the Chittagong coastal plain) the whole country emerged as having experienced modest improvement in health care facilities. Thus, an overall finding is that, even with a localized pattern of Health Care and Facilities in the base year, accompanying a low level change in service provisions that took place between 1961 and1974, the post civil


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, FACTOR-2
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
MOLU
HOBI
KISH
MYMS
TANG
GAZI
NARS
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NR
MU
BR
COMN
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NR
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CN
COMS
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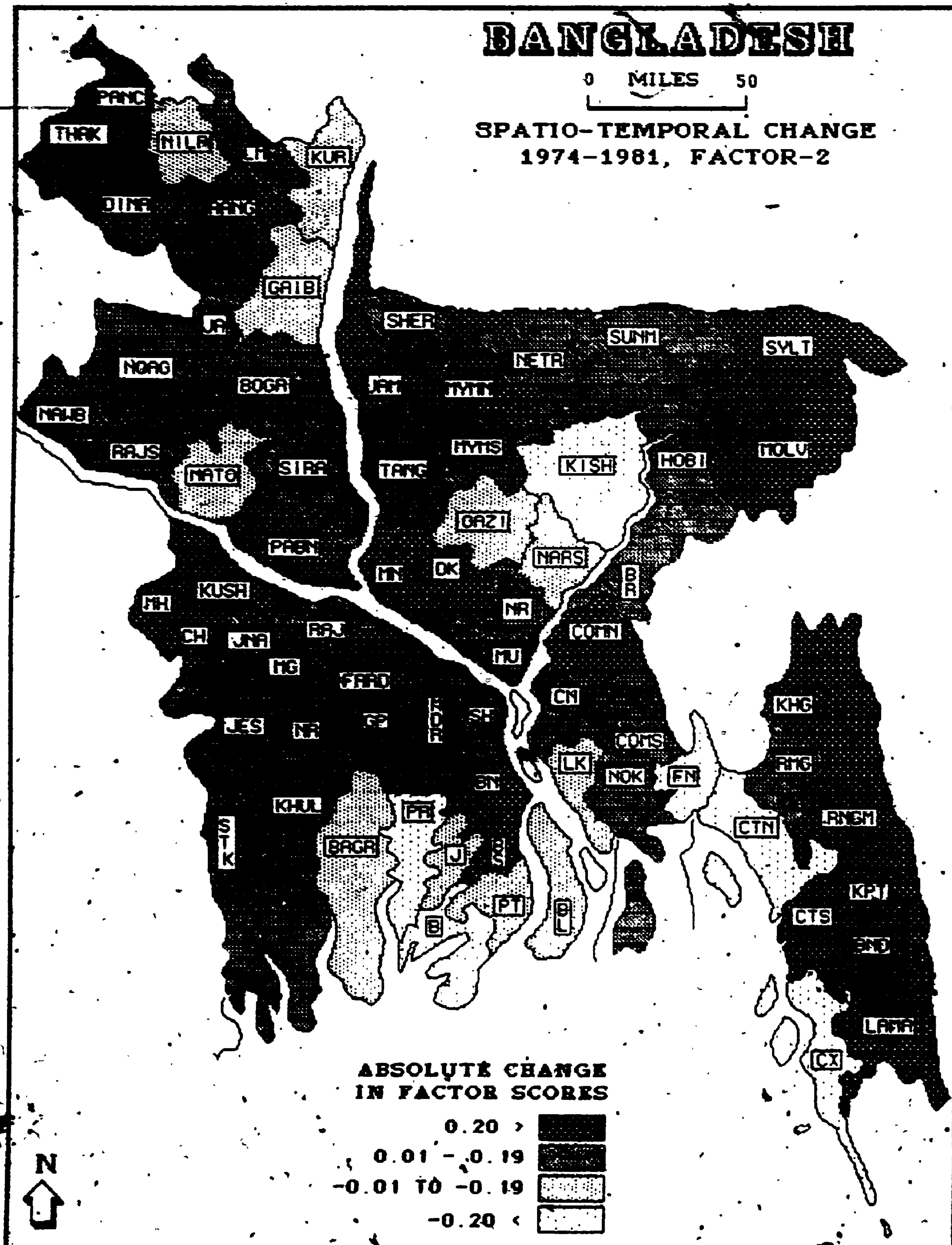
NOK
FN
KHG
RMG
KHUL
STK
BAGR
PR
BN
J
BS
PT
BL
B
CTN
ANOM
KPT
CTS
BND
LAMA
CX
ABSOLUTE CHANGE
IN FACTOR SCORES
0.20 >
0.01 - 0.19
-0.01 TO -0.19
-0.20 <
N

Figure 6.2x


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, FACTOR-2
PANC
THAK
NILP
KUR
DINA
GAIB
JR
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
KUSH
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COMN
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FARD
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JES
NR
SH
COMS
LK
NOK
FN
KHG
RMG
BN
KHUL
PR
STK
BAGR
J
CTN
PT
B
BL
KPT
CTS
LAMA
CX
ABSOLUTE CHANGE
IN FACTOR SCORES
0.20 >
0.01 - 0.19
-0.01 TO -0.19
-0.20 <
N

Figure 6.2y

war period of development (1974-1981) provides evidence of progress in public health investment. This is further support for the initial hypothesis that the level of increase in social service provisions would be more pronounced in the 1974-1980 period than in the 1961-1974 period (Chapter 1, Hypothesis # 2a; p. 24).

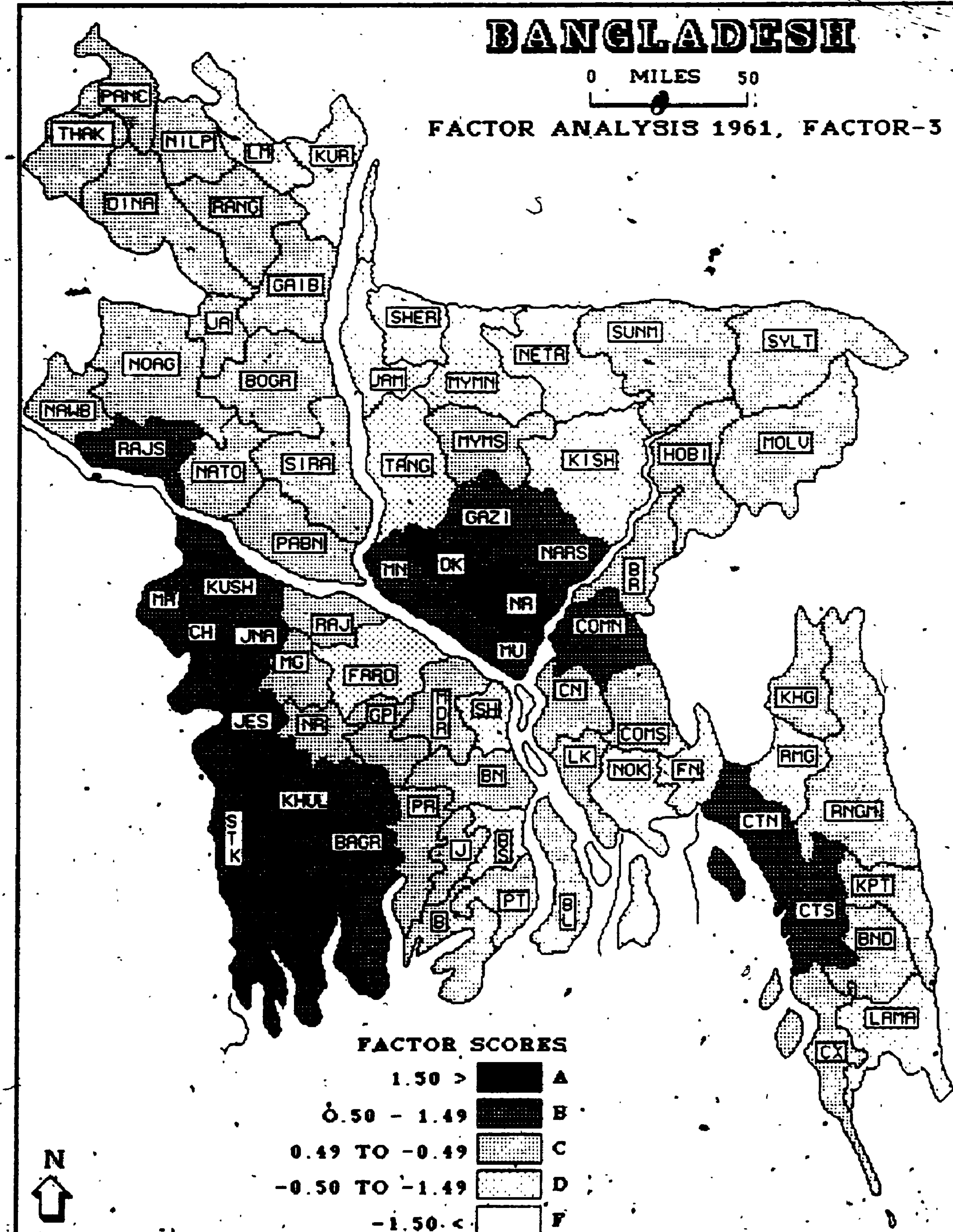
Factor 2 is orthogonally related to Factor 1 and there are fundamental differences in the spatial and temporal characteristics of the two Factors. Factor 1 describes a rather homogeneous spatial pattern and a positive temporal shift over the whole country during the whole study period (above). Factor 2, however, reveals a markedly heterogeneous spatial pattern at each time period, and varied directions of change over time. Despite overall socio-economic improvement in the country as a whole and including health variables (Table 5.1) Health Care and Facilities remained a distinct dimension because of its localized pattern of concentration. A few Districts (Dhaka, Mymensingh North, Barisal, Rajshahi, Rangpur, Sylhet, Barisal) which had the initial advantage of superior medical college and hospital facilities in relation to their population size, were the most favoured areas in the localized pattern of Health Care Facilities. Temporal differentiation varies in both a positive and negative fashion; changes between 1961 and 1974 are generally negative across the country, but there is a major positive shift between 1974 and 1981.

Factor 3: Housing Structure

The third dimension within which certain variables are associated is Factor 3, which includes some variables least represented in Factor 1 and Factor 2 (Table 6.3). Factor 3 keys on house construction material, particularly percentage of house wall by cement and bricks (HWBRK) and percentage of house roof by cement and bricks (HRBRK), as ~~well as~~ household amenities (TOILT, DBATH) and administrative, managerial, technical and professional employment (MANGR) It yields an eigenvalue of 2.4 and accounts for about 8 per cent of the total variation in the data set (Table 6.2) The naming of Factor 3, 'Housing Structure' derives from the high positive correlations of HWBRK (+.84) and HRBRK (+.83), while other positive loadings for DBATH (+.53), TOILT (+.51) and MANGR (+.51) indicate an association between housing structure and household amenity. The moderate positive loading of MANGR on Factor 3 suggests that districts where the percentage of labour force engaged in administrative, managerial, professional and technical services are higher are more likely to have good housing with household amenities. A rather weak, negative loading of BIRTH (-.37) on Factor 3 implies the notion that districts which have relatively higher percentage of good housing will have lower birth rates. On the other hand, good housing and household amenities are essentially urban characteristics and are often associated with affluent economic class (i.e. MANGR). Nevertheless, the incidence of good housing and certain household amenities are not confined to or universal within "urban" districts, and higher values are also found in a few rural districts, due either to (local) availablility of brick construction materials or possibly, to metropolitan influence on surrounding areas. Consequently, the patterns of association of good housing is only partially "urban" on a district comparison basis.

Factor 3- Spatial and Temporal Change

The spatial patterns of Factor 3 are illustrated through the dimensional analysis in Figures 6 3a (1961), 6.3b (1974) and 6 3c (1981) and are relatively stable for the 3 time periods In positive terms, Housing Structure is strongest in terms of consistently identifying the four districts with the largest urban centres, namely Dhaka, Nârayanganj, Chittagong and Khulna together with the extended zones of rural districts around them a pattern that expands between 1961 and 1974 and then contracts to a repeat of 1961 between 1974 and 1981 To be more specific, the situation in 1961 (Figure 6 3a) reveals that there are three major clusters of districts representing high positive scores One cluster includes Districts in the Central Division centred on Dhaka and Narayanganj, and including Manikganj, Munshiganj, Narshingdhi and Gazipur as well as Comilla North in the Eastern Division. It must be stressed that with the exception of Dhaka and Narayanganj, the five other districts are predominantly rural Factor scores indicate that Dhaka District has the value of 2 6 which is highest in the country (Appendix II) However, four other districts, three of which are rural (Munshiganj, Manikganj and Narsingdi) record scores of between greater than 1 00 and less than 2.00. Although Narayanganj (1 5) is the fourth largest urbanized district, nevertheless it has a large rural component. The localized pattern of good housing in the Central Division suggests the influence of the major metropolitan agglomeration and specifically Dhaka the capital city as the centre from which more permanent building types diffuse


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1961, FACTOR-3
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
JAM
MYMN
NETR
NAWB
RAJS
NATO
SIRA
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KUSH
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JNA
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FARD
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KHG
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RMG
BN
KHUL
STK
PR
CTN
RNGM
BAGR
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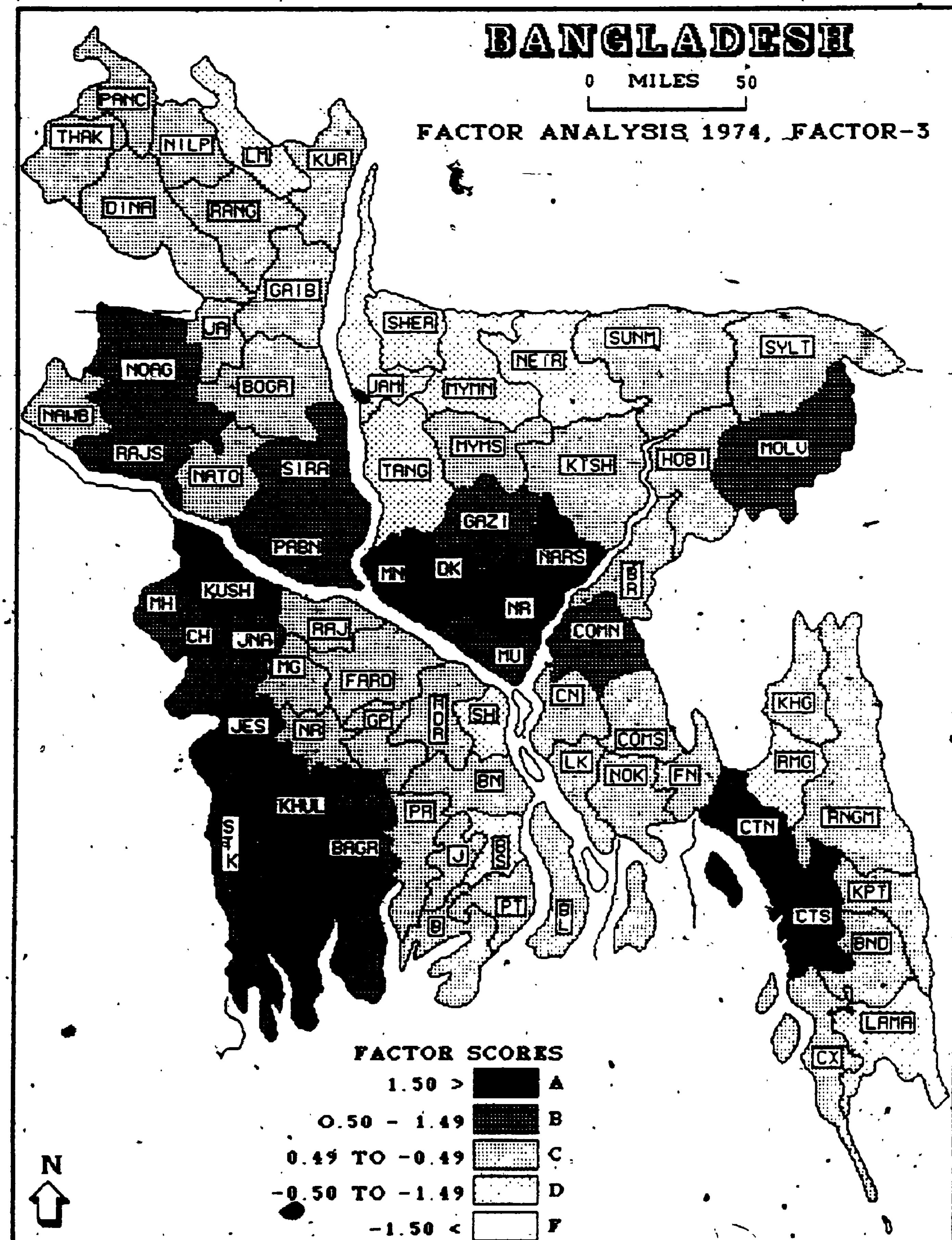
BS
PT
BL
KPT
B
CTS
BND
LAMA
CX
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

Figure 6.3a

Another cluster of Districts is noticed in the Eastern Division including Chittagong North and Chittagong South with factor scores recorded for both the districts of around 1.00 The remaining group of Districts comprised a continuous belt in the Southern Division stretching along the Bangladesh-India border (moribund delta plain) from Rajshahi in the north to Satkhira in the south Only three districts in this continuous belt (i.e. Khulna 1.3, Jessore 1.2 and Kushtia 1.5) recorded scores greater than 1.00 (Appendix II) Although all three groups include both "urban" and "rural" districts the spatial patterns of relatively high scores centre around a few primary "urban" districts which as discussed in Factor 1, have a tendency to dominate the development surface The exception is the moribund delta which, as a largely flood free zone and with the availability of building construction materials (i e bricks), stands out as a region of better housing.

Lower scores on Factor 3 in 1961 are concentrated in the Brahmaputra and the eastern Jamuna flood plain areas extending from Jamalpur in the north-west to Kishoreganj in the south-west of the Central Division. This is a major pocket of relative disadvantage. This pattern may be explained by referring to the low Z values (negative) on HWBRK in these areas (Figure 5 4a) which are dominated by indicators of poor housing (i e bamboo, wood, straw, leaves) A general lack of personal means, tempered by both cultural norms and physiographic constraints (Figure 3.3c) determine the types of dwellings in which people live in this area.

Figure 6 3b shows spatial patterns for Factor 3 in 1974. The 1961 patterns of high scores have expanded somewhat Out of 71, fourteen



BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1974, FACTOR-3
PANC
THAK
NILP
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KUR
DINA
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SHER
SUNM
SYLT
NOAG
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JAM
MYMN
NAWB
MOLV
MYMS
RAJS
KTSH
HOBI
NATO
SIRA
TANG
GAZI
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KUSH
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COMN
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FARD
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KHG
JES
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ADR
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COMS
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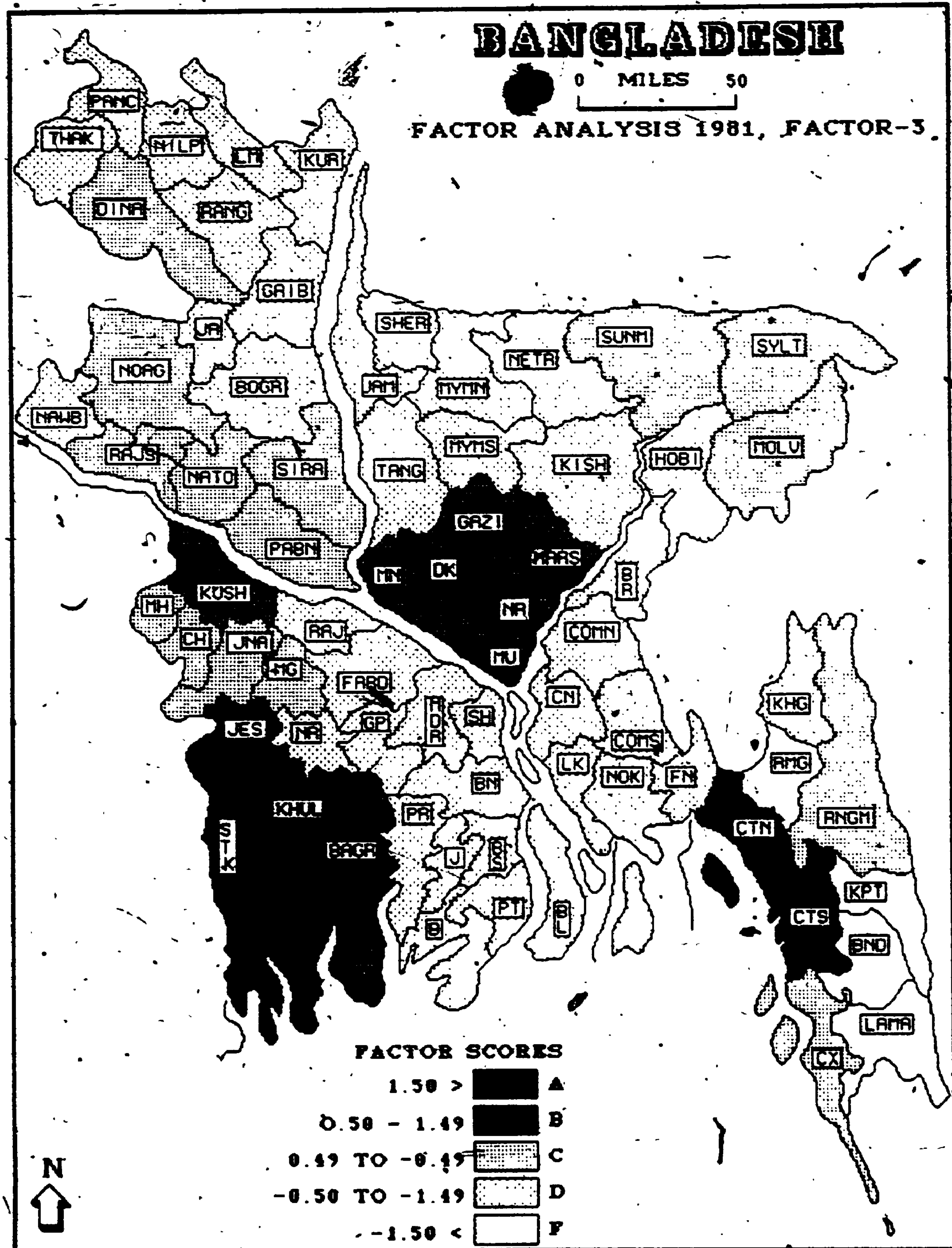
RMG
BN
KHUL
PR
CTN
RNGM
SK
BAGR
J
BS
KPT
PT
BL
B
CTS
BND
LAMA
CX
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

Figure 6.3b

districts (Appendix III) reported scores above 1.00 compared to nine districts in 1961. Significant increases were recorded for each of the high scoring zones in 1961, including Dhaka, Narayanganj, Chittagong and Khulna and the moribund delta. In addition, there was an expansion of relatively high scores, especially in the Northern Division, notably in Pabna, Sirajganj and Noagaon Districts, and in the north-east; Molvi Bazar District is included in the upper medium category. These districts were previously lagging but record high scores in 1974. An improved condition from the below average (in 1961) to an average level is also noticed in Kishoreganj, Noakhali, Feni and Faridpur Districts. Although increase in good housing has its maximum impact in a few urbanized districts (i.e. Dhaka, Narayanganj, Chittagong and Khulna), strong incidence in other rural districts, particularly around Dhaka and Khulna, and their spread in the Northern Division suggest that better housing was no longer a purely urban component.

Figure 6.3c depicts spatial patterns on Factor 3 for 1981. Most noteworthy is the contraction of high scoring districts from the 1974 situation. With the exception of original (1961) three dominant advantaged clusters of districts, most parts of the country illustrated a condition of relative disadvantage. Only eleven districts (out of 71) recorded scores above +1.00 in 1981 (Appendix IV) compared to fourteen districts in 1974. A greater reduction in factor scores even in the advantaged clusters suggest that in terms of housing, the country as a whole experienced a post civil-war depression. After 1974 it was not possible either to fund the building materials nor to keep up with the demand for new housing of better quality.

5


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1981, FACTOR-3
PANC
THAK
NILP
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KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
NETR
SUNM
SYLT
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KISH
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KHUL
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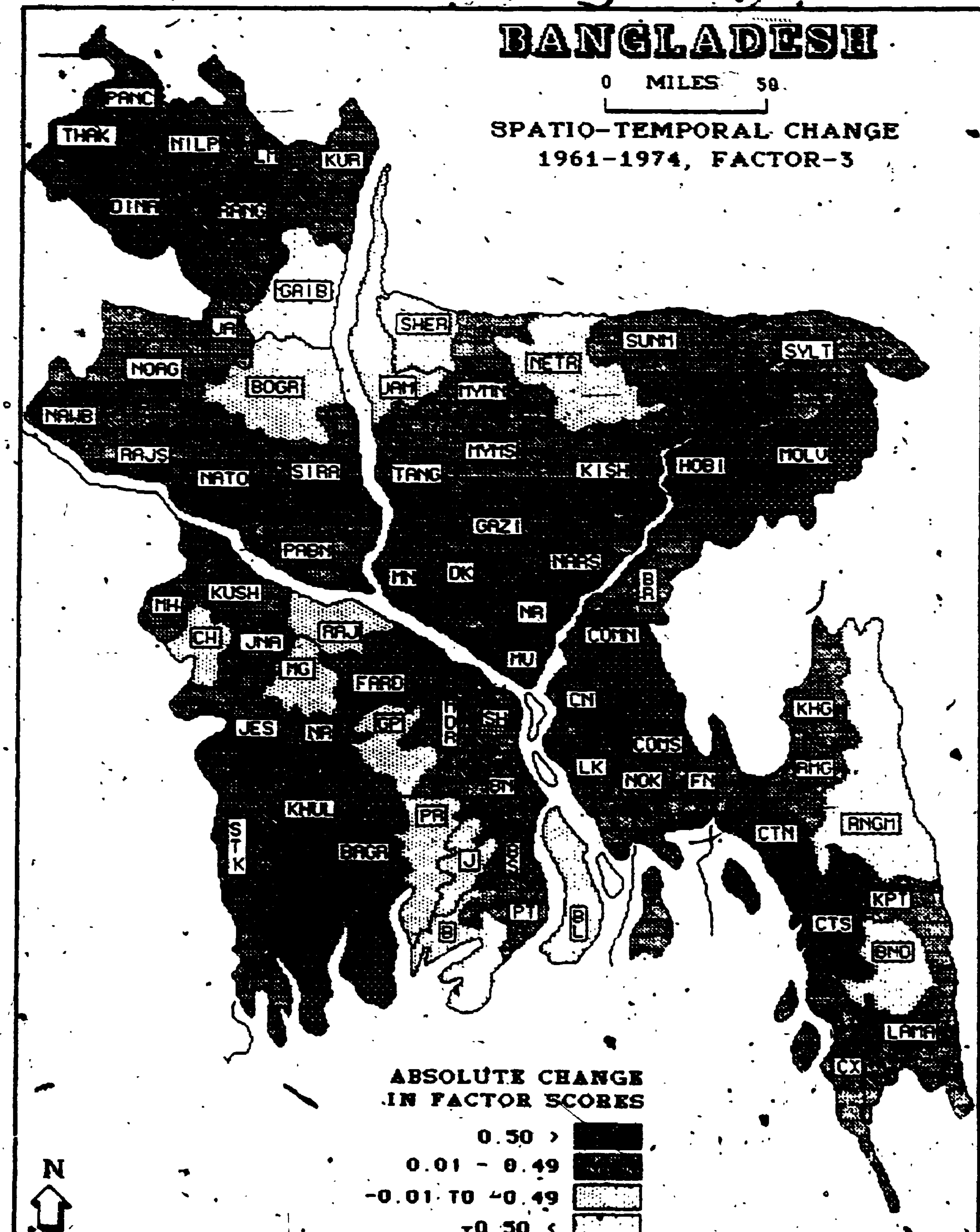
CTS
BND
LAMA
CX
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
- -1.50 < F
N

Figure 6.3c

Spatio-temporal changes between 1961 and 1974 are recorded in Figure 6.3x which identifies the positive changes in factor scores that took place in most part of the country, with the exception of only a few cases in the marginal areas (i.e. lower active delta, the Jamuna flood plain and the Chittagong Hill-Tracts). The worsening of the situation is evident by the overwhelmingly occurance of negative changes in factor scores between 1974 and 1981 (Figure 6.3y). Explanation for an overall negative change across the national space is provided above. However, there should be some other type of explanation for the relative disadvantage in specific areas associated with negative growth. For example, housing in the active delta has traditionally been provided by plentyful supplies of wood and leaves from the southern "mangrove" forest. As a result, housing structure in this particular area is tempered by cultural norms and to some extent by physiographic constraints (relatively low lying land and with hundreds of rivers meandering over the region). On the other hand, the Chittagong Hill-Tracts are dominated by the tribal people. They are not a sedentary farm population, but practice shifting cultivation throughout the area. As a result, quality housing of a rather permanent nature is not a suitable option for them in this region. Because of sparse population distribution, bamboo made housing of a temporary type is largely found in the Hill-Tracts. Relative poverty is another important economic factor which precludes them from choosing good housing option. Although availability of bamboo and wood play an important role in the housing in Hill-Tracts, nevertheless, they are complemented by difficult physical settings. In the Northern Division, mud built housing


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, FACTOR-3
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
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SIRA
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HOBI
MOLV
GAZI
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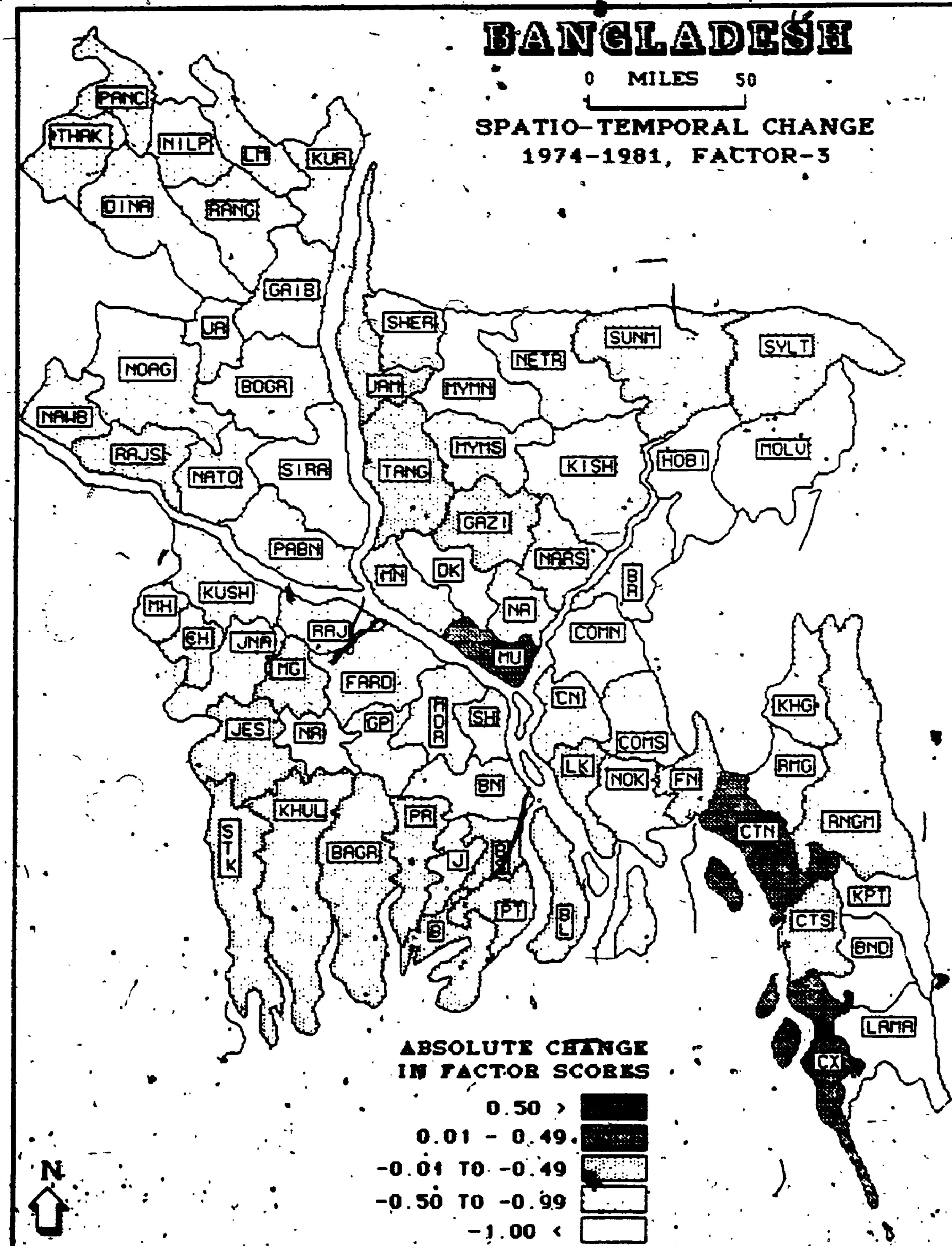
RMG
KHUL
PR
CTN
RNGM
STK
BAGR
J
PT
BL
KPT
CTS
BND
LAMA
CX
ABSOLUTE CHANGE
IN FACTOR SCORES
0.50 >
0.01 - 0.49
-0.01 TO -0.49
-0.50 <
N

Figure 6.3x


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, FACTOR-3
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
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HOBI
MOLV
GAZI
PABN
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DK
NARS
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FARD
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KHG
JES
NR
GP
MDR
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
BS
KPT
PT
BL
CTS
B
BND
LAMA
CX
ABSOLUTE CHANGE
IN FACTOR SCORES
0.50 >
0.01 - 0.49
-0.01 TO -0.49
-0.50 TO -0.99
-1.00 <
N

Figure 6.3y

structures are the dominant type, also tempered by local cultural norms and reflecting the poor personal means of people in this region.

The 1974-1981 trend may be confirmed by referring to the national mean value of the percentage of dwellings reporting house walls by cement and bricks (HWBRK) which declined considerably between 1974 and 1981 (Table 5.1). It must be stressed, however, that the absolute numbers of brick built houses definitely increased over time (1974-1981), but that the proportion of total dwellings declined due to a rapidly growing number in the family units. A gradual decline in the proportion of brick built structures, particularly, in the later phase of development was matched by an increase in the proportion of dwellings reporting house wall by wood (HWWOD) and mud (HWMUD, Table 5.1).

The orthogonal nature of Factors 1, 2 and 3 may now be jointly considered. Factor 1 describes a homogeneous surface pattern of general socio-economic structure in 1961 with a low level of development over the whole country. In terms of the direction of change both the periods (1961-1974 and 1974-1981) experienced a relative improvement in the general socio-economic structure. Positive change was moderate in the period between 1961 and 1974, however, become more significant between 1974 and 1981. Factor 2 depicts a scattered pattern of development in health care and facilities in 1961, with an initial concentration of facilities in a few selected urban districts. Temporal change suggests a low rate of growth in health service provisions particularly between 1961 and 1974. A more remarkable positive change, however, is observed across the country in the later phase of development (1974-1981). Factor 3 is opposite to Factor 2; it illustrates a very localized pattern of better housing structure in 1961, centering on three major urban centred regions. Temporal changes between 1961 and 1974 indicate a noticeable improvement in the proportion of brick built ~~structure~~ across the country, however, an even greater contraction is evident by negative scores in almost all parts of the country between 1974-1981 (because of the decline of national mean). Therefore, the three major dimensions of development are independent (uncorrelated) both spatially and temporally.

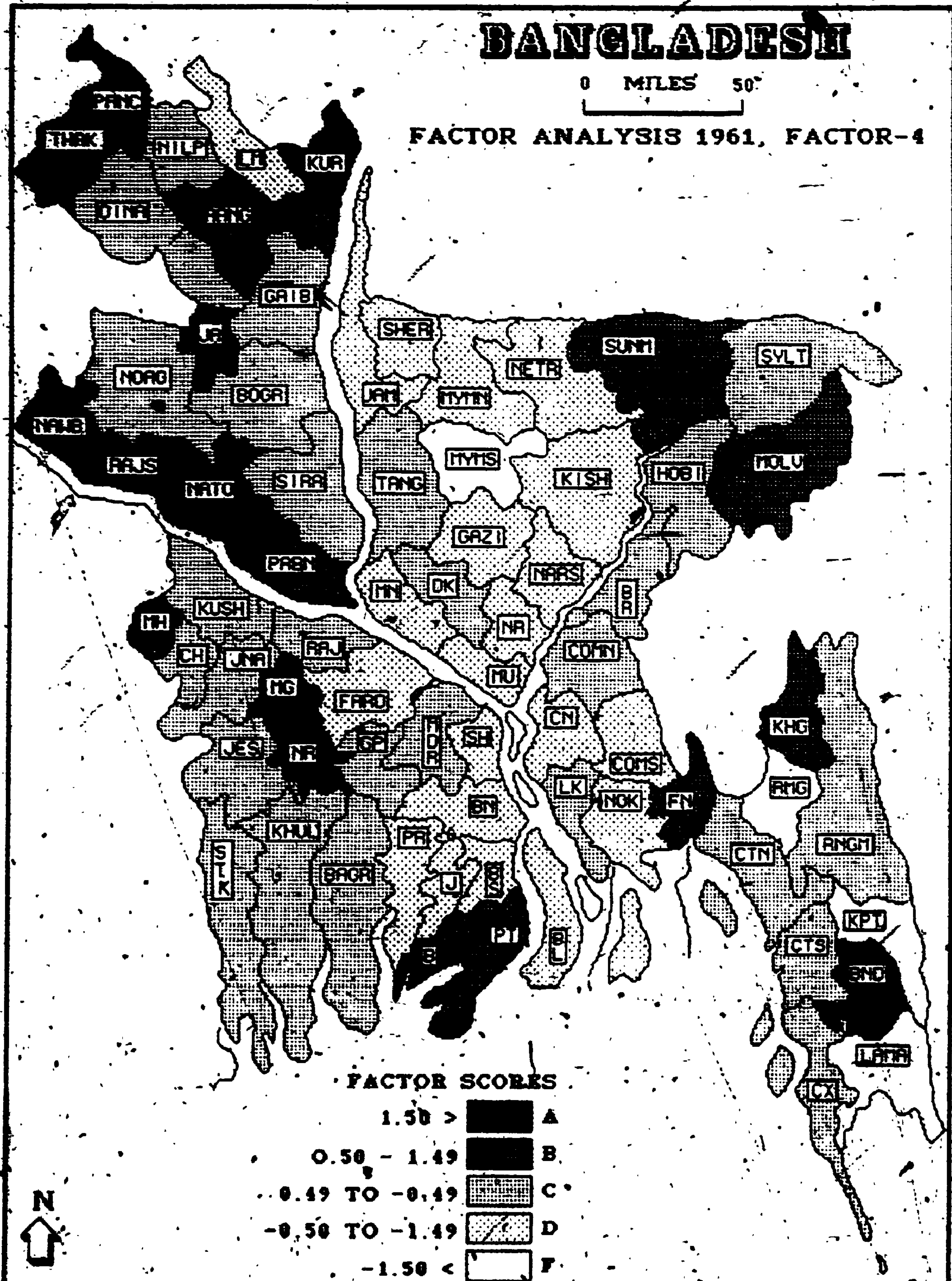
Each of the remaining four Factors (Table 6.3) identify a narrow set of variables and explain only a small proportion of total variation (3 to 6 per cent). The factors are interesting, nevertheless, in that they suggest some fragmentation of the development process and highlight elements that fall outside the overall trends. Factors 4, 6 and 7 (Table 6.3) isolate variables associated with the agricultural sector. Despite a common agricultural orientation, however, the three factors are quite distinct from one another. Factor 4 is a dimension of Agricultural Structure (i.e "large scale farming"), Factor 6, Agricultural Intensity (i.e. irrigation and multiple cropping), and Factor 7, performance in relation to Rice Production (i.e. Rice Yield). Together the three agricultural factors account about 13 per cent of the total variation in the data set. Each factor and the sector as a whole is distinguished from Factor 1 (General Socio-Economic Structure), Factor 2 (Health Care and Facilities), and Factor 3 (Housing Structure), in terms of its spatial dimensions and the patterns of change over time.

Factor 4: Agricultural Structure

Factor 4 identifies the specific variables of farm size (FRMSZ) and per capita availability of farm land (ALAND), with an eigenvalue of 1.9 and explaining about 6 per cent of the total variation in the data set. Its pattern is essentially one of gradual decline in the factor loadings and a peripheral distribution of the higher factor scores. A strong positive correlation between the two variables (Table 5.2) and their high positive loadings on Factor 4, i.e. FRMSZ (+.97) and ALAND (+.96), indicate the dimension of Agricultural Structure. Independent study suggests that relatively 'large farm size' tends to occur in Districts where the area under agriculture is highest (Ali, 1986). Factor 4, therefore is a dimension of a relatively "Large Scale of Farming" in the Bangladesh context. However, this is not totally a rural factor. There is a great variation in both urban and rural districts. Some urbanized districts especially in the Northern Division: have 'large farm sizes' relative to other rural districts.

Factor 4- Spatial and Temporal Change

Figure 6.4a reveals areal variations in scores on Factor 4 for 1961. It must be assumed that Districts with relatively high positive scores are relatively advantaged with respect to availability of farmland compared to those with negative scores. Cases with higher average farm size thus have an advantage in terms of better agriculture structure. Although, this dimension of agriculture is more likely to be a rural component, many urbanized districts (i.e Dhaka, Chittagong, Khulna, Sylhet, Jessore, Rajshahi, Rangpur, Comilla North) show a national average condition, whereas the lower active


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1961, FACTOR-4
PANC
THAK
NILP
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DINA
GAIB
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
NARS
MN
DK
BR
KUSH
MH
NR
RAJ
COMN
CH
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FARD
KHG
CN
JES
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GP
MDR
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COMS
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RMG
KHUL
BN
PR
CTN
RNGM
STK
BAGR
J
PT
B
BL
KPT
CTS
BND
LAMA
CX
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

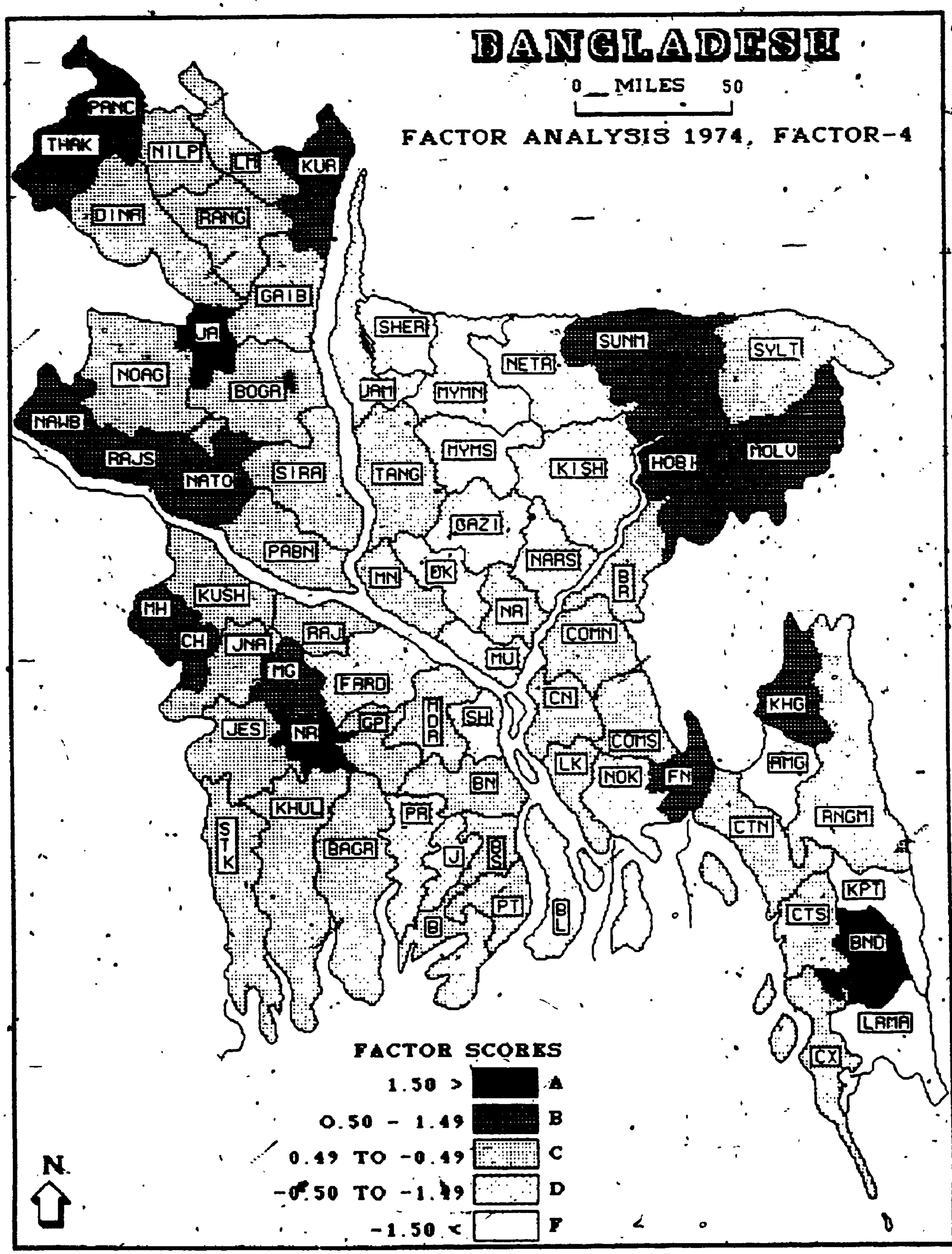
Figure 6.4a

delta and the whole of Central Division recorded negative scores in 1961 (Figure 6.4a). High positive factor scores present a rather scattered pattern but one which emphasises a peripheral distribution especially in the Northern Division. The reason for relatively better farm structure in Northern Division in 1961 was probably because population density per square mile was less compared to the Central and Eastern Divisions (except Hill-Tracts). In 1961, about 10 districts experienced significantly high scores (greater than 1.00) and most of these districts are concentrated in the Northern Administrative Division. Significantly low scores (less than -2.00) are noticed mainly in the Chittagong Hill-Tracts, with the exception of Bandarban (Appendix II). This is due to the severe shortage of agricultural land in this area. Lower medium scores (negative) are displayed mainly in the prominent jute belt of Bangladesh covering the whole of Central Division. This is a region where demand for agricultural land is generally high due to an excessive population pressure on limited land resources.

It must be stressed that even with a medium level of population density the central-north (Central Division) was reporting relatively low farm size. This is probably because of the presence of old alluvium (non-arable) in this region and partly because of the extension of northern depressed basin part of which is unsuitable for agriculture. Therefore, with respect to farm size, the western part of the country (Northern and Southern Administrative Divisions) was more favoured compared to its eastern counterpart (Central and Eastern Administrative Divisions). However, the active delta in the Southern Division is in a position of relative disadvantage as indicated by negative scores. Although population density was medium in this region, agriculture is very demanding because of land scarcity in the low lying zone. As a result, relatively 'large scale farming' is not evident.

The spatial patterns of Factor 4 (Agricultural Structure) for 1974 (Figure 6.4b) remained more or less stable with minor exceptions. The incidence of high scores declined in the Northern Division, notably in Thakurgaon, Nawabganj, Rajshahi, Natore, Pabna and Rangpur Districts. In the Central Division, a decline in 'large scale farming' is recorded only in the Dhaka District, however, Manikganj and Narayanganj and Districts gained in relative terms. In the Eastern Division, relative improvement in 'large scale farming' included three districts, namely, Chandpur, Comilla South and Hobiganj. On the other hand, the Southern Division depicts a fluctuating situation. Relative gain is recorded only in three districts (Barisal North, Barisal South and Chuadanga), however, an equal number of districts (Magura, Patuakhali and Barguna) registered relative decline. Therefore, it may be concluded that the incidence of 'large scale farming' considerably reduced in the Northern Division by 1974, compared to the Central and Eastern Divisions, where it recorded slight improvement.

Figure 6 4c illustrates spatial patterns on Factor 3 for 1981. High scoring districts remained almost stable in gross terms, allowing minor changes. For example, the condition of Panchagarh and Thakurgaon Districts (Northern Division) improved relatively. The Central Division recorded a fluctuating situation. For example, a relative gain is observed in Sherpur, Jamalpur and Netrokona


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1974, FACTOR-4
PANC
THAK
NILP
LM
KUR
DINA
RANG
GAIB
JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
KUSH
MH
CH
JNA
RAJ
MG
FARD
JES
NR
GP
KHUL
STK
BAGR
SHER
JAM
MYMN
NETR
SUNM
SYLT
HOBI
MOLV
MYMS
KISH
TANG
GAZI
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NARS
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KHG
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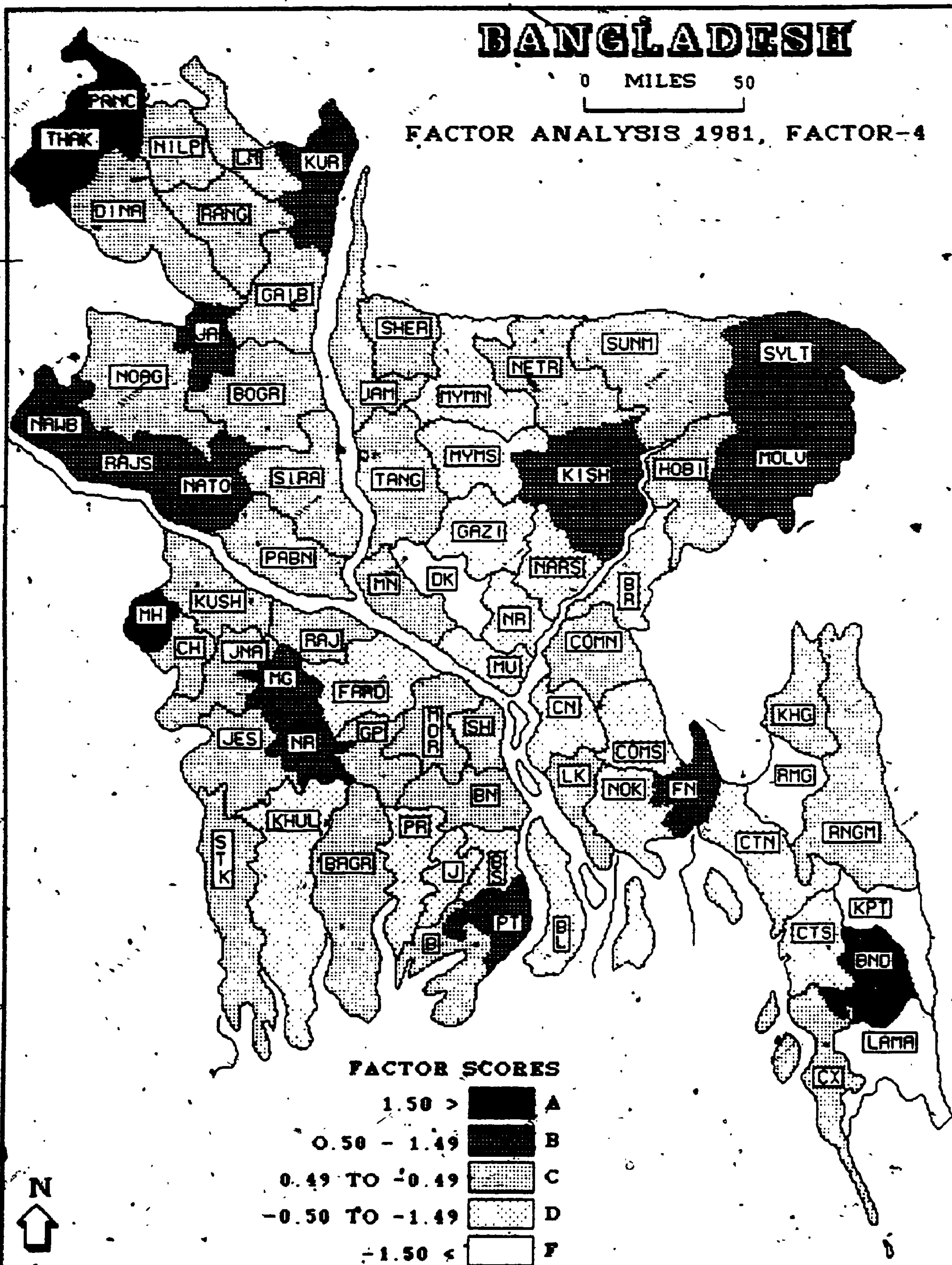
CX
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

Figure 6.4b


BANGLADESH
0 MILES 50
FACTOR ANALYSIS 1981, FACTOR-4
PANC
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DINA
RANG
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JA
NOAG
BOGR
NAWB
RAJS
NATO
SIRA
PABN
SHER
JAM
MYMN
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SUNM
SYLT
MOLV
HOBI
KISH
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TANG
GAZI
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RNGM
KPT
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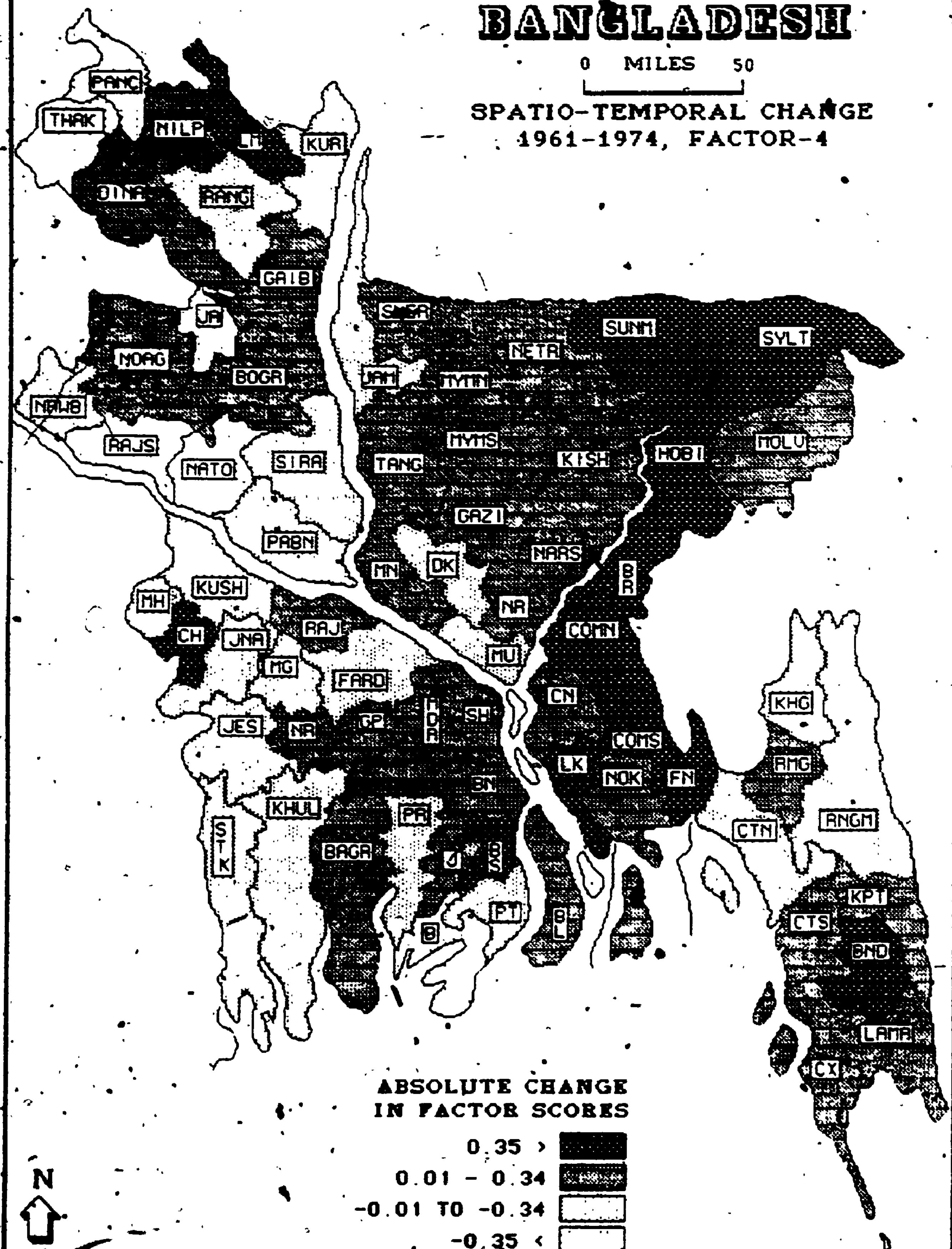
BND
LAMA
CX
FACTOR SCORES
1.50 > A
0.50 - 1.49 B
0.49 TO -0.49 C
-0.50 TO -1.49 D
-1.50 < F
N

Figure 6.4c

Districts including Kishoreganj and Sylhet which registered the most significant gain from a low to high level. However, Dhaka and Narayanganj Districts experienced a relative decline. Relative decline in Agricultural Structure is also noticed in both the Southern and Eastern Divisions. Districts experienced a relative loss in the Southern Division are Khulna, Barisal South, Chuadanga and Narail. In the Eastern Division similar decline is recorded in Districts, namely, Hobiganj, Brahmn Baria, Chandpur, Comilla South, Chittagong North, Chittagong South and Khagrachari in the Chittagong Hill-Tracts.

Positive changes in factor scores between 1961-1974 (Figure 6.4x) suggest that Districts in the Central and Eastern Divisions of the country improved at a rate above the national average compared to the Northern and Southern Divisions. It must be noted that rate of decline (national mean) in farm size and per capita availability of agricultural land have been very small over the study period. However, the decline was more prominent in both the Northern and Southern Divisions. Negative changes in the North and South indicate that demand for agricultural land is very intense. In the Centre and East, a greater decline in the proportion of labour force engaged in agriculture is noticed (Figures 5.9b, 5.9x) which acted to reduce the absolute pressure on farmland.

Changes in factor scores between 1974-1981(Figure 6.4y) indicate that districts along the Dhaka-Chittagong axis and representing other major cities, including Khulna, Rajshahi and Rangpur, experienced a shift in the Agricultural Structure to levels below the national average (greater decline). However, other peripheral districts (e.g. Sunamganj, Hobiganj, Molvi Bazar, Nilphamari, Lalmonirhat,


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1961-1974, FACTOR-4
PANC
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NOAG
BOGR
JAM
MYMN
NAWB
RAJS
NATO
SIRA
MYMS
TANG
KISH
HOBI
MOLU
GAZI
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BAGR
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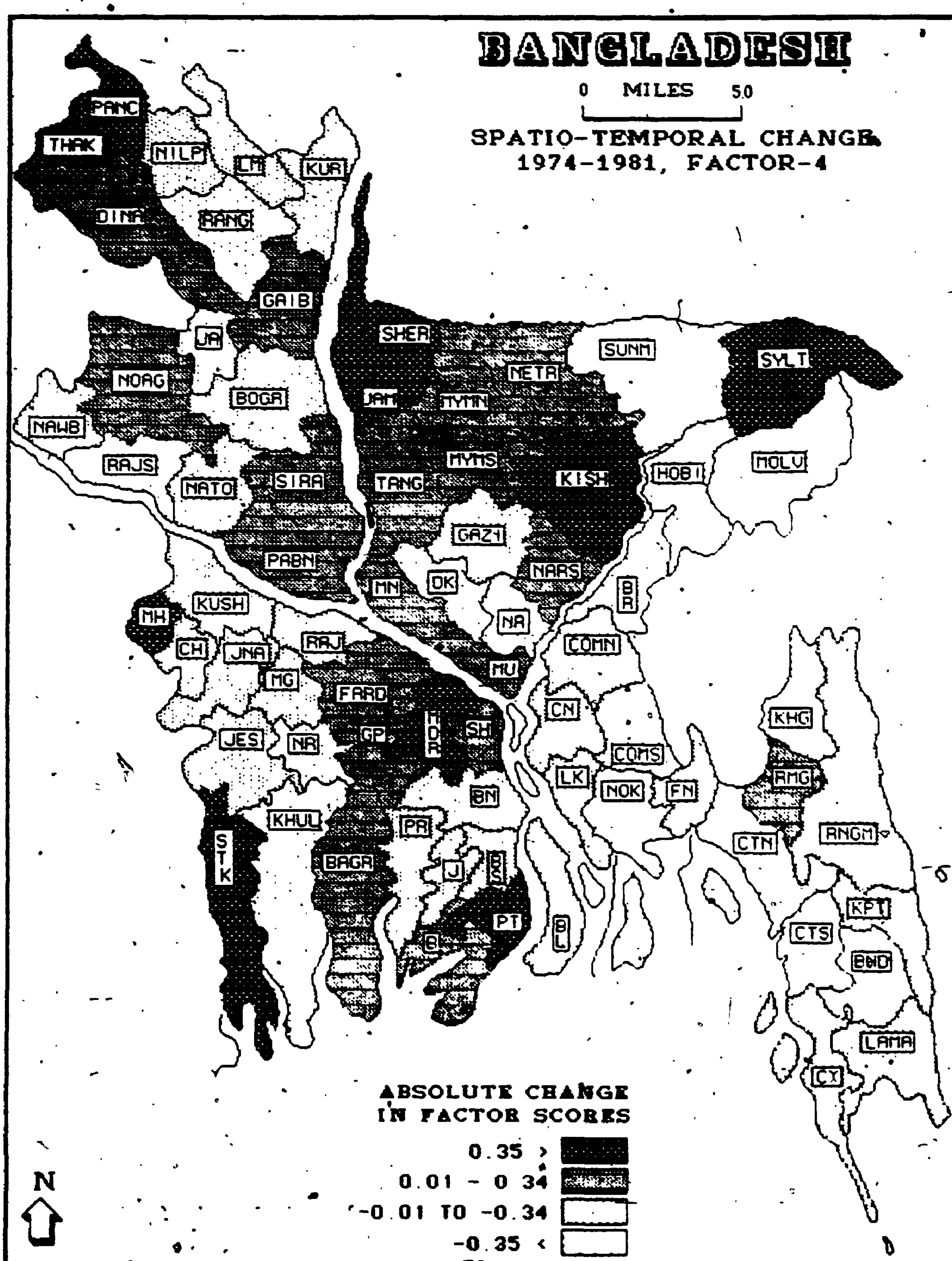
ABSOLUTE CHANGE
IN FACTOR SCORES
0.35 >
0.01 - 0.34
-0.01 TO -0.34
-0.35 <
N

Figure 6.4x


BANGLADESH
0 MILES 50
SPATIO-TEMPORAL CHANGE
1974-1981, FACTOR-4
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BOGR
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KHUL
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ABSOLUTE CHANGE
IN FACTOR SCORES
0.35 >
0.01 - 0 34
-0.01 TO -0.34
-0.35 <
N

Figure 6.4y

Kurigram Nawabganj, the upper moribund delta and the Chittagong Hill-Tracts) experienced a similar decline. Therefore, a clear distinction cannot be made between rural and urban districts in terms of decline in "large scale farming". Population pressure is the dominating factor responsible for decline in the average farm size. Negative association with farm size is also evident in regions where land availability is low due to physiographic limitations (i.e. the Chittagong Hill-Tracts). Significant improvements in "large scale farming" in Sylhet and Kishoreganj Districts may be explained by the fact that thses areas recorded a very higher percentage of land irrigated (see below).

Factor 6: Agricultural Intensity

Two variables that load positively on Factor 6 are the percentage of farmland irrigated (PIRIG) and percentage of farmland with multiple cropping (PMULT). Moderate factor loadings of PIRIG (+.66) and PMULT (+.65) suggest that there is an underlying dimension of Agricultural Intensity. However, Factor 6 has an eigenvalue of 1.3 and and explains only about 4 per cent of the total variation in the data set (Table 6.2). It must be pointed out that dimensional and change maps are not produced for this factor. However, an inference may be drawn on Agricultural Intensity by reference to the distribution of PIRIG in Chapter 5 (Figures 5.19a, 5.19b, 5.19c 5.19x and 5.19y).

Factor 6- Spatial and Temporal Change

In 1961 (Figure 5.19a) the incidence of high scores are concentrated in the Central and Eastern Divisions (except Hill-Tracts)

The Northern Division records a medium condition, whereas the Southern Division is below the national mean. The basic initial patterns remained fairly consistent in 1974 (Figure 5 19b) The original patterns remained stable even in 1981 (Figure 5 19c), with slight changes For example Sunamganj and Hobiganj Districts declined in relative terms

There should have some explanation for the Divisional (regional) concentration of Agricultural intensity In order to understand the regional irrigation and cropping intensity, one must turn to its specific context- the physio-cultural association of the country It may be noted that there is a long tradition of irrigating paddy (boro) in Bangladesh by various hand operated systems (i e doons or dunga, long scoops hollowed from a tree trunk operated with the help of counterweights of clay and baskets swung between two people are probably the most important) The relative advantage of the Central and Eastern Divisions may be explained by the fact that the continuing importance of traditional irrigation techniques in the districts like Kishoreganj, Netrokona, Sunamganj, Hobiganj, Molvi Bazar and Sylhet together account for about one third per cent of the total irrigated area The distribution of the area irrigated by low lift pumps and tubewells together account for about 47 per cent of the total (Johnson, 1982) The essential requirement for a low lift pump scheme is a source of surface water that will last through a substantial part of the dry season The 'bils' (shallow lakes) and rivers of the Meghna and South Dhaka Depressions provide such a source in the Central and Eastern Divisions Furthermore, soils regularly rejuvenated by flooding in the western half of these two divisions, and sufficiently prolonged rainy season to permit multiple cropping of rice and jute, are significant advantages. It should be noted that the Southern deltaic plain is the significant areas of canal irrigation, which is the least represented method in the country. As a result, the percentage of irrigated land is fairly low in this area and this is evident by low scores. The saline floodplain and the coastal estuarine districts (i.e. lower active delta) generally lack irrigation for clearer reasons. Groundwater here is saline, surface water is salty during the dry season. By contrast, the fresh-flowing distributaries of the Padma-Meghna in Barisal and Pirojpur Districts support considerable irrigation from low lift pumps. The relative sparsity of irrigation in the Northern Division points perhaps to unexploited potential rather than to any intrinsic difficulty in finding ground water sources here.

Between 1961 and 1974 (Figure 5.19x) low level changes occured mostly in the Chittagong Hill-tracts and the Southern Division with a pocket representing the Brahmaputra flood plain. This is expected in the Southern Division because of a number of constraints including low rainfall, a longer dry season, poor access to surface water for dry season irrigation and seasonal salinity. The limitation of Agricultural Intensity in the Chittagong Hill-Tracts is mainly physiographic. Between 1974 and 1981 (Figure 5.19y) majority of the country experienced a low level change. Districts scored above the national average are Sylhet, Chandpur and Noakhali.

Factor 7: Rice Productivity

Factor 7 loads high on average rice yield (RICEY) and percentage of people employed (DOJOB) The moderate positive association of RICEY (+ 76) and DOJOb (+ 51) on Factor 7 indicate a dimension of performance in 'Rice Production', with an eigenvalue 1.1 and explaining only about 3 per cent of the total variance (Table 6.2) Positive association of rice yield with the percentage of employed people suggest the fact that labour force generally find their employment in districts where rice productivity is relatively high In other words, increasing agricultural production creates the provision for higher employment rate This is expected because a lion's share of the active labour force is engaged in agricultural activities and job facilities in the rural -agricultural sector truly portrays the overall job situation of the country This is a dimension within the broad agricultural structure which reinforces the characteristics of 'Green Revolution' and measures the influence of soil quality, fertilizer and high yielding variety (HYV) in agricultural development This factor is also excluded from mapping, however, the patterns may be inferred from the distribution of RICEY (Chapter 5, Figures 5 18a, 5 18b, 5 18c, 5 18x and 5 18y)

Factor 7- Spatial and Temporal Change

Average rice yield per acre for 1961 is plotted in Figure 5 18a High scores are pronounced mainly in the Eastern and Northern Divisions and in spatial terms describes an axis running south-west to north-west from the Hill-Tracts to Dinajpur and Nawabganj Districts and including the Dhaka-Gazipur region Low scores are evident in the Southern Division and the central-north. In 1974 (Figure 5.18b) the diffusion of high scores is noticed in Districts, namely, Sunamganj, Kushtia, Bogra Lalmonirhat and Rajshahi. Relative improvement is also observed in few other Districts across the country (i.e. Natore, Serajganj, Jessore, Pirojpur, Barisal North, Barisal South, Manikganj, Netrokona and). In 1981 (Figure 5.18c) the incidence of high scores are significant in the Central Division, including Dhaka, Narayanganj, Narsingdi, Mymensingh South and Kishoreganj Districts Similar improvement is recorded in Rajshahi District in the North and Khulna District in the South. Relative decline is recorded in a number of Districts, namely, Dinajpur, Rangpur, Lalmonorhat, Nawabganj, Noagaon, Panchagarh, Sunamganj, Jessore, Satkhira, Kushtia, Meherpur, Chuadanga, Khagchari and Rangamati).

This broad pattern may be explained by adoptation of HYV of rice which is highest in Comilla District, perhaps because of the leadership given there by the Bangladesh Rural Development Academy. The other districts are adjacent or sub-adjacent to this district or to Dhaka (with its Bangladesh Rice Research Institute) Thus a normal process of innovation diffusion may be responsible for the distribution. The outlying high adaptation in Kushtia (1974) is explicable by the long established agronomic research there associated with the Ganges-Kobadak Scheme. In the Northern Division there is a considerable area (pleistocene Terraces) where adoptation of HYV is low due to coarse alluvium on which it may be excessively expensive to lavish fertilizers under water conditions that promote rapid leaching. However, better Agricultural Structure in the Northern

Division is more likely to employ people in the agricultural sector (DQJOB). As a result, the Northern Division seem to score high in a few districts, but show medium incidence elsewhere. In the active delta plain, soil salinity can be a problem, in addition to its generally low level, threatened often by flooding and so probably more likely to require taller varieties than are presently available among HYVs. On the other hand, HYV 'aus' paddy has always been important in the Chittagong Hill-Tracts.

Between 1961 and 1974 (Figure 5.18x) a low level changes in the performance of rice productivity (per acre) were recorded mainly in the Northern Division including Nilphamari, Rangpur, Gaibanda, Noagaon, Rajshahi, Natore, Pabna nad Serajganj Districts. In the Southern Division, Rajbari, Faridpur, Barguna and Bhola Districts registered low scores. In the Central Division, Mymensingh South and Munshiganj are the only Districts represented low values. In the Eastern Division, Lakshmipur, Feni, Chittagong North, Cox's Bazar, Kaptj and Bandarban Districts recorded low. Between 1974 and 1981 (Figure (5.18y) the Central Division and the western Jamuna flood plain (Northern Division), including Rajshahi and Chittagong North experienced a significant improvement. The rest of the country depicted a low level change, with only minor exceptions.

The probable reasons for a low level changes across the country may now be explained. Rice productivity per acre is fairly low in Bangladesh despite the effect of HYVs. Only a slight increase is recorded over the study period (Table 5.1). There are several reasons for the lower rice yield per acre. The Bangladeshi farmer is characteristically a small-scale entrepreneur, achieving a very low return for the minimal amount of capital and the long hours of labour he and his family invest.' Further, traditionally much of the land lies fallow through the dry season or carries a low yielding 'rabi' crop. If there is a source of water available the farmer uses the technique of irrigation known to him to grow relatively high yielding 'boro' paddy, rising the water by wearisome human effort. The provision of a guaranteed supply of water in the dry season and the assurance of flood protection in the rains are, therefore, preconditions of increasing productivity on the farm in many areas, but do not of themselves ensure optimum levels of yield per acre. These can only be achieved by changing the nature of inputs at the farm level, changes that require a conscious commitment on the part of the cultivator to an improved system of farming. The technological changes that have had greatest impact in recent years are the introduction of high-yielding varieties of rice, the extended use of irrigation principally through low lift pumps, and the use of fertilisers. Improvements in the control of pests, diseases and weeds have also been initiated. Obviously these changes are to a considerable degree interdependent. There is no point in changing HYV of 'boro' paddy, for example, if water or the essential fertilisers are not going to be available. Such is the case in Bangladesh where there has been a fragmentation in the agricultural dimension. 'Large scale' farming (Agricultural Structure), irrigation and multiple cropping (Agricultural Intensity) and rice yield are found only loosely tied in spatio-temporal terms. The sepearation of Factors 4, 6 and 7 from each other (as indicated by individual variables) suggests that agricultural development in Bangladesh has not been well integrated.

Although increases in rice production are attributable to 'the Green Revolution' (since about 1968) that is currently underway in Bangladesh, so far this is more a demonstration of potential rather than an actuality of general achievement (Johnson, 1982).

For example, although Factor 6 shows a higher Agricultural Intensity in the traditional 'boro' rice growing regions in the Meghna Depression; Sylhet, Sunamganj, Hobiganj, Molvi Bazar, Kishoreganj, Tangail, Netrokona and Mymensingh Districts accounted for half per cent of the total area under 'boro' in 1978-1979 compared to 77 per cent in 1958-1959, despite their area increasing by 73 per cent. What seems at first glance surprising is that the traditional 'boro' regions rank medium. One possible explanation is that, as many of the 'boro' cultivators migrate to the remote heart of the Meghna Depression for the boro season only, they are not as adequately served by extension services.

Together these three factors (4, 6 and 7) seem to indicate both the degree of separation that exists within the development process in the agricultural sector between scale, intensity and productivity, and the variation between the sector and development of the types indicated by Factors 1, 2 and 3

Factor 5: Rural Dependency

The final factor (Factor 5) links dependency ratio (DPNDR), and student school attendance (SATND), both of which went up and down during the study period. Factor 5 accounts for about 6 per cent of total variation explained with an eigenvalue of 1.8. High positive loadings of DPNDR (+.86) and SATND (+.83) on Factor 5, (Table 6.3) indicate a dimension of Rural Dependency. It should be pointed out that the overall dependency is loaded by the young age group in the population pyramid. It is evident from the fact that the percentage of students attending school is positively correlated with the dependency ratio (Table 5.2). As such, districts with higher dependent population (i.e. young age) are more likely to support a higher school attendence rate. In other words, the greater the proportion of young age dependency the higher the rate of school attendence. Therefore, Factor 5 can be identified as a dimension of Rural Dependency in demographic terms. This factor is not mapped, however, conclusions may be drawn from the distribution of Dependency Ratio (DPNDR) in Chapter 5 (Figures 5.3a, 5.3b, 5.3c, 5.3x and 5.3y).

Factor 5- Spatial and Temporal Change

Given the rural-urban migration patterns, and the likelyhood of the younger segments of the population remaining in rural districts a 'rural-urban' separation is expected. In 1961 (Figure 5.3a) the pattern appears somewhat indeterminate, although the lowest dependency occurs along the main urban axis (Dhaka-Chittagong). By 1974 the national mean had climbed, which in turn, meant, that virtually all districts had an absolute value in 1974 higher than the 1961 mean (Table 5.1, see also Appendix III). In 1974 (Figure 5.3b) the lowest dependencies are more clearly associated with 'urban' districts. and this distribution is confirmed in 1981 (Figure 5.3c). Throughout the study period the highest dependencies occur in the Chittagong Hill-Tracts, the active delta, and in the depressed basin of the northeast, areas which are the major zones of high population increase and outmigration.

The patterns of change in dependency between 1961 and 1974 (Figure 5.3x) and between 1974 and 1981 (Figure 5.3y) are quite distinct. In the initial time period, against a sharply increasing overall dependency ratio, the major increases in Z scores were evident in a set of predominently 'rural' districts. Between 1974 and 1981 the pattern altered, in that the Hill-Tracts experienced a change below the average (i.e. a decline) and the greatest increase were found in the south and north-east, albeit still mainly in 'rural' districts'.

Conclusions

Using factor analysis, seven independent dimensions (factors) of development were distinguished and have been presented and discussed in this chapter. The key finding of this composite investigation is that the General Socio-Economic Structure (Factor 1) of Bangladesh evidences a significant, positive shift throughout the country and throughout the study period. Factor 1 combines a large number of variables which signify a mixture of social and economic circumstances which seem to have improved. Particular importance attaches to the overall occurance of change which affects every one of the 71 districts and whose direction is consistently positive. Even though there are some distinctions by district, Factor 1 seems to indicate that there has been a level of improvement, particularly in social and amenity terms which overrides the primary rural-urban district distinction. The nature and direction of Factor 1 provides a basis for support to hypothesis 2e. (Chapter 1, p. 25), but it must also be noted that it only explains 37 percent of total variation.

Beyond Factor 1 the analysis identifies six other dimensions (Factors 2 to 7) which suggest several other directions of development and which introduce both spatial and temporal variation to a greater degree than Factor 1. Factor 2, Health Care and Facilities, identifies a particular and significant public service and infrastructure element. In this case, the overall level of development in health care is lower than that recorded in Factor 1 and there are persistent regional distinctions based, it seems, on facility location, and temporal distinctions that indicate investment in the recent period, following distinct lags before 1974. Health care has, it seems, been more reflective of official development possibilities.

In contrast, the provision of the more substantial 'Housing' (Factor 3) reveals a distinctly different pattern, although it, like Health, tends to emphasise a more urban district pattern. In the case of housing, this is essentially a private sector endeavour, and seems to reflect that, while in the earlier period (1961-1974) some improvements were achieved, that more recently, housing has failed to keep up with population and/or that other problems of material availability or income have been significant. Taken together, Factor 2 and 3 substantially modify the overall pattern of development (Factor 1) but they suggest that modification is needed in respect of hypothesis 2a (Chapter 1, p. 24), to distinguish between public and private sector investment.

While Factors 2 and 3 to some extent emphasise the socalled 'urban' districts, each of the first three factors incorporates conditions among both urban and rural populations. It seems, however, that what remains largely separate is the agricultural sector which, although economic, underlies the general condition of a great number of population in all districts. The absence of agricultural variables in Factor 1, except in negative terms, is of major significance, agricultural employment has not improved. Similarly, in Factors 4, 6 and 7 we have an equally significant situation. Each of these three factors is based on agricultural variables, but, instead of combining in a composite dimension of agricultural development, they indicate a fragmented pattern of only partial improvement. In fact, Agricultural Structure (Factor 4) reflects a pattern of stagnation linked to extreme pressure on land resources, and the patterns linked to Input Improvement (Factor 6) and higher Rice Yields (Factor 7) are far from general, and seem to indicate major lags in attempts to improve agricultural efficiency and output. Problems of employment in or migration from rural (agricultural) areas, seem to be indicated also by Rural Dependency (Factor 5)

Essentially, four broad dimensions of development or disadvantage emerge from the factor analysis. i) overall Socio-Economic development which has been broadly based and consistent by district, but which, it must be noted, is based on variables whose absolute values remained very low, even at the end of the period, 2) variable response in one public sector, Health, occurring chiefly in the period since 1974, but also indicating problems of absolute level of service, and of reaching the more isolated rural districts, 3) a [illegible] sector amenity condition, in housing, that reflects the overwhelmingly, traditional and poor quality in this sector and the difficulty of mobilizing private development; and 4) a still largely separate, and fragmented Agricultural sector in which structure, operational improvements and performance are highly variable and, it would seem, unco-ordinated across the various regions and districts

The dimensional pattern revealed is of great significance in terms of development planning, both as regards it elements and spatial dimensions (Chapter 8) It does not strongly support an urban-rural or core-periphery distinction, although the Hill-Tracts do seem to show peripheral characteristics The factor analysis stresses the separation between development/disadvantage characteristics To complement these findings, the last analytic procedure (Chapter 7) cluster analysis, seeks to group these same dimensions and to determine whether one can identify what may be termed 'development regions' (by districts) for the 1961, 1974 and 1981 points in time, and whether such 'regions' reveal more of the development process

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CHAPTER 7

Development Regions

Introduction

This chapter concerns the second stage of composite analysis of information relating to development in Bangladesh i.e the cluster analysis. Clustering is the systematic grouping of objects on the basis of properties or relationships they have in common. The objects to be grouped in this case are areal or spatial taxonomic units, i.e the 71 districts of Bangladesh. The properties (differentiating characteristics) on which the grouping is based are the factor scores of each district for the seven development factors identified and analyzed in Chapter 6. The ultimate goal of the cluster analysis is to produce groupings of all the districts of Bangladesh in which within-group variance is minimized and between-group variance is maximized. In other words, characteristics of objects in the same group are more like one another than to the array of characteristics in other object groupings. Groups thus identified as homogeneous spatial observation units are thought of as "Development Regions" of Bangladesh at the respective point in time i.e 1961, 1974 and 1981.

The need for such a classification may be justified on the ground that the 7 distinct (orthogonal) dimensions of development discussed in Chapter 6 are only useful in that they describe the inter-district patterns of variation in each factor. However, since development is multi-dimensional, and districts vary in more than one dimension, it is necessary to consider such variations simultaneously. To do that, a method that can classify districts of

Bangladesh on the basis of all major dimensions (within a single framework), is required. Grouping by cluster analysis is strictly based on internal inherent characteristics, in this case the composite ones arrived at by factor analysis. In using this technique we also seek to test the hypotheses relating to change in an overall context; namely that a changing pattern of regional development will emerge over the study period, and that the pattern and membership of development regions will reveal a higher degree of integration of districts within the national fabric over the study period. Another objective is to clarify the rural-urban distinction which analysis in Chapter 6 showed to be less consistent than anticipated. Hopefully, patterns derived via cluster analysis will reveal the strength of any core-periphery regionalization for each of the successive time periods.

The first part of the chapter outlines the choice of clustering method used in the analysis, its application, and particularly the means of interpretation based on hierarchic grouping cycles, dendrograms, the choice of significant clusters, mapping of selected clusters and cluster diagnosis of selected groups. The second part of the chapter presents the description of selected clusters for 1961, 1974 and 1981 and their interpretation in both static and dynamic terms.

Choice of Method in Hierarchic Grouping Analysis

In multivariate classification several types and measures of resemblance have been used, including the correlation coefficients r_{ij} and a standardized r-space Euclidean distance d_{ij} (Abdullah, 1979). The cluster analysis employed in this study uses Euclidean distance as the resemblance function, calculated from the n x r matrix of standardized factor scores (see Chapter 4). The series of cluster analyses uses as input the factor scores of the previous factor analysis, for each of the point in time (i e 1961, 1974 and 1981) The ultimate objective of this technique is to achieve an overall hierarchic grouping of observation units (the 71 Districts) on an iterative basis In each case, the final stage is one composite group, but earlier stages are chosen as significant groupings and regionalizations

The hierarchical grouping technique, at each step, either pairs two units, adds another unit to a group which has been formed at an earlier step, or combines two previously formed groups In other words, hierarchy starts with N clusters, each being a single individual, which are numbered according to the input order of the individuals In each of the N-1 fusion cycles the two clusters which are most similar are fused and the resulting union cluster is labelled with the lesser of the codes of its constituent clusters However, there are several similarity criteria on which clusters are formed and extended (Wishart, 1976) The most frequently used is the Ward's method of clustering based on the error sum of squares Although there are other methods (e g single, average, complete linkage etc) available in the hierarchy options, and each has its own merits and weaknesses, the choice depends on the resulting clusters desired (see Chapter 4) The Ward's method tends to produce good hierarchic groups The error sum of squares used in this method is defined as the sum of square distance from each individual to the centroid of its parent cluster

The Application of Ward's Method

Using the Ward's method of analysis and with no contiguity constraint [1], the 71 Districts of Bangladesh are classified on the basis of the 7 factor scores/dimensions: namely Factor 1 (General Socio-Economic Structure), Factor 2 (Health Care and Facilities), Factor 3 (Housing Structure), Factor 4 (Agriculturural Structure), Factor 5 (Rural Dependency), Factor 6 (Agricultural Intensity) and Factor 7 (Rice Productivity), as recorded in Appendices II, III and IV. The results of each hierarchical clustering sequence are summarized as dendrograms for each, distinct time period i.e 1961, 1974 and 1981. The errors (loss of detail) incurred in the hierarchic grouping of districts at successive fusion cycles are also recorded as the framework for reference. The different optimal solutions of district grouping, as judged by the significant incremental error incurred during the sequence of fusion cycles, is used to identify the most significant stages in the changing group structure of Bangladesh Districts, for each time period. Maps of "development regions" are then produced on the basis of significant fusion cycles of district clusters/groupings. The interpretation of the specific clusters selected as "development regions" for each time period is aided by the Cluster Diagnoses which are generated to support the choice of cluster. The Cluster Diagnoses

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[1] **Contiguity constraint is applied in the grouping of areal units in order to ensure that similar areas are grouped only where they are adjacent to each other, or sharing the same land boundary. When the constraint is used the location factor (variable) is considered along with other diffferentiating characteristics of the districts to be classified. Otherwise, classification methods/procedures used in other disciplines such as biology and psychology can be used in geography without alterations. Thus, grouping areal units with contiguity constraint is a special case in classification. However, there is no concensus among geographers whether contiguity constraint is necessary in classifying areal units.**

show mean, standard deviations, T values and F ratios, for each of the 7 factors which are being grouped by score to yield the cluster The mean values of a given factor reveal the relative strength or weakness of each group in terms of the contribution to it of each independent factor A large T value indicates factors having cluster means which are substantially different from the population sample means for those same factors A small F ratio indicates factors having comparatively low variation within the cluster, and therefore, providing a good diagnosis- the tool for interpretation of the clusters in terms of contributing factors Overall, the clusterings are only groupings based on somewhat weak factors, but nevertheless, they do suggest both key composite regional characteristics of the variables ("development regions") and when viewed in temporal sequence, they provide the basis for interpretation of an overall direction of spatial change for the country as a whole in terms of its 71 constituent districts

Cluster Analysis: 1961

The complete results of the cluster analysis performed on the factor scores for 1961 are contained in the dendrogram (Figure 7 1) For example, starting with the pair of the most similar districts, Hobiganj (17) and Sunamganj (19), whose composite factor pattern is separated by least distance (.018386), the districts are successively grouped into 70, 69, 68, ----- 7, 6, 5, 4, 3, 2 and 1 groups A critical choice is to decide when to stop and sample the grouping process The amount of detail lost and the number of clusters required are two different considerations For example, Table 7 1a illustrates the loss of

DENDROGRAM OF CLASSIFICATION HIERARCHY:
GROUP STRUCTURE OF BANGLADESH DISTRICTS, 1961

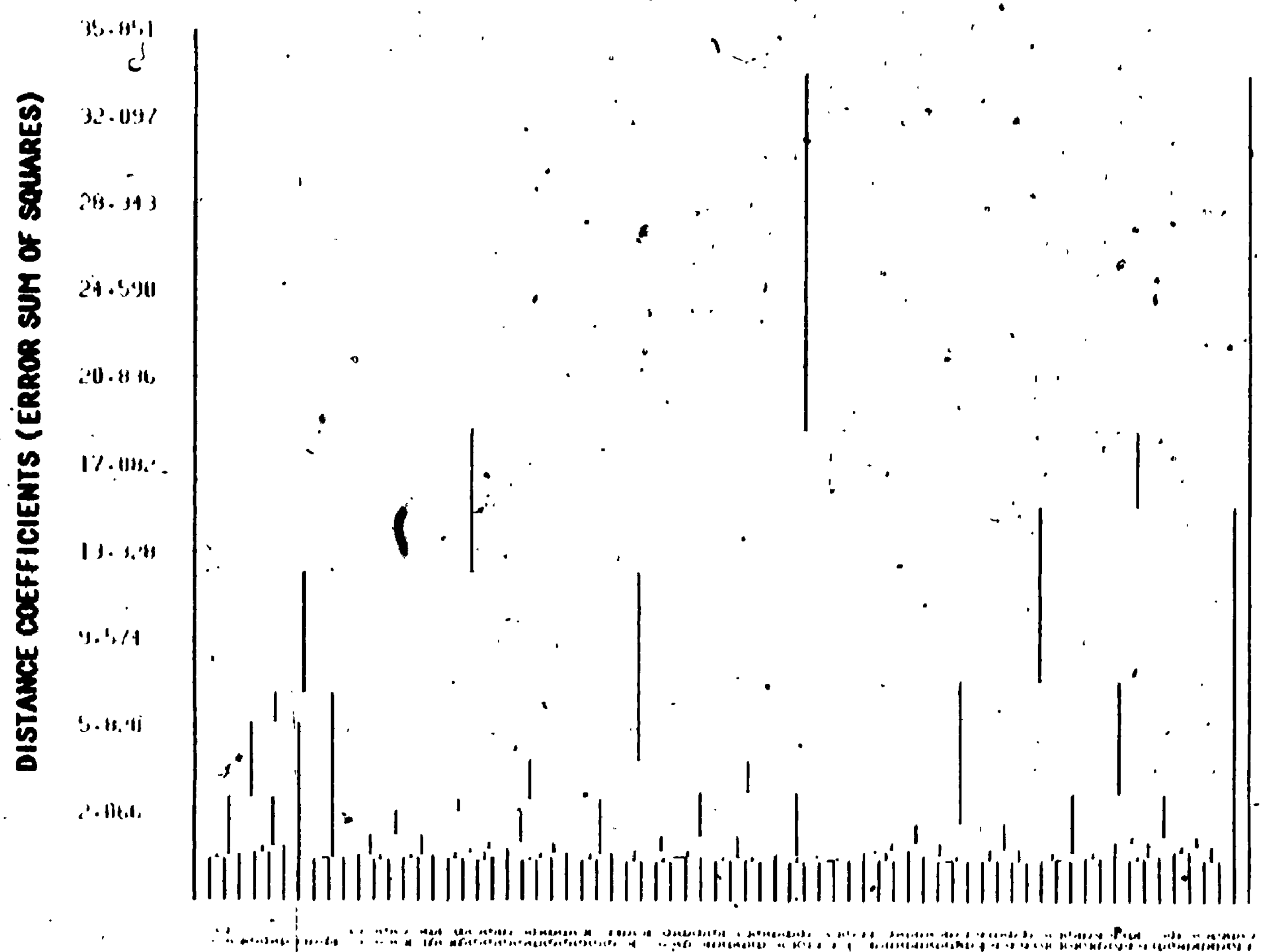


Figure 7.1

detail incurred in the final 8 cycles of the 1961 grouping. There is a sharp increment in the loss of information when the 66th cycle is passed, i e when the last 4 groups are formed Therefore, choice of significant level is made at 5 clusters The most significant grouping of districts occured with the largest jump (increment in error) at the 2 cluster fusion stage, i.e. following the 69th cycle At that point, members in the two distinct groups are 1) Barisal South District and 2) the rest of the country This latter grouping is, however, too generalized a view of district grouping with Barisal South representing an anomaly situation (see below for explanation) Further, this classification does not reveal any internal differences over the rest of the country. This indicates that some particularly significant level of grouping has been passed Stopping the grouping process at the 66th cycle with 5 groups of districts is important in order to minimize the within group variance and maximize the between group variance While the 23 per cent (cumulative) of information or detail lost in the process of grouping 71 districts into 5 groups is substantial, it nevertheless relates to the 77 per cent variation accounted for by the factor analysis (Chapter 6) and provides the most significant set of regions for the 1961 base year The 5 grouping retains a pattern of disimilar districts are in terms of development Given the figures in Table Table 7 la and need to provide an interpretable grouping the 5 group typology is the optimum solution in this case from both technical and regional descriptive standpoints

TABLE 7.1

ERROR INCURRED IN HIERARCHIC GROUPING OF DISTRICTS

a) 1961

FUSION CYCLE	CLUSTER	ERROR SUM	CUM.% ERROR	INCREMENTAL ERROR	% LOSS OF DETAIL
1961 CYCLE-63	GROUP-8	4.42	12.9		
1961 CYCLE-64	GROUP-7	6	17.6	1.58	4.7
1961 CYCLE-65	GROUP-6	7.27	21.3	1.27	3.7
1961 CYCLE-66	GROUP-5	7.87	23.1	0.6	1.8
1961 CYCLE-67	GROUP-4	12.51	36.6	4.64	13.4
1961 CYCLE-68	GROUP-3	15.44	45.2	2.93	8.6
1961 CYCLE-69	GROUP-2	18.67	54.7	3.23	9.5
1961 CYCLE-70	GROUP-1	34.14	100	15.47	45.3

b) 1974

FUSION CYCLE	CLUSTER	ERROR SUM	CUM.% ERROR	INCREMENTAL ERROR	% LOSS OF DETAIL
1974 CYCLE-63	GROUP-8	5.59	26.8		
1974 CYCLE-64	GROUP-7	5.97	28.6	0.38	1.8
1974 CYCLE-65	GROUP-6	8.6	41.2	2.63	12.6
1974 CYCLE-66	GROUP-5	9.58	45.9	0.98	4.7
1974 CYCLE-67	GROUP-4	11.55	55.4	1.97	9.5
1974 CYCLE-68	GROUP-3	15.27	73.2	3.72	17.8
1974 CYCLE-69	GROUP-2	16.16	77.5	0.89	4.3
1974 CYCLE-70	GROUP-1	20.85	100	4.69	22.5

c) 1981

FUSION CYCLE	CLUSTER	ERROR SUM	CUM.% ERROR	INCREMENTAL ERROR	% LOSS OF DETAIL
1981 CYCLE-63	GROUP-8	5.87	22.4		
1981 CYCLE-64	GROUP-7	5.88	22.5	0.01	0.1
1981 CYCLE-65	GROUP-6	6.28	23.9	0.4	1.4
1981 CYCLE-66	GROUP-5	9.81	37.5	3.53	13.6
1981 CYCLE-67	GROUP-4	9.88	37.8	0.07	0.3
1981 CYCLE-68	GROUP-3	12.13	46.4	2.25	8.6
1981 CYCLE-69	GROUP-2	19.52	75.6	7.39	29.2
1981 CYCLE-70	GROUP-1	26.17	100	6.65	24.4

Description of Spatial Patterns: Development Regions-1961

The five group typology of development may be identified in the dendrogram at coefficient levels of between 7 87 and 12.51 (Figure 7 1; Table 7 1a) The broad groups of districts at this level are mapped (Figure 7 2) for a better separation of cases, depicting the distinct regional pattern of the "1961 development regions" Figure 7 1 shows how, at higher coefficient values, the five groups are joined successively to form a large single cluster The sequence of grouping starts with Group 2 followed by Groups 1, 3, 4 and 5 (as anomaly) Group 2 fused first with Group 1 The second grouping occured at a relatively higher coefficient level when Group 3 fused with Group 4 (Capital District). Therefore, it may be concluded that, on the basis of distance criteria Groups 2 and 1 are somewhat similar to one another compared to Groups 3 and 4 together In other words, internal homogenity is greater between Groups 2 and 1 at the first stage, and then between Groups 3 and 4 at the second stage Group 5 represents an anomaly case, which in 1961 was characteristically quite different from all other districts of Bangladesh

The incidence of Group 2 is widespread across the country but emphasises the another third (Figure 7 2) Group 2 includes 34 districts representing Northern, Central (except Dhaka and adjacent Districts) and Eastern Divisions and also includes Districts in the active delta plain (Southern Division) with the exception of Barisal North, Pautakhali and Barguna Overall, Group 2 is represented by Districts predominantly rural-agricultural and peripheral in nature (Figure 7 2) Referring to the 1961 Cluster Diagnosis (Table 7 2) the F ratios

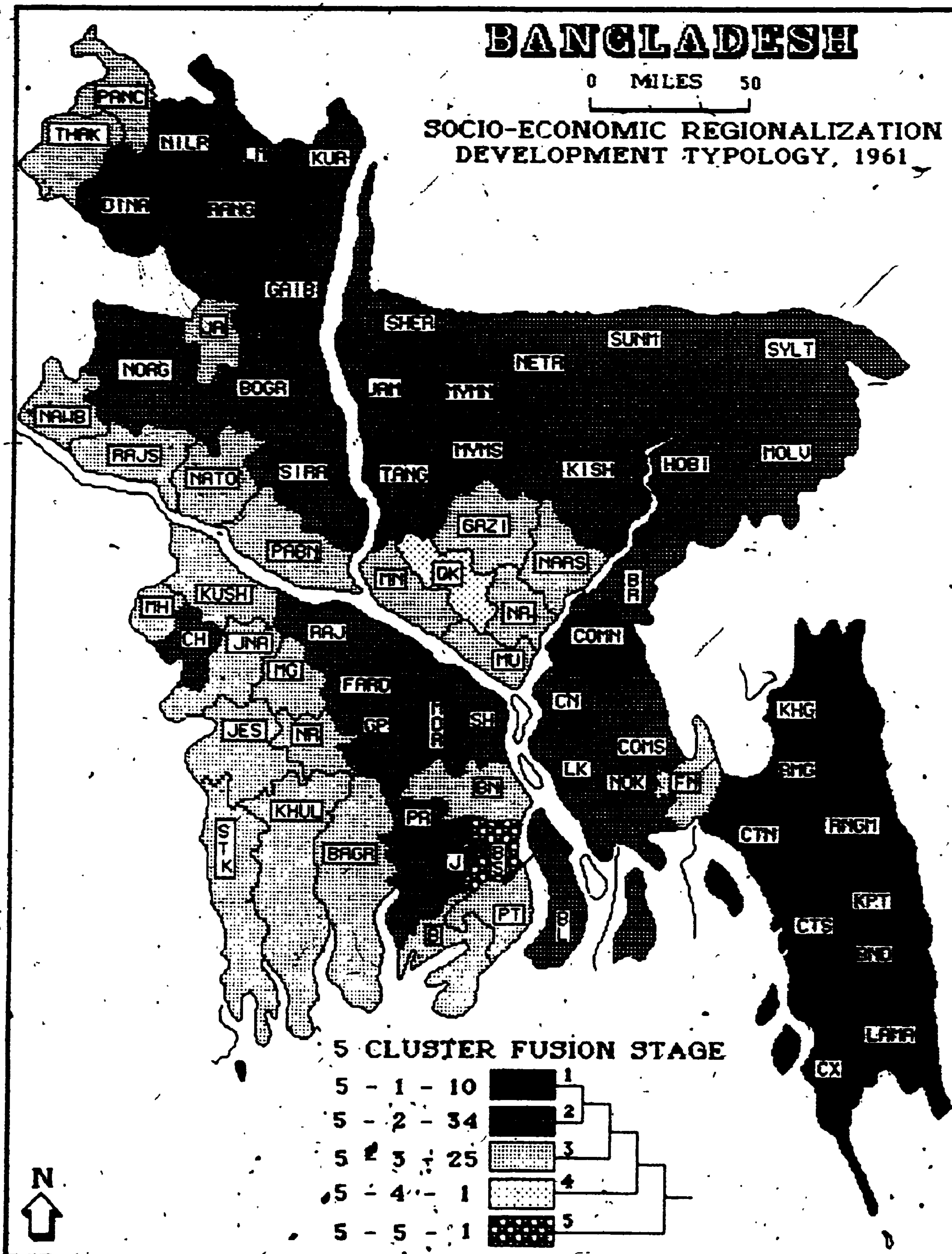

BANGLADESH
0 MILES 50
SOCIO-ECONOMIC REGIONALIZATION
DEVELOPMENT TYPOLOGY, 1961
PANC
THAK
NILR
KUR
DINA
RANG
GAIB
SHER
SUNM
SYLT
NETR
NORG
BOGR
JAM
MYMN
NAWB
RAJS
MYMS
KISH
HOBI
MOLV
NATO
SIRA
TANG
GAZI
PABN
DK
NARS
MH
KUSH
NA
CH
JNA
RAJ
COMN
MU
MG
FARD
CN
KHG
JES
NR
GP
SH
COMS
LK
NOK
FN
KHUL
PR
BN
STK
BAGR
J
CTN
RNGM
PT
KPT
CTS
BND
LAMA
CX
5 CLUSTER FUSION STAGE
5 - 1 - 10
5 - 2 - 34
5 - 3 - 25
5 - 4 - 1
5 - 5 - 1
1
2
3
4
5
N

Figure 7.2

TABLE 7.2

CLUSTER DIAGNOSIS, 1961

FACTORS	GROUP-1 (Cases=10)	GROUP-2 (Cases=34)	GROUP-3 (Cases=25)	GROUP-4 (Cases=1)	GROUP-5 (Cases=1)
FACTOR-1					
MEAN	-1.26	-1.1	-0.98	-1.34	-3.5
S.D.	0.52	0.17	0.17	0	0
T. VALUE	-0.36	0.03	0.36	-0.58	-6.13
F. RATIO	1.82	0.2	0.19	0	0
FACTOR-2					
MEAN	0.01	-0.21	-0.31	5.14	3.89
S.D.	0.38	0.43	0.39	0	0
T. VALUE	0.1	-0.14	-0.26	5.84	4.44
F. RATIO	0.18	0.23	0.19	0	0
FACTOR-3					
MEAN	-0.02	-0.34	0.51	2.62	-1.65
S.D.	0.74	0.36	0.64	0	0
T. VALUE	-0.07	-0.49	0.64	-0.21	-2.25
F. RATIO	0.98	0.23	0.74	0	0
FACTOR-4					
MEAN	-0.35	-0.36	0.61	-0.26	-0.87
S.D	1.79	0.56	1.02	0	0
T. VALUE	-0.31	-0.31	0.59	-0.21	-0.8
F. RATIO	2.82	0.27	0.91	0	0
FACTOR-5					
MEAN	-0.75	-0.89	-0.93	-0.78	3.15
S.D	0.42	0.26	0.22	0	0
T. VALUE	0.13	-0.11	-0.2	0.08	7.19
F. RATIO	0.58	0.23	0.16	0	0
FACTOR-6					
MEAN	-0.42	0.43	-0.52	1.48	0.43
S.D.	0.29	0.54	0.4	0	0
T. VALUE	-0.61	0.66	-0.76	2.23	0.66
F. RATIO	0.19	0.65	0.36	0	0
FACTOR-7					
MEAN	1.18	-0.16	-0.57	-1.15	-1.74
S.D	0.64	0.65	0.7	0	0
T. VALUE	1.8	-0.09	-0.49	-1.05	-1.61
F. RATIO	0.38	0.4	0.45	0	0

suggest that Group 2 is the most successful cluster of districts where within-group variance is greatly minimized (greater homogenity) over the first 4 prime factors. Relatively small T values indicates that the mean values of Group 2 for all prime factors are not significantly different from the national mean. As a result, Group 2 may be considered of the indicative of national average condition in 1961 The most positively loaded factor in this group is 6 (Agricultural Intensity) The area comprised by Group 2 is dominated by irrigation facilities both traditional and modern (see Chapter 6 for detail). As a result, multiple cropping area are most likely to occur in this region. The region, however, is not totally 'rural'; a few of the more peripheral 'urban' districts are also included in this group, i.e. Mymensingh North, Sylhet, Serajganj and Rangpur.

It is apparent that Group 1 in 1961 (Figure 7.1) representing 10 Districts concentrated mainly in the Chittagong and Chittagong Hill-Tracts (Eastern Division) is a peripheral region in the south-east corner of Bangladesh (Figure 7.2). This area is characterized by higher rice yield per acre and is evident by the high positive mean value on Factor 7 (Table 7.2). However, mean values on other factors are generally low, but moderate compared to Group 2. The most discriminatory and influencing factors between Groups 1 and 2 are therefore, Factors 7 (Rice Productivity) and 6 (Intensity of Production) respectively. It is also surprising to note that with respect to Factor 2 (Health) Dhaka and Chittagong Districts are significantly discriminated. Although the incidence of general socio-economic well-being was moderate in Group 1, nevertheless, it hides the internal discrepencies. For example, a higher F ratio is found in Group 1 for Factors 1, 3 and

4 This indicates that Chittagong North and Chittagong-South Districts are not quite similar to those of Hill-Tracts, particularly, with respect to General Socio-Economic Well-Being, Housing and Agricultural Structure (Table 7 2) With the exception of Chittagong; the rest of the Districts in this group are marginal and somewhat solated from the process of development

The distribution of Group 3 includes districts located around the Dhaka District (capital), and a continuous belt in the moribund delta plain extending from the Padma-flood plain in the north to Khulna in the south, particularly, along the Bangladesh-India boarder (Figure 7.2) Positive mean values on Factors 3 (Housing Structure) and 4 (Agricultural Structure) indicate that this group is in a relatively advantaged position compared to Groups 1 and 2 (Table 7-2) This group is comparable with Group 2 with respect to mean values on Factors 1, 2 and 5 However, Group 3 is disadvantaged when compared to Group 2, particularly in relation to intensity of rice production Small T values suggest that the means of Group 3 on all factors are not significantly different from the national mean Low F ratios on all factors also suggest greater spatial homogenity within the group Therefore, this factor also represent another near average representation of the national condition However, as noted above, Group 3 is differentiated from Groups 1 and 2 by two or more distinct factors of development

On the other hand, Dhaka and Barisal South Districts both remain distinct as Group 4 and Group 5, respectively (Figure 7 2) Cluster diagnosis (Table 7 2) suggests that Group 4, the national capital (Dhaka District) is the dominant group in the country in terms of development criteria. This is evident by the high positive mean values of Factor 2 (Health Care) Factor 3 (Housing Structure) and Factor 6 (Intensity of Production). Larger T values suggest that in 1961, Group 4 is characteristically much different from the average national character. In other words, large T values on Factors 2 and 6 are quite high compared to the national mean for those factors, an indication of the relative affluency of Dhaka District over other groups. Although General Socio-Economic Well-Being scored relatively low for Dhaka its difference with other groups is minor (except Barisal South).

Group 5 in 1961, Barisal South District, presents an anomaly case where symptoms of both development and underdevelopment coexist. The uniqueness of Group 5 (Barisal South) is revealed by cluster diagnosis (Table 7.2) indicating relatively high negative mean values on Factor 1, Factor 3, Factor 4 and Factor 7. These factors represent dimensions of General Socio-Economic Structure, Housing Structure, Agricultural Structure and Rice Productivity. Relatively high positive mean values are observed on Factor 2 and Factor 5. These factors are the indicators of Health Care and Facilities per unit population and Rural Dependency, respectively. Large T values on Factors 1, 2, 3 and 5 suggest that, in 1961, Barisal South was characteristically much different from the national average condition. The distinctive advantage of Barisal South in terms of better health care provisions was probably due to its superior medical college and hospital facilities at this initial time period. Bangladesh had only six medical colleges and Barisal south had one of them.

At the 3 cluster fusion stage (an error sum of squares 15 44, Table 7 1a) it is observed that the differences between Groups 1, 2 and 3 are minor compared to Groups 4 and 5 (Figure 7 1) At this level of group extraction, Dhaka stayed out seperately as a national 'core', and Barisal South remained isolated from the rest of the country as an anomaly The three-cluster grouping suggests a major 'development' distinction between the capital and the rest of the country, with the broader set of urban districts exhibiting generally 'rural' characteristics However, at the two cluster fusion stage Dhaka fused with the rest of the country at an error sum of squares of 18 67 (Table 7 1a), but Barisal south remained isolated until the error sum of squares reached 34 15 (Figure 7 1, Table 7 1a)

Cluster Analysis: 1974

The Dendrogram (Figure 7 3) presents the summary of the cluster analysis for 1974 in graphical form Starting with the pair of the most similar districts, Rajbari (28) and Gopalganj (29), whose composite factor pattern is seperated by the least distance (016079), the districts are successively grouped, based on the procedures outlined above A sharp increment in the loss of information (error) is first recorded when the 65th fusion cycle is passed or the 6 groups are formed suggesting the significance of a 7 cluster grouping (Table 7 1b) About 29 per cent (cumulative) detail is lost in district grouping at this level The second big jump is noticed at the 3 cluster fusion stage, particularly, when cycle 68 is passed pointing to a four cluster grouping It must be noted that about 55 per cent (cumulative) detail is lost in this grouping of districts At this level Bandarban coalleses

DENDROGRAM OF CLASSIFICATION HIERARCHY:
GROUP STRUCTURE OF BANGLADESH DISTRICTS, 1974

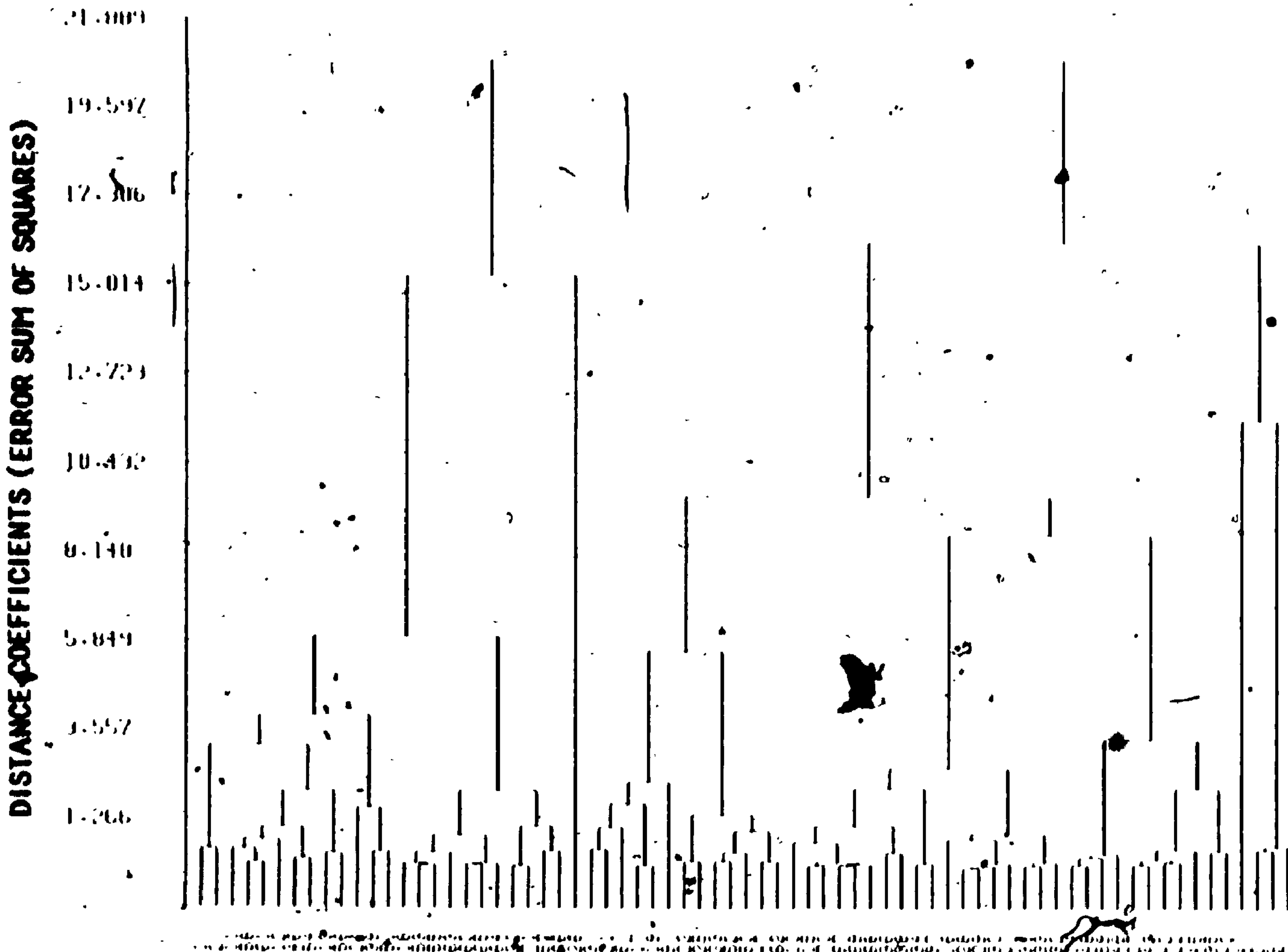


Figure 7.[illegible]

with other Hill-Tracts Districts, but Dhaka still stands out as a unique case The third significant increment in the error sum of squares occured at 2 cluster fusion stage following cycle 69 At this level of district grouping Dhaka loses its status as a seperate case However, its unity with the rest of the country may not be important, particularly, when one is truely concerned with the cumulative per cent loss of detail (about 78 per cent) which is very high and changes in the hierarchic grouping of districts which suggest that important levels of grouping can be identified at earlier cycles Stopping the grouping process at the 67th fusion cycle with 4 groups of districts is important in order to obtain a simplified regional structure However, the relative significance of the cumulative percentage loss of detail that occured at the 7 cluster fusion stage is, nevertheless, also important As a result mapping and discussion of both the 7 and 4 cluster stages for 1974 is presented

Description of Spatial Patterns: Development Regions-1974

As noted above, the total sequence of cluster analysis for 1974 is presented in Figure 7 3 Seven groups of Districts are recognized at coefficient level of 5 97, (Table 7 1b) and are superimposed on the map in Figure 7 4 It is noticed that Dhaka and Bandarban Districts remain as individual districts at the 7 cluster fusion stage The sequence of grouping starts with Group 6 followed successively by Groups 7, 1, 2, 3, 4, and 5 (Figure 7 3) However, at the 4 cluster (Figure 7 5) fusion stage (an error sum of squares 11 55, Table 7 1b) Bandarban coalleses with other Districts in the Chittagong Hill-Tracts,

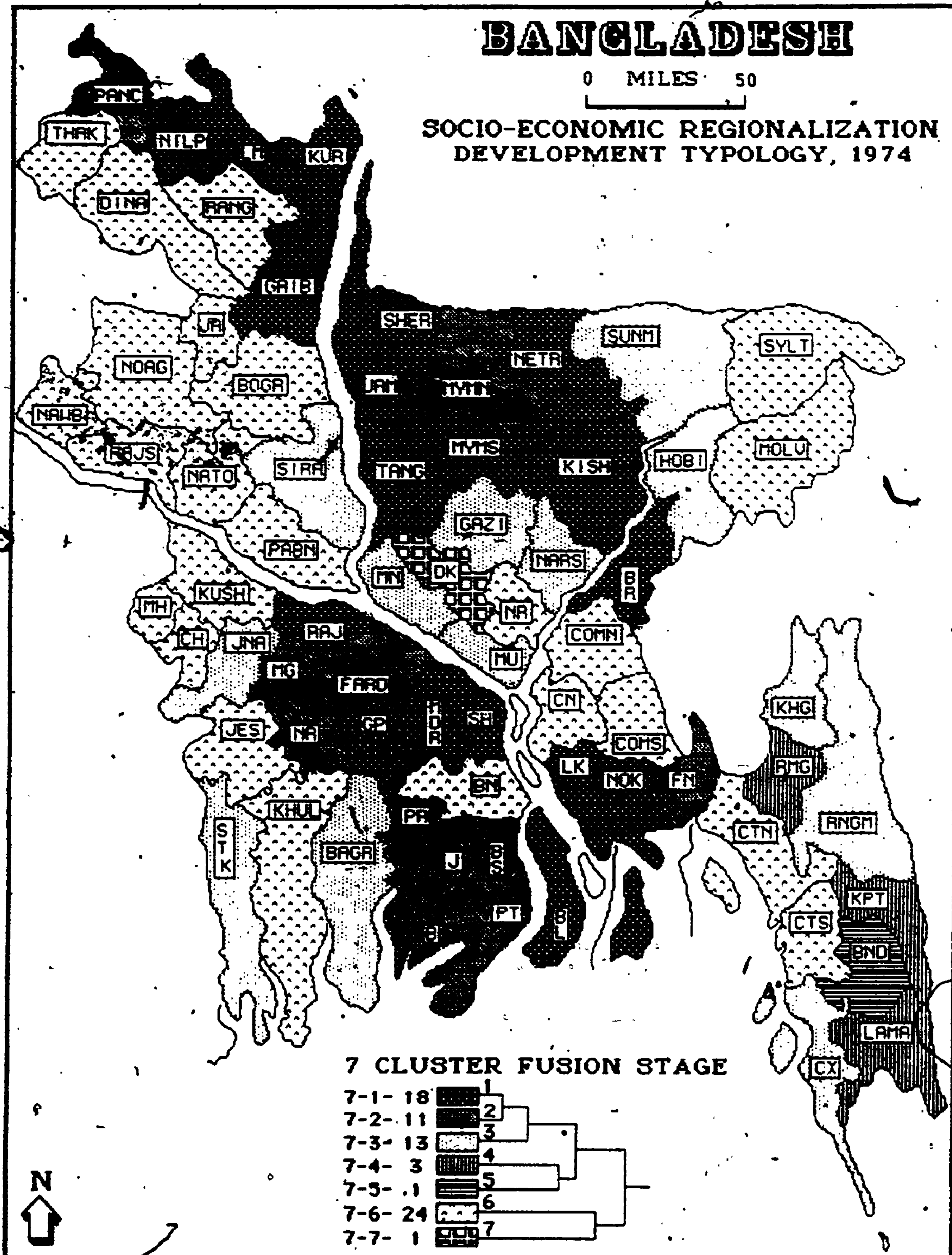

BANGLADESH
0 MILES 50
SOCIO-ECONOMIC REGIONALIZATION
DEVELOPMENT TYPOLOGY, 1974
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JAI
SHER
SUNM
SYLT
NETR
NOAG
BOGR
JAM
MYMN
NAWB
MYMS
MOLV
RAJS
NATO
SIRA
TANG
KISH
HOBI
GAZI
PABN
MN
DK
NARS
BR
KUSH
NR
MH
COMN
RAJ
CH
JNA
MU
MG
FARD
CN
KHG
JES
NR
GP
SH
COMS
LK
NOK
FN
RMG
BN
KHUL
PR
CTN
RNGM
STK
BAGR
J
PT
KPT
CTS
BND
LAMA
CX
7 CLUSTER FUSION STAGE
7-1- 18
7-2- 11
7-3- 13
7-4- 3
7-5- 1
7-6- 24
7-7- 1
N

Figure 7.4

413

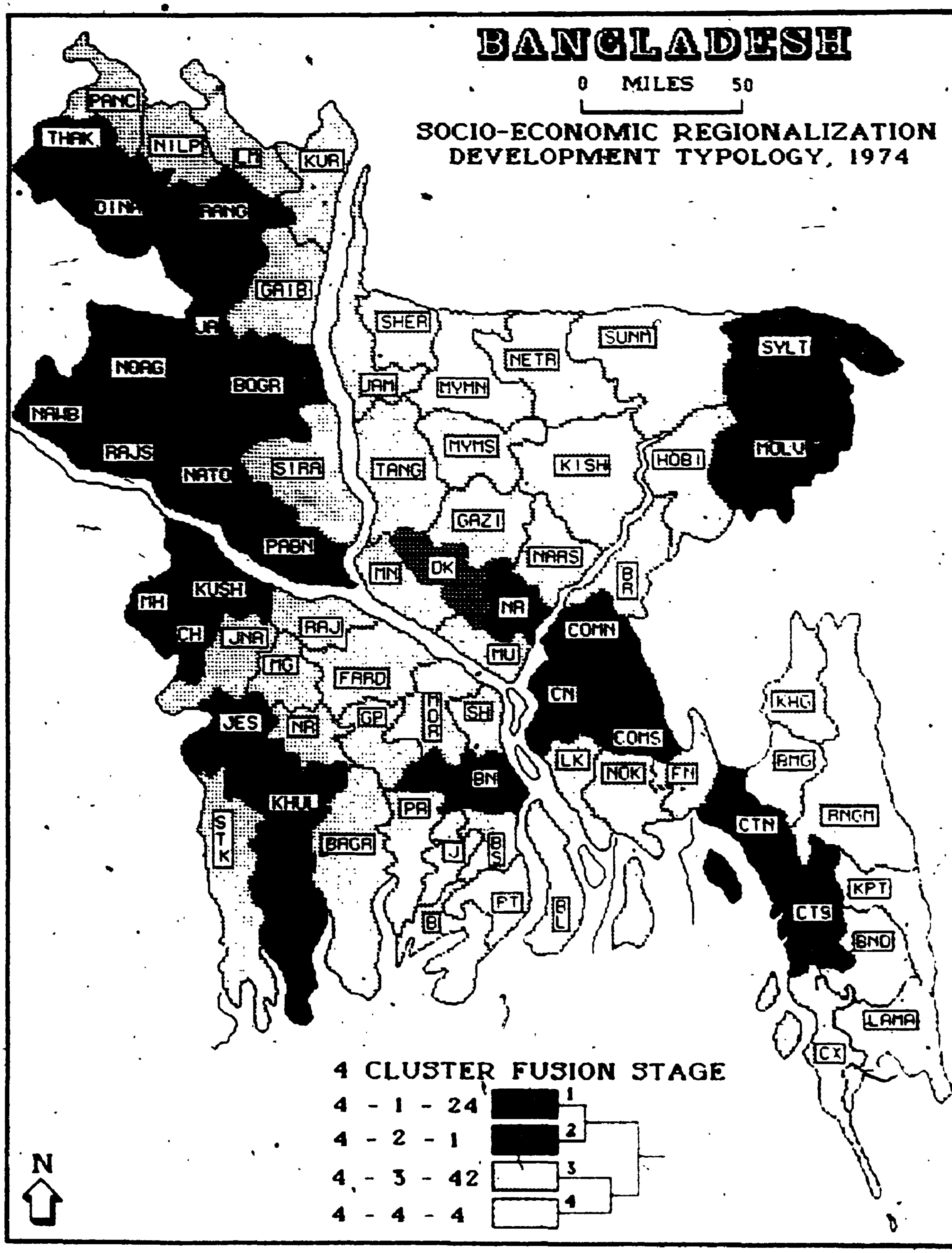


Figure 7.5

but Dhaka still remains as a unique case In the four group typology of 1974 'development regions' (Figure 7.5), former Group 6 (Figure 7.4) is represented by Group 1 and former Group 7 is represented by new Group 2 (Figure 7.5). These groups both share "urban", and "rural" components On the other hand, former Groups 1, 2 and 3 (Figure 7.4) are represented by new Group 3 (Figure 7 5) cover a vast area of rural-agricultural districts The new Group 4 (Figure 7 5) replaced former Groups 4 and 5 (Figure 7.4) and identifies an isolated rural periphery. The four groups of districts (Figure 7 5) may now be spatially described and differentiated by the input factors.

Districts in Group 1 (Figure 7.5) are dominant over most parts of the Northern Division (except the northern piedmont alluvial plain) and also form a narrow belt in the moribund delta along the India-Bangladesh Border. Another belt is formed along the main urban axis (Dhaka-Chittagong) and a pocket is found in north-eastern part of the country including Sylhet and Molvi Bazar Districts (Figure 7.5) According to Table 7.3 (1974 Cluster Diagnosis) Group 1 shows relatively high and positive mean values on Factors 1, 3, 4, 6, and 7. However, high F ratios on Factors 1, 2, 4, 5 and 7 suggest that there is a considerable variation within the cluster. Large T values on Factors 1, 2, and 5 indicate that Group 1 is substantially different from the national mean with respect to the factors mentioned (Table 7.3).

Group 2 represents Dhaka District. Mean values of this group are quite high and significantly positive on Factors 2, 3 and 6. These factors indicate relative prosperity in the dimensions of Health Care and Facilities, Housing Structure and Agricultural Intensity Large T

TABLE 7.3

CLUSTER DIAGNOSIS, 1974

FACTORS	GROUP-1 (Cases=24)	GROUP-2 (Cases=1)	GROUP-3 (Cases=12)	GROUP-4 (Cases=4)
FACTOR-1				
MEAN	0.2	0.02	-0.08	-0.93
S.D.	0.31	0	0.23	0.25
T. VALUE	0.65	0.15	-0.14	-2.19
F. RATIO	0.72	0	0.41	0.49
FACTOR-2				
MEAN	-0.16	4.27	-0.29	0.96
S.D.	0.49	0	0.61	1.06
T. VALUE	-0.02	5.22	-0.23	1.25
F. RATIO	0.96	0	0.52	1.61
FACTOR-3				
MEAN	0.76	4.95	0.04	-0.58
S.D.	0.81	0	0.72	0.28
T. VALUE	0.45	4.66	-0.28	-0.91
F. RATIO	0.65	0	0.53	0.08
FACTOR-4				
MEAN	0.37	-0.55	-0.08	-0.44
S.D	0.63	0	0.72	3.34
T. VALUE	0.33	-0.6	-0.12	-0.49
F. RATIO	0.41	0	0.53	11.4
FACTOR-5				
MEAN	0.9	1.23	1.37	1.97
S.D.	0.24	0	0.26	0.16
T. VALUE	0.96	-0.03	0.35	2.06
F. RATIO	0.48	0	0.34	0.22
FACTOR-6				
MEAN	0.26	2.73	-0.02	-0.66
S.D	0.75	0	0.91	0.23
T. VALUE	0.21	2.95	-0.11	-0.82
F. RATIO	0.69	0	1	0.07
FACTOR-7				
MEAN	0.14	-0.75	-0.37	1.47
S.D	0.74	0	0.91	0.85
T. VALUE	0.25	-0.71	-0.29	1.66
F. RATIO	0.61	0	0.91	0.81

values on Factors 2, 3 and 6 suggest cluster means are quite different, i.e higher than the national averages (Table 7.3).

Group 3 represents about 42 mainly 'rural' districts, the majority of which occupy the whole Central Administrative Division (except Dhaka and Narayanganj) and include Sunamganj and Hobiganj Districts in the Eastern Division With the exception of a few districts along the border, including Barisal, North, the whole Southern Division is fused with the Central Division to form Group 3. The northern piedmont alluvial plain and a few districts between the main urban axis, also including Rangamati, Khagrachari Districts in the Hill-Tracts are also members of this group at the four cluster stage. The characteristics of this cluster are predominiently rural. Low mean values are evident on Factors 1, 2, 4, 6 and 7. High F ratios on Factors 3, 4, 6 and 7 suggest that there is a considerable variation among districts which hides internal discrepencies. However, low T Values on almost all Factors indicate that this group is the closest one to represent the national average condition (Table 7.3). Factor 5 (Rural Dependency) is highly loaded on this group indicating the symptom of rural disadvantage, because of the incidence of a higher young dependent population.

Group 4 comprises 4 Hill-Tracts Districts including Kapti, Bandarban, Lama and Ramgarh. The most important contributing factors in this group are Factor 2 (Health Care), and Factor 7 (Rice Productivity). Because of dispersed population in this region, health care provisions per unit population seems to be higher. The relative disadvantage and isolation of this particular group may be justified by pointing to the large T value on Factor 1 (Table 7.3). However, small F ratio on Factor 1 suggests a greater homogenity within the group But there is a substantial variation in Health Care facilities in this group as indicated by F ratio

In order to summarize the changing spatial patterns, it must be noted that Dhaka's unity with the rest of the country (except Barisal South) is observed at the 2 cluster fusion stage in 1961 (Figure 7.1) with a higher fusion level (18 66) compared to 4 cluster fusion stage in 1974 at a lower fusion level (11.55) It should be pointed out that the disparity betwen Dhaka and the rest of the country was very sharp and distinguished in 1961. Although square distance between core and periphery remained, it was recorded at a much lower level in 1974 compared to 1961 As a result, we can conclude that Dhaka's (core) distance from the neighbouring group dropped (error sum of squares reduced) to some extent in 1974 For example, variation between Dhaka and other areas, particularly, along the major urban axis (Dhaka-Chittagong) and in some Northern and Southern Districts (representing both "urban" and "rural" components) is minimized to a certain degree This is an indication of the weakening of disparity between two neighbouring groups (Groups 1 and 2, Figure 7.5) This means there is a tendency of spatial convergence initially between group including "urbanized" Districts It may be also be pointed out that during and after the civil war in 1971 every thing was disturbed As a result, the war ravaged economy of Bangladesh did not produce any clear-cut "development regions" in 1974 although the pattern seems more developed than 1961 The development path was disturbed in various parts of the country and at a differential rate, which hides the actual progress that took place at the District level between 1961-1974. However, the distinction begins to emerge and we may expect a considerably clearer regional picture of development in 1981.

Cluster Analysis: 1981

The Dendrogram (Figure 7.6) summarizes the results for the 1981 clustering. Starting with the pair of most similar districts, Rajbari (28) and Gopalganj (29), separated by least distance (.018946), the districts are successively grouped, based on the procedures outlined above. Immediately apparent are the three big jumps (sharp increment in errors) in the hierarchic grouping of Districts (Table 7.1c). The first sharp increment in the loss of information is observed at 65th cycle when 6 groups are formed. Dhaka remained isolated at this level, which accounts some 24 per cent of the cumulative error. The second most significant group solution is identified at the 68th cycle or 3 cluster fusion stage and the most significant at the next successive stage of District groupings, cycle 69 or 2 cluster fusion stage.

Therefore, the most significant group solution is identified at the 3 cluster fusion stage (12.13, Table 7.1c). This level of group extraction is found more suitable considering the importance of a simplified group structure and the significance of cumulative (about 46 per cent) error incurred in district groupings. However, a 6 group typology of development is also considered given the relative importance of the loss of detail at 65th fusion cycle (Table 7.7). The grouping sequence begins with Group 4 and followed by Groups 5, 6, 1, 2 and 3, successively. These groups are, however, synthesized at the

DENDROGRAM OF CLASSIFICATION HIERARCHY:
GROUP STRUCTURE OF BANGLADESH DISTRICTS, 1981

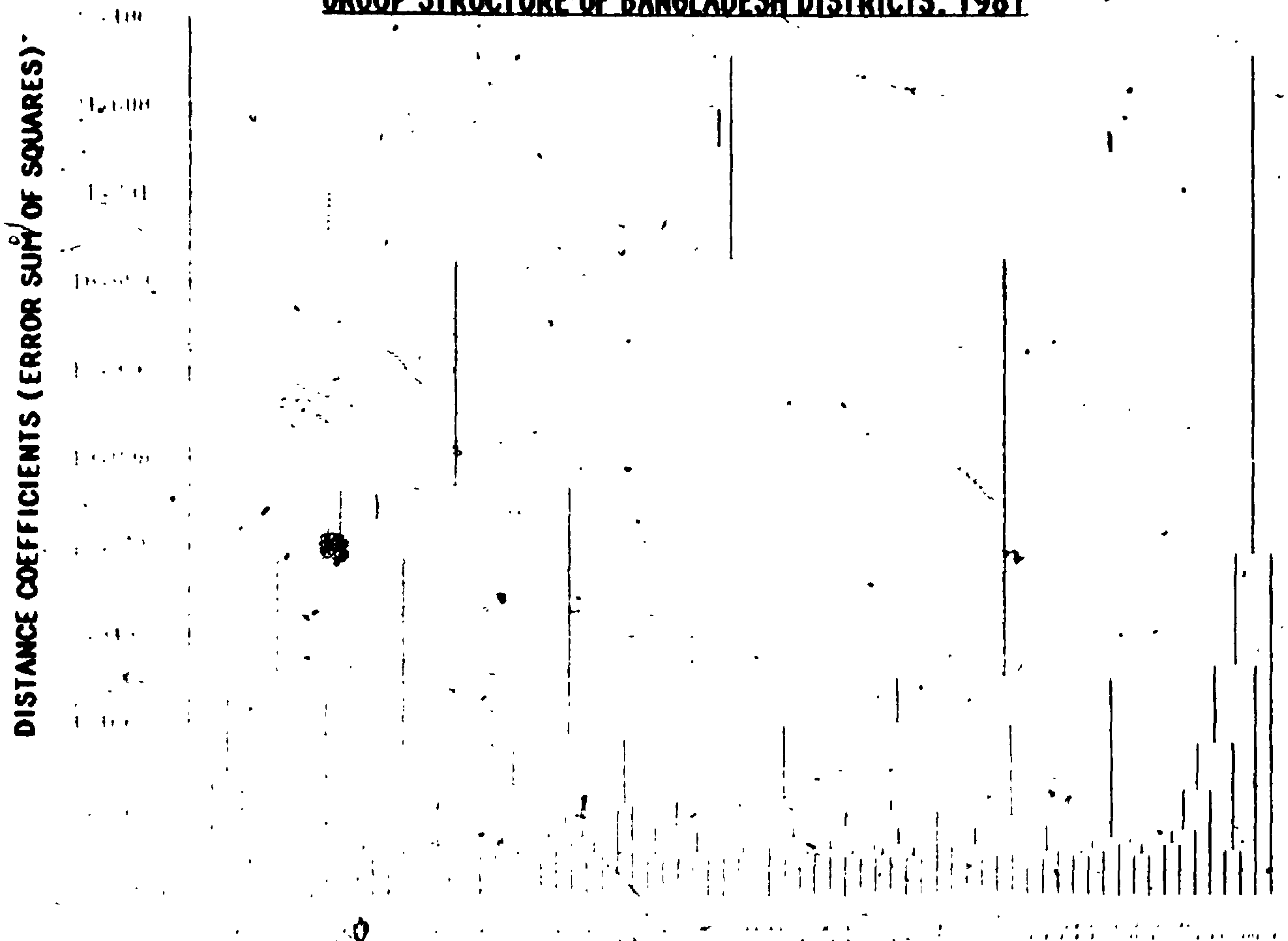
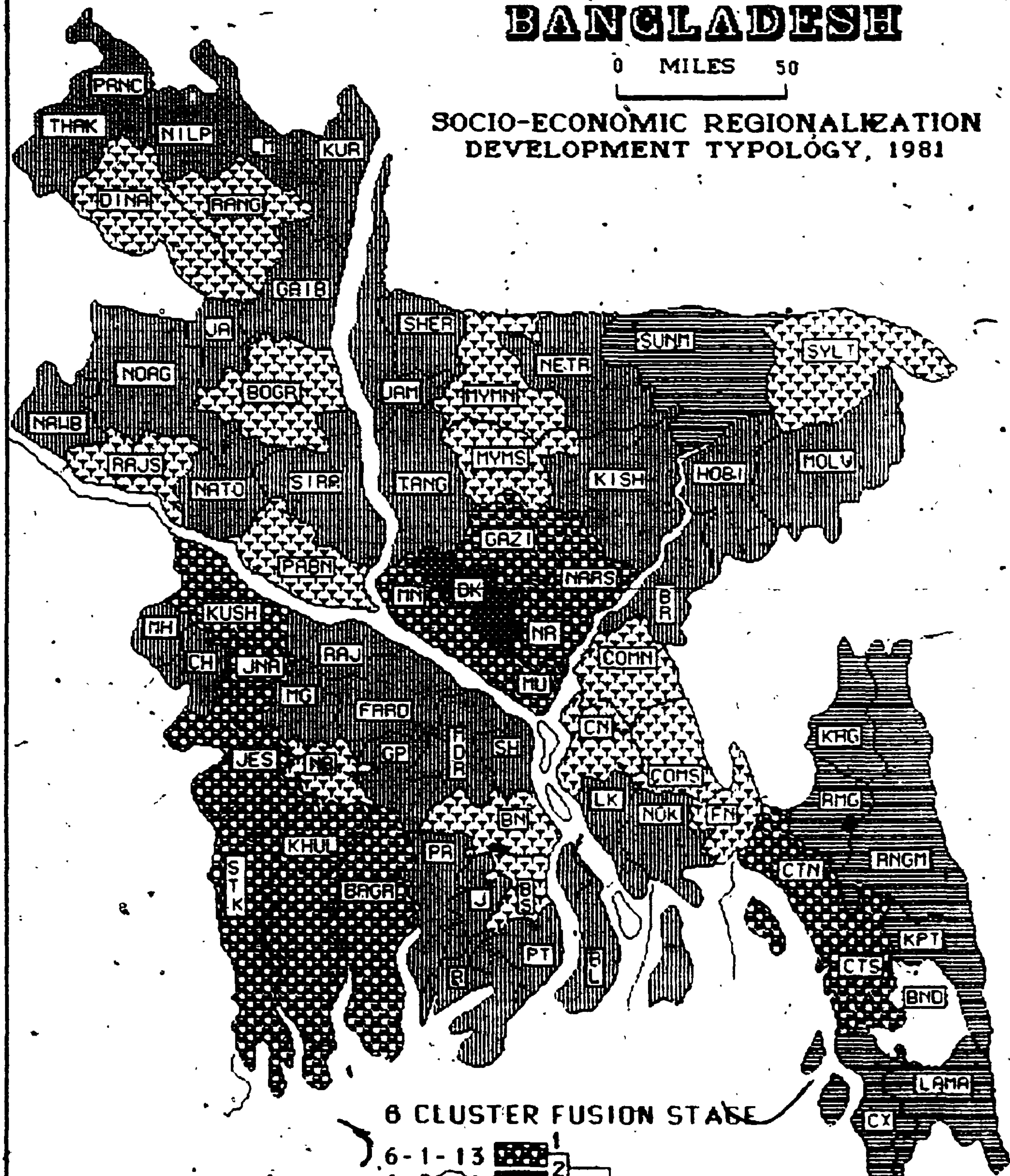


Figure 7.6

3 cluster fusion stage (Figure 7.8). The new sequence of groups in the hierarchic structure are Groups 1 (combining former Groups 1, 2 and 3), 2 (former Group 4) and 3 (former Groups 5 and 6).

Description of Spatial Patterns: Development Regions-1981

The three broad groups of districts are superimposed on map (Figure 7.8). Immediately apparent is the Group 1 pattern of relatively urbanized and industrial districts along the Dhaka-Comilla-Chittagong axis, and to a lesser extent from Rajshahi to Khulna including Jessore and Kushtia Districts. Randomly distributed cases under Group 1 represent those districts which previously (before 1971) served as District Headquarters (e.g. Rangpur, Dinajpur, Bogra, Pabna, Mymensingh North, Sylhet and Barisal South). These are strongly linked with the national capital (Dhaka) and the major urban axis. Districts within this group had the advantage of having regional administrative headquarters aside from any advantage of relative gains from localized industry and commerce. However, quite a few districts appeared as members of Group 1 which did not serve local regions previously either as 'semi-cores' or District Headquarters (e.g. Chittagong South, Feni, Chandpur, Munshiganj, Manikganj, Gazipur, Narayanganj, Narsingdi, Mymensingh South, Barisal North, Bagerhat, Satkhira, Narail and Janeadh). These Districts are located either around the capital District of Dhaka or along the main urban axis. For example, Districts around Dhaka are Narayanganj, Gazipur, Manikganj, Munshiganj and Narsingdi. Along the main urban axis, the Districts of Feni and Chandpur are also prominent. In the


BANGLADESH
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SOCIO-ECONOMIC REGIONALIZATION
DEVELOPMENT TYPOLOGY, 1981
PANC
THAK
NILP
KUR
DINA
RANG
GAIB
JA
SHER
SUNM
SYLT
NOAG
BOGR
JAM
MYMN
NETR
NAWB
RAJS
NATO
SIRA
TANG
MYMS
KISH
HOBI
MOLV
GAZI
PABN
MN
DK
NARS
BR
KUSH
MH
CH
JNA
RAJ
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6 CLUSTER FUSION STAGE
6-1-13
6-2-1
6-3-15
6-4-34
6-5-7
6-6-1
1
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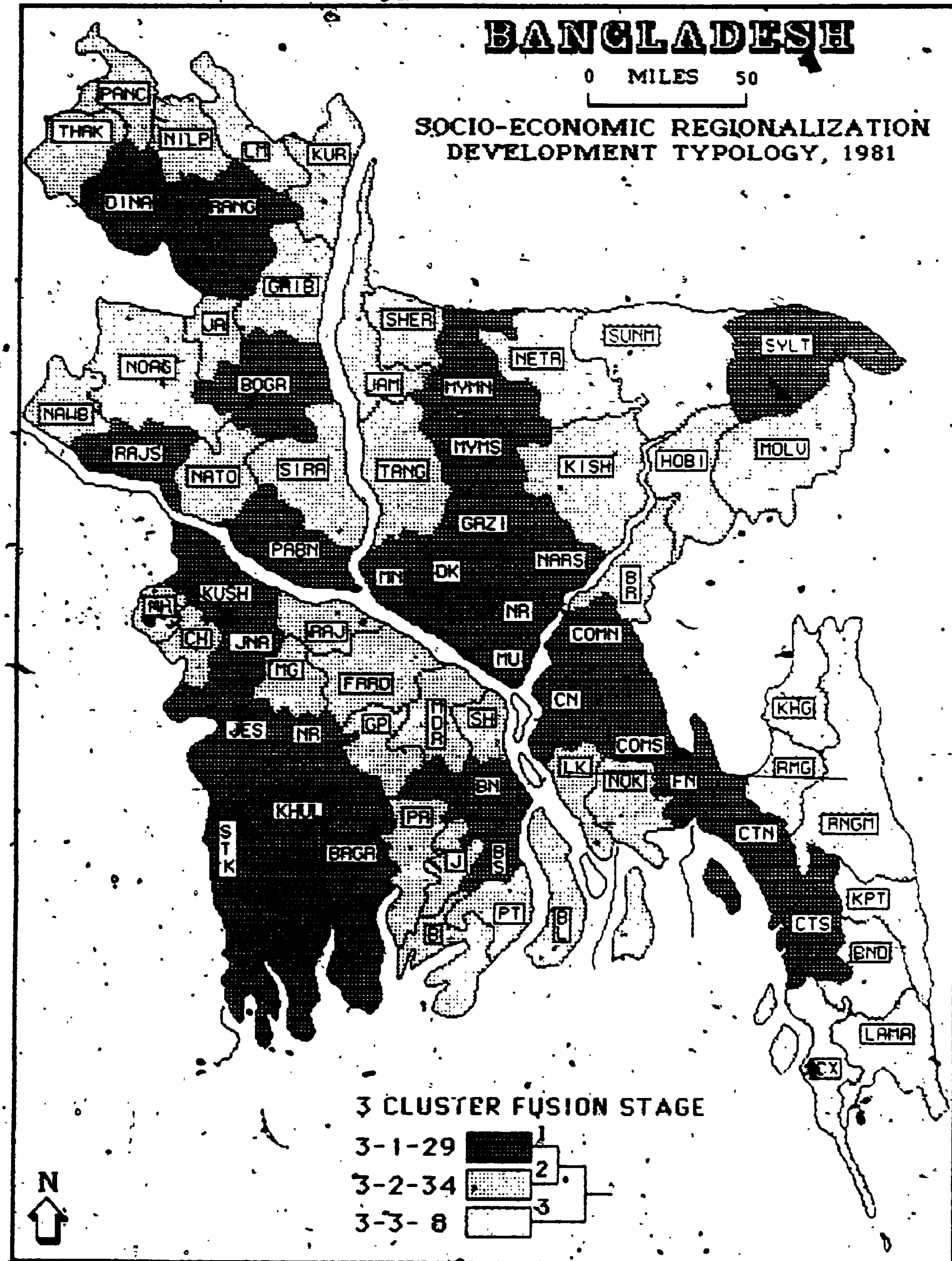
N

Figure 7.7


BANGLADESH
0 MILES 50
SOCIO-ECONOMIC REGIONALIZATION
DEVELOPMENT TYPOLOGY, 1981
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3 CLUSTER FUSION STAGE
3-1-29
3-2-34
3-3- 8
1
2
3
N

Figure 7.8

Southern Division, particularly, around the Khulna industrial belt, Bagharhat and Satkhira Districts and along the Khulna-Rajshahi axis Narail and Jhenadah Districts stand out (Figure 7 8) These Districts received benefits of development either due to their distinctive locational advantages on the develpment axis or due to their close proximity to major urban centres and trade potentials with their counterparts Therefore, we can conclude that spatial convergence between the neighbouring groups had occured at a much lower distance coefficient level in 1981 compared to 1961 and 1974 (Tables 7 1a, 7 1b and 7 1c)

Cluster diagnosis for 1981 (Table 7 4) indicates that Group 1 has relatively high and positive mean values on Factor 1 (Socio-Economic Structure), Factor 2 (Health Care), Factor 3 (Housing Structure) and Factor 6 (Agricultural Intensity) F ratios are significantly high on Factors 2, 3 and 7. This suggests that internal variation within the group is not considerably minimized with respect to Health, Housing and Rice Productivity However, low T values indicate cluster means on all factors are not significantly different from the population sample means Relatively high negative mean values on Factor 5 (Rural Dependency) suggests that Group 1 is inversely associated with the dependency ratio In other words, dependency ratio is generally lower in Group 1 Factor 4 (Agricultural Structure) also scored low on Group 1 Therefore, members of Group 1 may be treated as the 'urban' associated group

Group 2 comprises of those districts more obviously, rural and to some extent peripheral (Figure 7 8) Although the spatial pattern appears rather scattered on the map, there seems to be an apparent

TABLE 7.4

CLUSTER DIAGNOSIS, 1981

FACTORS	GROUP-1 (Cases=29)	GROUP-2 (Cases=34)	GROUP-3 (Cases=8)
~~FACTOR-1~~			
MEAN	1.44	1.04	0.58
S.D.	0.26	0.18	0.39
T. VALUE	0.77	-0.29	-1.55
F. RATIO	0.52	0.24	1.15
FACTOR-2			
MEAN	0.33	-0.79	1.6
S.D.	1.32	0.33	1.95
T. VALUE	0.13	-0.38	1.17
F. RATIO	1.18	0.07	2.58
FACTOR-3			
MEAN	0.34	-0.73	-1.12
S.D.	1.34	0.41	1.11
T. VALUE	0.61	-0.35	-0.71
F. RATIO	1.42	0.13	0.98
FACTOR-4			
MEAN	-0.25	0.27	-0.46
S.D.	0.66	0.83	1.78
T. VALUE	-0.24	0.31	-0.46
F. RATIO	0.49	0.76	3.51
~~FACTOR-5~~			
MEAN	-0.77	-0.23	0.05
S.D.	0.31	0.19	0.36
T. VALUE	-0.86	0.46	1.18
F. RATIO	0.59	0.23	0.84
FACTOR-6			
MEAN	0.21	0.17	-2.11
S.D.	1.21	0.89	1.66
T. VALUE	0.21	0.18	-1.53
F. RATIO	0.82	0.45	1.58
FACTOR-7			
MEAN	-0.02	-0.02	1.55
S.D.	1.01	0.71	1.07
T. VALUE	-0.17	-0.18	1.38
F. RATIO	1.02	0.49	1.44

order in the organization of districts which is relateable to their rural and physical setting within the country. The incidence of Group 2 is widely distributed across the country with the exception of the extreme south-east. In the Northern Division, this group is mainly concentrated in the piedmont alluvial plain and the low land basin. These are marginal ares and are somewhat removed from the zone of influence of major urban centres and the development axis. In the Southern Division, Group 2 formed a continuous belt accross the active delta plain extending from the District of Rajbari in the north to Barguna in the south. In this broad region of relative disadvantage Barisal, which was formerly the District Headquarter for the lower active delta is the only exception. In the central-north (Central Division) and north-eastern region (Eastern), Group 2 produced two pockets of relative disadvantage. These are the western Jamuna flood plain and the depressed basin including the hilly areas of Molvi Bazar and Hobiganj. These areas are predominantly rural-agricultural and not well articulated by modern transportation networks either due to their unfavourable physical setting or because of their relative remoteness from the major urban centres and development axis. For example, in the lowland and depressed basins and also in the hilly areas of Molvi Bazar and Hobiganj Districts, road transport is extremely difficult. Same is the case for the active delta plain where a large number of rivers and tributaries meander over the vast low lying alluvial plain and frustrate the development of road transport. Because of the relative isolation of Group 2 from the national capital and major urban centres and development axis, Districts under this category shows a condition of relative material deprivation. Therefore, members of this group may be regarded as the 'rural' associated group.

Cluster Diagnosis (Table 7.4) indicates Group 2 is relatively disadvantaged compared to Group 1. With the exception of Factor 4 (Agricultural Structure), the mean value of which is positive and slightly higher than Group 1, all other factors scored relatively low on Group 2. The negative influence of Health and Housing are more marked, while dependency (Rural Dependency) is relatively high in this group. Low T values indicate that cluster means on all Factors are close to national mean and small F ratios suggest a greater internal homogenity within the cluster- therefore, a good diagnosis.

Cases in Group 3 comprises of Districts in the Chittagong Hill-Tracts and Sunamganj in the depressed basin. This is the most disadvantaged group as evident by the low mean values on Factor 1 (General Socio-Economic Structure), Factor 3 (Housing Structure) and Factor 6 (Intensity of Production, Table 7.4). Because of lower population density per square mile, this group, however, indicates high mean value on Factor 2 reporting higher provision of health care services per 50,000 population. Relatively high mean value on Factor 7 suggests that this is an area of higher rice yield ('aus' paddy mainly) per acre (see Chapter 5, Figures 5.18a, 5.18b, 5.118c, Chapter 6, Factor 7) and unemployment is less likely to occur simply because of higher participation rate in the agricultural labour force (Table 7.4). The shifting cultivation process in this region allows land to renew it's fertility at a regular interval. As a result, rice productivity per unit area is expected to be higher in this area compared to those areas of sedentary farm population. Although the

Chittagong Hill-Tracts comprises a very small arable land area, nevertheless, its performence in 'aus' rice production per acre is significant

Conclusion

Using the grouping technique of cluster analysis, the factor scores for each of the 7 Factors determined by factor analysis, (Chapter 6, Appendices II, III and IV) have been grouped/ classified and regionalized for 1961, 1974 and 1981, and a selection of the resultant cluster- regions presented in Chapter 7 The overall objective was to reverse the analytic direction of factoring and to attempt to group the districts on a composite basis and interpret the groupings as 'Development Regions' As an adjunct to this procedure, one is also seeking to determine whether the shift in the pattern of regions over time corresponds to the development process, and whether the result can be interpreted in terms of the 'core-periphery' model

In 1961 a five-cluster regionalization was chosen as being the most significant grouping of districts, in 1974 the four-cluster, and in 1981 a three-cluster set of regions This progression would seem to indicate a more coherent structure over time This does seem to be the case, but less in terms of the reduced number of clusters than the manner in which a more clear-cut separation seems to emerge. In terms of the core-periphery, this distinction is overall rather weak, but the trend seems to be that the core area enlarges over time, but its distinctiveness is lessened In statistical terms what the clustering indicates is a decreasing percentage loss of detail through time, and hence, that a narrower set of groups represents a decreasing distance between the composite characteristics of the districts.

The five-cluster grouping in 1961 seems to reflect that at that time, the vast majority of the country exhibited a low level of development in what may be termed a predominantly 'rural' mode (i.e. Groups 1, 2 and 3 comprising 69 of 71 districts). At this time, in contrast, the two districts of Dhaka and Barisal South stood out and maintained major differences with all the rest. While Barisal South seems to be an anomaly which has lost significance by 1974, Dhaka is obviously set aside by virtue of composite characteristics accuring to its status and role as the national capital. Its distinction, however, emphasises the very low level of development elsewhere. In 'core-periphery' terms, Dhaka is the 'core', the rest of the districts form a 'periphery'. In developmental terms this may reflect the very low level of investment during the East Pakistan period.

The four-cluster grouping that emerges as most significant in 1974 shows some major shifts in the pattern of regions, which, despite the disruptions of civil war and independence, reflect the beginnings of development indicated by the factor analysis While Dhaka remains as a single, separate district in 1974, there has also emerged a major group (1) of 24 districts that combine features of a higher level of development and which coalleses with Dhaka at the three-cluster stage. This group seems to represent an emergent enlarging 'core' region and includes most of the socalled 'urban' districts. In contrast, the remaining districts and split between the majority (42) which are less developed 'rural' and scattered throughout the country, and the more distinct set of districts in the

Hill-Tracts (4), which seem to represent a physically and culturally distinct 'periphery'. The main factors contributing to this pattern are Factors 1, and 4, 6, and 7.

Essentially, the thre-cluster pattern of 1981 is a stronger, more coherent version of that in 1974. By this time, Dhaka is no longer separate, but forms part of an enlarged set of 29 districts which represent the socalled developed 'core'. This group includes all but one of the districts containing major urban places or former district headquarters, and to that extent is 'urban', but it also includes many 'rural' districts, and here the critical configuration in most cases is the proximity of those districts to the major urban axes (Dhaka-Chittagong, and Khulna-Rajshahi) At the other extreme is the enlarged group of eight districts, all but one of which are in the extreme south-east, i.e. the Chittagong Hill-Tracts This area remains disadvantaged and distinct in composite terms of low population densities and better rates of service provision, this is obviously still the most 'peripheral' region In between group 1 and and group 3, lies the largest set of 34 districts (group 2) which are virtually all 'rural' and lie somewhat distant (in relative terms) from the main development axes.

Overall, therefore, between 1961 and 1981 those districts which are more obviously 'developed' grow substantially in number, while the total of those at a lesser level diminishes The end result, the three "Development Regions" of 1981, is in some ways a very satisfactory outcome compared to 1961, although the absolute levels of development are so low It does suggest 1) the growth of a more advantaged region from Dhaka District to 40 percent of all districts, 2) a reduced rural less-disadvantaged area, which, upon examination, is found to share in many non-agricultural aspects of development (Factor 1); and 3) the Hill-Tracts whose distinctiveness reflects factors other than level of development per se. In 'core-periphery' terms, there is an 'urban' influence, but the overall spread of influences seems to have reduced the localized effect which might have been expected to have been associated with Growth Pole and related policies, and which may be an indicator of the growing influence of those based on Social Justice. A summary of the overall conclusions of the study, including further examination of the relationships of the analytic findings to the sequence of development policies and plans is presented in Chapter 8.

CHAPTER 8

Summary and Conclusions

In this study we have been concerned with the major dimensions of development in a Third World context, and specifically the nature of developmental change in Bangladesh from a regional and rural perspective, between 1960-1980, in both absolute and relative terms The study has sought to incorporate and relate the different dimensions of development (i e theoretical, historical and methodological), basing itself on the conceptual models deemed appropriate to Bangladesh and identifying the approaches to development that have been applied What has been attempted is an analysis of change based on an array of variables which it is postulated are measures of social and economic well-being, and relate to an overall concept of development based on social justice and equality of opportunity Spatio-temporal change has been measured over the twenty year period using 31 selected variables from the 1961, 1974 and 1981 censuses, organized on the spatial base of Bangladesh's 71 Districts The primary objective of the investigation was to analyze the regional characteristics of change for all variables on both an individual (univariate) and composite (multivariate) basis and, thereby, to establish whether, despite persistent conditions of low income and economic underdevelopment, positive changes had taken place, and whether, in the process, there had been significant alterations in regional patterns of development

Consequently, despite the fact that economic approaches have seemed to be dominant, and overtly social programmes only recently introduced in Bangladesh, this investigation attempts to assess the situation more in terms of attributes of a 'Unified' or 'Social Justice' approach. An underlying expectation was that, despite the persistence of economic underdevelopment, some measure of social improvement would have occured. It was further expected that, through improvements in social well-being, some degreee of regional equalization would have occured, with a lessening of the discrepancies between the urban (cores) and the rural (periphery) within the country In order to justify the underlying premises in the context of Bangladesh the major dimensions of development (i.e. theoretical/conceptual, historical/applied, and methodological) were developed in Chapters 2, 3 and 4.

In the immediate post World War II period, as the idea of the conscious promotion of development in colonial and ex-colonial countries gained acceptance, its primary focus was economic, and its main objectives were modernization through industrialization of largely agricultural-rural economies. The key criterion for success was the rate of economic growth, which was to be as rapid as possible. The role of the agriculture and the rural sector was to furnish labour and raw materials. As part of the industrial-based strategy it was assumed that social welfare would follow and, presumably, be supported by the modernizing and wealth generating sectors. Social conditions were not ignored, but their betterment was believed to be an inevitable by-product of economic growth (Chapter 2).

However, the impetus to change this approach came from a number of directions; first, the obvious failures inherent in the existing models, which saw many countries slide back in terms of GNP/ per capita and provision of the most basic social services. second, the alternative approaches—and critical appraisals being introduced by non-governmental organizations and some of the more socially advanced aid providers, and finally, the idea crystallized through the United Nations and its agencies The UN Myrdal Commission reviewed the role of social planning in the development process The shift in emphasis was reflected in the UN resolution for the Second Development Decade, endorsed by the Economic and Social Council and adopted by the General Assembly in its resolution "The Unified Approach to Economic and Social Planning in National Development" (1970) The UN resolution stressed the need to reduce inequality across the range of social and economic criteria for the majority of the population (Chapter 2)

Given the initial condition of poverty or disadvantage in a country one seeks for a concept that embodies a positive change in that state, and on the basis of the lowest common denominator The most appropriate concepts are those of 'well-being' and equity 'Well-being' is defined as a situation in which a certain basic level of material, and socio-cultural and other basic needs of a society are met Equity is the appropriate distribution of well-being among members of society and has strong spatial connotations Need is the most basic and serves to provide a concrete basis for a set of individual and composite measures against which to assess both the base level of disadvantage (poverty) and the degree of well-being achieved The application of the specifics of Need, as the key to the realization of social justice, allows level of living to emerge as the set of factual circumstances that define change along a continuum that runs from poverty to 'well-being' (Chapter 2).

Although the development paradigm as it developed stressed a more social view point, and introduced the concept of development based on social justice, actual development planning continued to have a strong economic orientation. In examining the primary models that have underlain development planning and that have had both regional objectives and regional results, one can identify a series of economic models, beginning with those based on Hirschmann's (1958) growth and take-off model and shifting to varients of the so-called growth-pole model. Both were criticized for failing to achieve their goals of economic growth in LDCs. The prescriptive models suggest a gradual shift from industrial to agriculturally oriented economic growth, and from economic development to social development. Whereas, the shifts also suggest a more general spatial application, it is unlikely that application will ever be achieved on a uniform basis. This suggests that, inevitably, any model of the resultants of development will postulate a degree of spatial inequality, although reduction in the level of inequality may be seen as a sign of progress. Therefore, attention is drawn to the most pervasive and seemingly appropriate spatial resultant model of development; the 'core-periphery' model. This model is both a general assessment of the manner in which development creates a regional dichotomy, and has been discussed and investigated to the degree that the significance in change to the core-periphery situation can be identified as an indicator of the direction of change in overall development (Chapter 2).

Bangladesh experienced approaches to development, national and international, that reflected the models of the objectives and strategies for development that were "current" during the last 40 years. The 'development model' that had set the tone, and because of longevity was most influential, was colonial exploitation. The incorporation of East Bengal into what became the British Indian Empire, 1757, reduced a vibrant, industrializing economy to one of raw material and food production, tributary to Calcutta, and on the 'periphery of the periphery'. After nearly 200 years, independence, through the partition of India and Pakistan in 1947, was a mixed blessing. Although the moslem majority, which had become generally impoverished and denied power in Bengal, achieved majority status in East Pakistan, the new situation became one of neo-colonialism applied via Islamabad, rather than London or Delhi (Chapter 3).

Between 1947 and 1971, the dominant factor in the development of Bangladesh was its dependent status as East Pakistan. As part of an important, newly independent state in need of development, it fell within the context of a series of models of international development. These emphasized economic growth based primarily on rapid industrialization, with 'take-off' as a function of [illegible] development, and, in more concrete terms the concentration of investment in specified urban growth poles. In this context agriculture and the rural sector in general were placed in a secondary role. Although these models were deemed appropriate for Pakistan and applied during the 1950s and 1960s, application in East Pakistan was somewhat peripheral. The national investment policy was strongly oriented to West Pakistan. The overall result was to underline the secondary role of East Pakistan as a rural economy supplying food and raw materials. In this context, the industrial and infrastructural development that did take place was concentrated in the cities of Dhaka, Chittagong, Khulna and Narayanganj, to enable them to take-over the role of Calcutta as jute, textile and related processing centres (Chapter 3).

Consequently, during the period prior to independence of Bangladesh and including the first part of the study period (1960-1971) development activity was largely confined to residual investment in the urban-industrial and energy sectors, to schemes related to the particular environmental character of East Pakistan (i.e. control of floods and allocation of irrigation water), and to modest public investment by the provincial government in areas such as health and education. Among the tenets of the dominant economic models were that development in the rural economy as well as any impetus for social welfare, would occur and be supported by 'spread' or 'trickle-down' effects from growth in the urban-industrial sectors. These linkages came to be widely questioned, but in East Pakistan there was scarcely sufficient activity to stimulate wider impacts (Chapter 3).

Measured in economic terms, East Pakistan at the beginning of the study period (1960) and newly independent Bangladesh (early 1970s) exhibited classic symptoms of stagnation, with actual declines in industrial output and GNP and increased unemployment in agriculture. Events in 1970-71 exacerbated the problem, when overt political manipulation led to the declaration of Bangladesh independence, it took a destructive civil war to achieve statehood.

The new state, which at its birth was amongst the world's poorest countries, has continued to suffer the impacts of physical calamities (e.g. cyclones, floods etc.), and a succession of political upheavals. Nevertheless, since 1971, activity generated within the country, together with international assistance, has benefitted Bangladesh, rather than being siphoned-off to West Pakistan (Chapter 3).

To some extent, the shift to independence coincided with changes in approaches to development espoused by international experts and followed by donors. Whereas, the rural sector has been largely the recipient of a 'Residual Social Policy' approach, more concerted efforts at rural development were made, beginning in the 1971-1980 period. The initial result was that institutions such as (East Pakistan) Water and Power Development Authority and Agricultural Development Corporation, and the Integrated Rural Development Programme, which had existed largely in name, were expanded by the Bangladesh government and became vehicles for attempts at integrated rural development. These included application of elements of the 'Green Revolution' as well as local political campaigns. However, success in this area has been retarded by structural and institutional problems. Even the highly acclaimed Comilla model of rural development, based on cooperative methods and a closely integrated local approach, failed to involve the marginalized rural population and remains a regional anomaly (Chapter 3).

The net economic impact of development programmes to the late 1970s was disappointing. The switch in emphasis from urban to rural made little impact on the overwhelming rural poverty and agricultural production lagged behind population growth, necessitating major imports of cereals. On the other hand, Bangladesh began to experience the shift in emphasis to what the United Nations has termed a 'Unified Approach' to development The approach, which embodies concepts of 'social justice' and 'well-being' looks at development from a broader perspective and places an emphasis on the general improvement in living conditions through provision of basic needs This approach has found a place in Bangladesh, albeit quite recently The First Five Year Plan (1973-1978) was still largely economic in orientation, but did specifically seek a more equitable distribution in income, partly through direction of public expenditures to the poorest segments of the population, an by attempts to impose employment quotas (mainly in public service) at regional and District levels In addition, the plan established a network of regional health centres, and gave atention to administrative decentralization and some measure of regional planning (Chapter 3)

The underlying premise of the investigation is that development in Bangladesh has been and will be more a function of general social improvement than of individual income related characteristics. The basic condition in Bangladesh, and especially across its largely rural hinterland, is one of poverty This poverty is not defined in narrow economic terms but as poverty in terms of basic needs such as food supply, housing, health care and basic education Narrowly defined and spatially focused economic development approaches are deemed to have the potential to exacerbate the relative levels of poverty, especially between rural and urban populations and areas, and to heighten spatial differentiation of a core-periphery nature In contrast, an approach based on 'Social Justice' which identifies basic needs and sees their general provision as the most significant and basic approach to the allevation of poverty and the realization of some level of positive development, represents the valid strategy and the framework against which progress can and should be measured

Based on the above premise and expectations, the framework of investigation has had the following components

1) an array of variable information which emphasises measures of well-being within the society

2) Information collected for the three Census dates- 1961, 1974 and 1981- and assembled on the framework of 71 Districts within Bangladesh (Chapter 4)

3) Univariate analysis of 19 selected variables (from a revised list of 31 variables) with respect to their regional variation (relative) and temporal change (absolute) between 1960-1980 (Chapter 5), and

4) Composite analysis of 31 variables, using factor and cluster analytic techniques and associated forms of dimensional analysis, to arrive at an overall expression of development/change over time and in spatial (District) terms (Chapters 6, and 7)

The variable information was collected from national and regional government agencies in Bangladesh and assembled in eight broad categories: Demographic, Housing Characteristics, Household Amenity, Employment Category and Income, Health Care, Education Facility and Use, Central Services, and Agricultural Structure and Performance. The original list of 69 items was reduced to a set of 35 variables and further reduced on the basis of correlation analysis to 31 variables for composite analysis.

The sequence of five maps for 19 selected variable depictions (Chapter 5) provided not only illustration of some individually critical dimensions of Bangladesh during the study period, but also substantiation of the need to synthesise these sometimes divergent measures This indicated that each individual variable and each group of variables had a specific pattern of spatial and temporal change Most of the individual variables exhibited spatial patterns strongly associated with either the physiographic base of the country or provide some reinforcement of an 'urban' versus 'rural' district dichotomy (Chapter 5)

The only variable for which no change was recorded over the 1960-1980 period was average farm size All other variables, whose gross characteristics are recorded in Table 5 1, show some change, with the majority being positive in nature vis a vis the general concept of development. For example, demographically, although population numbers and densities continued to increase, there were significant drops in both birth and infant mortality rates, the latter especially after ~~1974~~, which may be related to increased levels of investment in provision of health care and facilities Employment generally has seen a significant drop in the proportion engaged in agriculture and modest increases in other categories While the non-agricultural employment provided some evidence of spatial concentration in those Districts associated with ~~major urban centres~~, there is a ~~much~~ more diffuse pattern (including rural districts) associated with both household characteristics and health and educational variables. There are indications of the spread of household amenities including both bath and toilet facilities and of ecectricity into rural areas The spread of electricity and the possession of a radio represent the largest individual changes recorded and whose impact has had broad significance Regional mapping indicates that each of the patterns involving public investment has been widespread and certainly not confined to specific growth areas On the other hand, within the rural countryside there is still evidence of extreme pressure on resources, so that although irrigated areas, multiple cropped areas and rice yield have risen, per capita availability of agricultural land has fallen The list (Table 5 1), however, revealed that the 'improvement' was generally very modest (Chapter 5)

This finding (univariate analysis) supports our summary expectation that, in view of the recognition of broad levels of absolute change and a more or less continuous attempt to achieve development during the 1960-1980 period (albeit, with different levels of effectiveness) there would be evidence of an overall improvement in economic and social well-being in Bangladesh during the study period (see Chapter 1, hypothesis # 1, pp 23-24) However, in some cases there was substantial regional variation in both the absolute values and degree of change, and there was often little consistency between two inter-censal periods This supports our specific assumptions that given the different sources of development policy, i.e Pakistani until 1971; and Bangladeshi since 1971, and the increased influence of UN stimulated policies in the later decade, then it was expected that the level of development would be more pronounced in the 1974-1980 period than in the 1960-1974 period (e.g. infant mortality rate) And, also, given the variable geographic nature of the country, including a core-peripheral differentiation already apparent in 1960, there would be continued variation in the levels of development and the degree of change between districts, and overall core-peripheral differences will persist (Chapter 1, hypotheses # 2a and 2b, p 24) It must be remembered that the period under review is largely one of rural neglect and Residual Social Policy Figures in Chapter 5 suggest some modest improvement in social conditions despite the economic problems This supports our hypothesis that with respect to individual variable differentiation, overall change over time in a generally positive direction was expected for all variables, together with changing patterns of detailed spatial distribution of variable measures However, it was also expected that the patterns and levels of change would vary with respect to distinctions between variables (i.e social and economic), especially in terms of their susceptibility to government/ public programme initiation and provision. Thus it was expected that public service provisions (e.g health, education) would achieve higher levels of positive change and a broader pattern of spatial diffusion, than variables related more to the private sector (e.g. agriculture, manufacturing employment). What one is searching for is evidence of modest improvement; despite lack of policy, which may suggest a more sustainable direction than that of economically oriented, sectoral approaches (Chapter 1, hypothesis # 2d, p 24). In this sense, one turns from the 'confusion' of the individual variable array to attempts at composite analysis (Chapter 6) Nevertheless, individual variable analysis provides some clues to underlying directions of change.

The first phase of the composite analysis was the factor analysis. This was attempted to determine a few key dimensions of development and directions of change between 1960-1980. Using factor analysis, seven independent dimensions (factors) of development were distinguished (Chapter 6). The key finding of this composite investigation is that the General Socio-Economic Structure (Factor 1) of Bangladesh evidences a significant, positive shift throughout the country and throughout the study period. Factor 1 combines a large number of variables which signify a mixture of social and economic circumstances which seem to have improved. Particular importance attaches to the overall occurance of change which affects every one of the 71 districts and whose direction is consistently positive. Even though there are some distinctions by district, Factor 1 seems to indicate that there has been a level of improvement, particularly in social and amenity terms which overrides the primary rural-urban distinction. The nature and direction of Factor 1 provides a basis for supporting the hypothesis that investigation would reveal a changing pattern of regional development over the study period in which increasing numbers of districts would evidence the effects of development, and that the overall "measure" of Change would incorporate a higher degree of integration of districts within the national fabric (Chapter 1, hypothesis # 2e, p. 25). However, it must also be noted that Factor 1 only explained 37 percent of total variation.

Beyond Factor 1 the analysis identified six other dimensions (Factors 2 to 7) which suggest several other directions of development and which introduced both spatial and temporal variation to a greater degree than Factor 1. Factor 2, Health Care and Facilities, identified a particular and significant public service and infrastructure element. In this case, the overall level of development in health care was lower than that recorded in Factor 1 and there were persistent regional distinctions based, it seems, on facility location, and temporal distinctions that indicated investment in the recent period, following distinct lags before 1974. Health care has, it seems, been more reflective of official development possibilities. This finding provides support for hypothesis 2a (Chapter 1, p. 24) that given the different sources of development policy and UN stimulated policies in the latter decade, the level of development would be more pronounced in the 1974-1980 period than in the 1960-1974 period.

In contrast, the provision of the more substantial Housing (Factor 3) reveals a distinctly different pattern, although it like Health, tends to emphasise a more urban district pattern. In the case of housing, this is essentially a private sector endeavour, and seems to reflect that, while in the earlier period (1961-1974) some improvements were achieved, that more recently, housing has failed to keep up with population and/or that other problems of material availability or income have been significant. Taken together, Factors 2 and 3 substantially modify the overall pattern of development (Factor 1) but they suggest that modification is needed in respect of hypothesis 2a (Chapter 1, p. 24) to distinguish between public and private sector investment.

While Factors 2 and 3 to some extent emphasise the socalled 'urban' districts, each of the first three factors incorporates conditions among both urban and rural populations. It seems, however, that what remains largely separate is the agricultural sector which, although economic, underlies the general condition of a great number of the population in all districts The absence of agricultural variables in Factor 1, except in negative terms, is of major significance; agricultural employment has not improved. Similarly, in Factors 4, 6 and 7 we have an equally significant situation. Each of these three factors is based on agricultural variables, but instead of combining in a composite dimension of agricultural development, they indicate a fragmented pattern of only partial improvement In fact, Agricultural Structure (Factor 4) reflects a pattern of stagnation linked to extreme pressure on land resources, and the patterns linked to Input Improvement (Factor 6) and higher Rice Yield (Factor 7) are far from general, and seem to indicate major lags in attempts to improve agricultural efficiency and output. Problems of employment in or migration from rural (agricultural) areas, seem to be indicated also by Rural Dependency (Factor 5).

The dimensional pattern revealed is of great significance in terms of development planning, both as regards its elements and spatial dimensions. It does not strongly support an urban-rural core-periphery distinction, although the Hill-Tracts do seem to show peripheral characteristics The factor analysis stresses the separation between development and disadvantage characteristics To complement these findings, the last analytic procedure (Chapter 7) cluster analysis, sought to group these same dimensions and to determine whether one can identify what may be termed 'development regions' (by districts) for the 1961, 1974 and 1981 points in time, and whether such 'regions' reveal more of the development process

Using the grouping technique of cluster analysis, the factor scores for each of the 7 Factors determined by factor analysis, (Chapter 6, Appendices II, III and IV) have been grouped/ classified and regionalized for 1961, 1974 and 1981, and a selection of the resultant cluster- regions presented in Chapter 7 The overall objective was to reverse the analytic direction of factoring and to attempt to group the districts on a composite basis and interpret the groupings as 'Development Regions'. As an adjunct to this procedure, one is also seeking to determine whether the shift in the pattern of regions over time corresponds to the development process, and whether the result can be interpreted in terms of the 'core-periphery' model

In 1961 a five-cluster regionalization was chosen as being the most significant grouping of districts; in 1974 the four-cluster; and in 1981 a three-cluster set of regions. This progression would seem to indicate a more coherent structure over time. This does seem to be the case, but less in terms of the reduced number of clusters than the manner in which a more clear-cut separation seems to emerge. In terms of the 'core-periphery', this distinction is overall rather weak, but the trend seems to be that the core area enlarges over time, but its distinctiveness is lessened. In statistical terms what the clustering indicates is a decreasing percentage loss of detail through time, and hence, that a narrower set of groups represents a decreasing distance between the composite characteristics of the districts.

The five-cluster grouping in 1961 seems to reflect that at that time, the vast majority of the country exhibited a low level of development in what may be termed a predominantly 'rural' mode (i.e. Groups 1, 2 and 3 comprising 69 of 71 districts). At this time, in contrast, the two districts of Dhaka and Barisal South stood out and maintained major differences with all the rest. While Barisal South seems to be an anomaly which has lost significance by 1974, Dhaka is obviously set aside by virtue of composite characteristics accruing to its status and role as the national capital. Its distinction, however, emphasises the very low level of development elsewhere. In 'core-periphery' terms, Dhaka is the 'core', the rest of the districts form a 'periphery'. In developmental terms this may reflect the very low level of investment during the East Pakistan period.

The four-cluster grouping that emerges as most significant in 1974 shows some major shifts in the pattern of regions, which, despite the disruptions of civil war and independence, reflect the beginnings of development indicated by the factor analysis. While Dhaka remains as a single, separate district in 1974, there has also emerged a major group (1) of 24 districts that combine features of a higher level of development and which coalleses with Dhaka at the three-cluster stage. This group seems to represent an emergent enlarging 'core' region and includes most of the socalled 'urban' districts. In contrast, the remaining districts and split between the majority (42) which are less developed 'rural' and scattered throughout the country, and the more distinct set of districts in the

Hill-Tracts (4), which seem to represent a physically and culturally distinct 'periphery'. The main factors contributing to this pattern are Factors 1, and 4, 6, and 7.

Essentially, the three-cluster pattern of 1981 is a stronger, more coherent version of that in 1974. By this time, Dhaka is no longer separate, but forms part of an enlarged set of 29 districts which represent the so called developed 'core'. This group includes all but one of the districts containing major urban places or former district headquarters, and to that extent is 'urban', but it also includes many 'rural' districts, and here the critical configuration in most cases is the proximity of those districts to the major urban axes (Dhaka-Chittagong, and Khulna-Rajshahi). At the other extreme is the enlarged group of eight districts, all but one of which are in the extreme south-east, i.e. the Chittagong Hill-Tracts. This area remains disadvantaged and distinct in composite terms of low population densities and better rates of service provision, this is obviously still the most 'peripheral' region. In between group 1 and and group 3, lies the largest set of 34 districts (group 2) which are virtually all 'rural' and lie somewhat distant (in relative terms) from the main development axes.

Overall, therefore, between 1961 and 1981 those districts which are more obviously 'developed' grow substantially in number, while the total of those at a lesser level, diminishes. The end result, the three "Development Regions" of 1981, is in some ways a very satisfactory outcome compared to 1961, although the absolute levels of development are so low. It does suggest: 1) the growth of a more advantaged region from Dhaka District to 40 percent of all districts, 2) a reduced rural less-disadvantaged area, which, upon examination, is found to share in many non-agricultural aspects of development (Factor 1); and 3) the Hill-Tracts whose distinctiveness reflects factors other than level of development per se. In 'core-periphery' terms, there is an 'urban' influence, but the overall spread of influences seems to have reduced the localized effect which might have been expected to have been associated with Growth Pole and related policies, and which may be an indicator of the growing influence of those based on Social Justice

This finding is supported by the hypothesis 2a (Chapter 1, p 24) that given the different sources of development policy, i e Pakistani until 1971, and Bangladeshi since 1971, and the increased influence of UN stimulated policies (Unified Approach) in the latter decade, then it was expected that the level of development would be more pronounced in the 1974-1980 period than in the 1960-1974 period It was also expected that given the variable geographic nature of the country, including a strong core-periphery differentiation already apparent in 1960, there would be continued variation in the levels of development and the degree of change between districts, and overall core-peripheral differences would persist (Chapter 1, hypothesis # 2b, p. 24). On the other hand, it was expected that the core-peripheral dichotomy, while it might show evidence of increased strength in the initial period, may be expected to weaken or show evidence of spatial diffusion towards the periphery in the later period (Chapter 1, hypothesis # 2c, p 24) The overall finding of the investigation is further supported by the hypothesis 2f (Chapter 1, p 25) that the relative positive changes in Bangladesh would be of moderate dimensions, and would reinforce the need for greater emphasis on integrated regional development in future.

Concluding Note

The components of this investigation have been somewhat constrained by availability of data, by three specific time periods, and by the spatial base that does not allow a rural-urban separation. Further verification and refinement of the socio-economic indicators to measure development and regionalize districts are necessary. New variables/indicators are required to adequately represent certain aspects of development such as the welfare of the people or their quality of life. Since we are constrained by the limitation of 1985 data, this study shows only modest changes in the development of spatial pattern over time, it is noted that only in 1991 will the assembly of new census data allow one to pursue the analysis, and hopefully illustrate a more pronounced change in regional and rural development.

The time period covered includes both pre- and post-independence Bangladesh and is a period lacking clear-cut development approaches. The 1971 census was not made due to civil war during 1971. As a result, a post war period (1971-1973) prior to the beginning of 1974 census remained ambiguous. Consequently, the study has reached a stage where a satisfactory explanation for the inter-censal periods can be provided with a considerable difficulty. In fact, this study is a preliminary attempt to establish the approach. In addition, it suggests the possibility of making further more detailed investigation at the micro level. In doing so, Upazilla (416, previous Thana) can be considered as spatial observation units. At this level one could expect the rural-urban discrepancies to be identified on a more precise basis.

Nevertheless, the results of analysis of a set of information that stresses conditions of general well-being and provision of needs, has provided results that suggest that there has been some positive change in Bangladesh between 1960 and 1980, including a major dimension of socio-economic advance and a shift in the regional pattern that indicates a greater degree of equality over the country as a whole. This is not a plea to abandon attempts at economic improvement, but rather a suggestion that development has other dimensions and that efforts towards social justice may yield positive results over time and space even in a country facing as great problems as Bangladesh.

APPENDIX I

Types of Data	Basic Data Collected
Demographic	Total Number of Population
	Total Number of Population 5 years & Above
	Density of population Per Square Mile
	Total Number of Households
	Average Size of Households
	Old and Youth Age Dependency Ratio
	Crude Birth Rate
	Crude Death Rate
Housing	Percentage of Houses by materials of Wall:
	Walls by Straw/Grass/Leaves & Bamboos
	Walls by Mud/Unburnt Bricks
	Walls by Corrugated Iron Sheets & Wood
	House Walls by Cement & Bricks
	Percentage of Houses by Materials of Roof:
	Roofs by Straw/Grass/Leaves & Bamboos
	Roofs by Tiles
	Roofs by Corrugated Iron Sheets & Wood
	Roofs by Cement & Bricks
	Roofs by Asbestos/Cement/Lime
Household Amenity	Percentage of Dwellings by Amenities:
	Dwellings Reporting Tube-Well
	Dwellings Reporting Electricity
	Dwellings Reporting Gas Supply
	Dwellings Reporting Bath Facilities
	Dwellings Reporting Toilet Facilities
	Dwellings Reporting Radio Set
	Dwellings Reporting Television Set
	Dwellings Reporting Telephone Set

Employment & Income	**Percentage of Occupation by Class of Service:**
	Managerial & Administrative Employment
	Technical & Professional Employment
	Clerical Employment
	Sales Employment
	Service Sector Employment
	Manufacturing Employment
	Transportation Employment
	Agricultural Employment
	Per Capita Income
Health & Medical Care	Per Capita Expenditure on Health Care
	Total Number of District Hospitals
	Total Number of Hospital Beds
	Total Number of Rural Health Complexes
	Total Number of Maternal Centres
	Total Number of Child Welfare Centres
	Total Number of Family Planning Centres
	Total Number of Dispensaries
	Total Number of Doctors/Physicians
	Total Number of Registered Nurses
Education	Per Capita Expenditure on General Education
	Per Capita Expenditure on Primary Education
	Per Capita Expenditure on Secondary Ed.
	Per Capita Expenditure on Post Second. Ed.
	Total Number of Primary Schools
	Total Number of Secondary Schools
	Total Number of Colleges
	Total Number of Students in Primary School
	Total Number of Students in Second. School
	Total Number of Students in College
	Percentage of Students attending School
	Adult Literacy Rate
Central Service	Total Number of Commercial Banks
	Total Number of Post Offices
	Total Number of Telegram/Telegraph Offices

Agriculture

Total Agricultural Land Size
Average Farm Size
Per Capita Agricultural Land
Percentage of Irrigated Area
Percentage of Double Cropping Area
Percentage of Multiple Cropping Area
Average Yield Rate of Rice
Average Yield Rate of Sugarcane
Average Cold Storage Capacity
Per Capita Value Added from Agriculture

APPENDIX II

FACTOR SCORES FOR DISTRICTS, 1961

FACTOR-1	FACTOR-2	FACTOR-3	FACTOR-4	FACTOR-5	FACTOR-6	FACTOR-7
-.52315	-.14251	.33873	-.33036	-1.36620	-.[illegible]	3.15523
-.64346	-.51651	1.331[illegible]	-.30478	-1.04309	-.46936	3.17657
-.91032	-.33864	.04213	-.47741	-.92797	-.79666	1.44467
-1.00056	.[illegible]61	-.00655	[illegible]	-.30076	-.35173	3.36526
-1.56335	.14903	-.37347	-2.17194	-.34613	-.49407	1.53465
-1.63796	-.45642	-.30097	.65776	-.56228	-.54027	1.52397
-1.74076	.02350	-1.12305	-2.13420	-.35066	-.40507	1.77357
-[illegible].58131	.27775	-.97652	-2.27573	-.39273	-.75013	1.0275
-1.30526	.63442	.06145	.23226	-.54336	-.46112	1.57154
-1.02019	-.32505	-.41383	-.36095	-.75029	.37507	1.60460
-.63646	-.47027	-.17466	-.57730	-1.11421	.63414	1.08467
-.65941	-.2070[illegible]	.04476	-.44731	-1.40457	.36736	1.37756
-.73826	-.22694	-.34873	-1.01750	-1.33544	.73545	.32240
-.35582	-.02855	-.54153	.67095	-.99160	-.49091	.33181
-1.15916	-.5654[illegible]	-.3[illegible]5[illegible]	-.24561	-.77462	.76554	.52057
-.91967	.02754	-.53455	-1.13092	-.56556	-.37326	-.22611
-1.13730	-.44735	-.24795	.22950	-.61624	.51840	.55127
-1.00641	-.61575	-.15519	.65573	-1.15297	.52666	.37417
-1.20291	-.37157	-.34174	.52[illegible]	-.48465	.59245	.41457
-1.03244	.60350	.07556	-.13637	-1.33700	.42737	.37117
-1.03153	-.90565	.72106	-1.10405	-.55764	-.70073	.51037
-1.12457	-.65204	1.04229	-.07342	-.[illegible]1692	-.34765	.34176
-1.01007	-.74066	1.01441	-.74747	-.54467	-.42560	.05527
-.71527	.22951	1.54471	-.53245	-1.44325	-.80241	-.15307
-1.17606	-1.02651	1.44011	-.57310	-[illegible].09355	-.27730	-.07576
-1.34173	5.14586	2.41971	-.25[illegible]	-.77517	1.4729[illegible]	-1.15465
-1.30745	.43437	-.71977	-.55[illegible]05	-1.27686	-.05016	-.54017
-1.17365	-.26187	-.47046	-.1773[illegible]	-.[illegible]5155	-.7[illegible]1[illegible]	-.55504
-1.19653	-.34153	-.23175	-.22471	-.[illegible]1736	-.3004[illegible]	-.34767
-1.25691	-.16921	-.47070	-.35[illegible]03	-.[illegible]1146	.17373	-1.[illegible]762
-1.36972	-.34054	-.61013	-.35[illegible]	-.51160	.50274	-.44374
-1.27338	-.12756	-.55224	-.36796	-.[illegible]1076	1.05345	-.37414
-1.26436	.01933	-.77651	-.62525	-1.07409	.16317	-1.1[illegible]75[illegible]
-1.45717	-.07516	-.91051	-.3[illegible]76	-.35032	1.07275	.77715
-1.23593	1.17445	-.56427	-.61[illegible]33	-1.00365	.43246	-.74607
-1.02671	-.16706	-.32551	-1.52371	-[illegible].[illegible]2714	.2773[illegible]	-.74364
-1.35138	-.09094	-.71913	-.74774	-.61571	1.49533	-.37337
-1.03777	.1733[illegible]	-.87867	-.12794	-.75635	.71517	-.27367
-.56067	.17234	-.04345	.09[illegible]17	-1.15590	-1.33382	-1.33053
-1.49611	3.85179	-1.65005	-.37[illegible]1	3.1572[illegible]	.47225	-1.74024
-1.21761	-.55253	-.21732	-.73725	-.41561	-.25551	-.33796
-1.10747	-.52685	-.30933	-.94[illegible]75	-.57667	-.45933	-1.16227
-1.00071	-.67333	-.33894	-.52524	-.73291	-.25973	-.95527
-.96947	-.17034	-.33650	.54103	-.76703	-.79336	-1.76765
-1.03778	-.49667	-.31076	1.07790	-.77444	-.55579	-1.45394
-.99733	-.18761	1.76319	.47103	-1.06112	-.45313	-1.35775
-1.00580	-.70932	.45079	.27240	-1.01232	-.31676	-.38641
-1.1054	-.10463	.21513	1.55567	-.90061	-.777[illegible]4	-.36407
-1.10313	-.17570	.21956	2.22[illegible]5	-.93098	-.70617	-1.34035
-.91352	-.48191	.55729	-.43[illegible]06	-.55654	-1.17758	-1.23087
-.66033	-.27367	1.25165	-.35[illegible]92	-1.31083	-1.24176	-1.70376
-.34464	-.56207	-.91775	-.35775	-.92407	-1.35727	-.72222
-1.27151	-.62236	-.15174	-.26[illegible]	-.47976	.39787	-.57763
-1.13547	-.5272[illegible]	-1.47245	-.12465	-1.01263	-.15667	-.53765
-1.29647	-.37259	.21457	1.34574	-.73662	.1272[illegible]	-.21627
-.79656	-.04125	-.43632	-.11039	-1.21773	-.[illegible]9970	-.41007
-.97636	-.35335	-.31815	2.33391	-1.04115	-.07576	-.40974
-.33713	-.33232	-.[illegible]	-.22[illegible]22	-1.17432	.12770	-.31807
-1.01877	-.26264	-.27909	1.44[illegible]60	-.02125	-.39127	-.47095
-.99667	-.47746	.00323	1.09555	-.79069	-.10660	-.14137
-.88607	-.07761	.17811	.57105	-1.21295	-.27457	-1.01006
-1.12915	-.70674	.14924	.23709	-1.03553	.20870	-.54787
-1.12051	-.67170	.14534	-.30736	-.62777	.12671	-.32357
-1.10276	-.44436	.25161	1.73752	-.51490	.22470	-.28003
-1.18543	-.57800	.14703	1.50[illegible]87	-.45047	.72244	-.35383
-.76605	-.58033	.57050	1.57543	-1.10167	.69309	.12036
-1.23323	-.51732	.61156	-.30460	-1.03421	.46777	-.53604
-1.05325	-.64633	-.50513	-.77750	-.62786	.4677[illegible]	-.34163
-1.13327	-.61717	-.21800	-.73361	-.32019	.41346	-.25334
-1.04167	-.5754[illegible]	-.31261	.2171[illegible]	-.32145	.05676	-.17002
-.[illegible]032	.67218	-.37043	.47753	-1.27007	.50551	-.05724

APPENDIX III

FACTOR SCORES FOR DISTRICTS, 1974

FACTOR-1	FACTOR-2	FACTOR-3	FACTOR-4	FACTOR-5	FACTOR-6	FACTOR-7
.43062	.51405	1.72106	-.33757	.65647	.26136	2.01270
.42207	-.30753	1.77265	-.19527	.73012	-.73732	1.07520
-.05311	.02567	-.73270	-.33370	1.53752	-1.02527	1.47778
-1.15416	2.29160	-.37053	4.56750	2.15993	-.31261	2.57447
-.57690	.5461	-.36010	-2.14067	1.76365	-.77560	.44170
-.64706	-.37467	-.34793	.63281	1.34130	-.36245	1.77141
-.94470	-.20244	-.63804	-2.15573	1.75437	-.78517	1.74015
-1.04456	1.05491	-.95730	-2.14943	2.01752	-.74667	.77604
-.56273	1.30655	.04277	.11122	1.26765	-.75573	1.11074
.09600	-.34575	-.23351	.03560	1.33667	1.44273	1.15084
.36469	-.50176	-.02756	-.42157	.71515	.33147	.25475
.63063	-.29211	1.23040	-.41545	1.11243	-.55571	.74695
.74673	-.47[illegible]	.29756	-.34127	1.0[illegible]637	1.47574	.2473
.31396	.16750	-.2[illegible]175	1.22609	1.14695	-.20370	-1.11777
-.06671	-.50195	-.34709	.12430	1.40476	.19102	-.21733
.16521	.00646	-.21307	-.92405	1.83045	.13477	-.48704
-.38207	-.55337	.33744	.65027	1.71025	.43344	.55136
-.24616	-.34543	.51196	.56445	.11507	.69565	.27007
-.39055	-.65377	.15135	1.10232	1.71655	.76172	.98032
.04175	.72327	.24650	.24445	.07560	.93177	.26557
-.16773	-.35597	.27551	-.92136	1.44659	-.47946	[illegible]
-.15322	-.70125	2.03675	-.33763	1.27712	-1.14765	.46442
-.02516	-.56535	1.0[illegible]762	-.30742	1.04[illegible]25	-1.09360	-.14473
.60533	.7075	2.7[illegible]315	-.30577	.17365	-.17077	-.35847
-.27244	-1.12263	2.2[illegible]576	-.61413	1.05367	-1.37770	.07261
.01706	4.26233	4.25436	-.55147	1.23511	2.77694	-.7522
.00266	.15597	-.13821	-.43745	1.17[illegible]53	-.34770	-1.27047
-.15550	-.42209	-.47324	-.14745	1.47027	-.73273	-1.07017
-.11016	-.47763	-.30506	-.27274	1.32053	-.44677	-1.04404
-.22137	-.45055	-.31004	-.22216	1.40240	-.72377	-1.10131
-.37309	-.53511	-.54175	-.02790	1.57062	.44857	-.76347
-.21173	-.37133	-.59379	-.96074	1.57332	.55390	-.17007
-.29453	-.31617	-.76095	-.57[illegible]17	1.40232	.79603	-1.07257
-.41123	-.32733	-.43447	-.53574	1.79630	1.30975	.32164
-.06731	1.37731	-.51759	-.66735	1.16922	.77069	-1.32824
.11642	-.[illegible]655	-.25500	-1.34071	1.22[illegible]35	1.17061	-1.30049
-.20335	-.2635	-.31225	-.72577	1.73526	1.89574	-.2546
.18274	-.14066	-.74601	-.02385	1.05479	1.23731	-.39615
.48423	.2363	.21758	.22[illegible]46	.79511	-.33[illegible]4	-1.03504
.02253	1.59114	-.55020	-.45[illegible]57	.09048	-.70233	-1.75530
-.31623	-.5436	-.24463	-.09735	1.59725	-.04217	-.[illegible]190
.07337	-.26094	-.3[illegible]800	-.76562	1.40954	-.35614	-1.24872
.11375	-.46174	-.37154	-.67095	1.1[illegible]207	-.56945	-1.00750
.04776	-.40021	-.21971	.21049	1.30296	-.72130	-1.41320
-.00553	.1225	-.67965	.13017	1.36153	-1.22234	-3.17275
.27025	-.61417	-1.57134	.13[illegible]14	.03462	.12970	-.61725
.19520	-.92023	1.03790	.25[illegible]09	1.47211	-.37760	-.50641
.74250	-.17343	.13917	1.22[illegible]84	1.22582	-.57760	-.34717
.14522	-.21465	.44512	-.28145	1.36345	-.51150	-.35161
.36565	-.94514	1.10647	-.26463	1.3726[illegible]	-1.[illegible]	-1.07127
.46052	.10455	1.87693	-.16755	.02600	-1.10654	-.2451
.16253	-.34426	1.27686	-.73132	1.20722	-1.07710	-.17524
-.02517	-.7633	.39727	.46197	1.03516	.49230	.14327
.14210	-.97331	1.37066	-.74212	.74553	-.14917	.1772
-.05737	-.36197	.36032	1.15001	.76230	.65110	.13277
.33637	-.39687	-.00066	.10579	.63443	1.01138	.27031
.17355	-.3451	-.42560	1.50564	.65334	-.7517[illegible]	-.11350
.26703	-.[illegible]651	.34310	-.15400	1.14717	.4194[illegible]	.15764
-.02123	-.[illegible]05	.03269	.29777	1.33715	-.34774	-.65092
-.11055	-.1606	.04023	1.24071	1.23427	-.72510	.23475
.08635	-.20444	.56401	.30201	1.21066	.77706	-.46715
-.21325	-.7403	.51963	.19525	1.47756	.11718	-.51193
-.27400	-.26543	.57174	-.06001	.03575	.74760	-.34014
-.27354	-.06274	.30504	1.32652	1.03550	.03353	.27713
-.13130	-.4865	.32156	1.53742	1.1[illegible]352	-.12076	.73246
.05423	.6016	.79844	.37787	.53027	.77077	-.12257
-.04564	-.50755	-.23262	.36074	1.25026	.35253	-.35665
-.16022	-.5455	-.32804	.62454	1.37021	.74570	.15792
-.14157	-.46357	-.34720	-.03033	1.34390	.76427	.17741
-.10552	-.5525	-.03813	.11155	1.27311	.51772	.07791
.09145	.74203	-.03901	.33286	.0[illegible]927	1.36376	.32475

APPENDIX IV

FACTOR SCORES FOR DISTRICTS, 1981

FACTOR-1	FACTOR-2	FACTOR-3	FACTOR-4	FACTOR-5	FACTOR-6	FACTOR-7
1.59659	.31357	1.74219	[illegible]	-1.11270	-.31117	3.17585
1.52913	-.96212	1.52407	[illegible]	-1.11143	-.77353	3.72147
.90136	-.17307	[illegible]	[illegible]	-.14760	-.51637	[illegible]
-.36979	5.38[illegible]	-2.64[illegible]	3.17573	.27247	-.76715	2.42[illegible]
1.25464	3.30[illegible]	-2.94070	[illegible]	.94634	-5.34165	[illegible]
[illegible]	.57625	[illegible]	[illegible]	[illegible]	[illegible]	1.50447
.43163	.35494	-2.16125	[illegible]	.47047	[illegible]	2.52477
.37553	1.36531	-1.55250	[illegible]	.27383	[illegible]	2.15035
.74109	2.59513	-.23519	[illegible]	[illegible]	[illegible]	1.13655
1.27603	-.27471	[illegible]	[illegible]	-.25172	[illegible]	[illegible]
1.51942	[illegible]	-.72614	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	.4590	[illegible]	.29607	-1.16673	.77475	[illegible]
1.34532	-.46197	-.72725	-.73037	-.07090	1.72464	.42977
1.50325	-.15737	-.66276	[illegible]	[illegible]	[illegible]	[illegible]
1.24[illegible]	-.67777	-.76730	[illegible]	[illegible]	[illegible]	[illegible]
1.77221	.10619	-.30775	-1.22475	-.15473	.54366	.5476[illegible]
.32035	-.20535	-.05495	-.70135	-.17756	.43777	.42157
.35577	-.20346	-.13643	.47[illegible]53	-.44126	.55066	[illegible]
.57525	-.64274	-.17564	.17516	.22579	[illegible]	[illegible]
1.05757	1.54705	.13330	.77477	[illegible]	[illegible]	[illegible]
1.79403	-1.06513	.07322	-1.17[illegible]7	[illegible]	[illegible]	[illegible]
1.42596	-.37707	[illegible]	-.26[illegible]15	[illegible]	[illegible]	.1613[illegible]
1.33[illegible]	-.55151	1.13213	-.73757	-.13464	[illegible]	-.47061
1.37767	.75757	1.17127	-.70[illegible]15	-1.43[illegible]	-.74322	[illegible]
1.32779	-1.22376	1.47643	[illegible]	-.47425	[illegible]	[illegible]
1.09672	5.22[illegible]	3.[illegible]4363	[illegible]	-.34[illegible]21	.73717	[illegible]
1.09545	.41265	-.23152	[illegible]	-.41620	[illegible]	[illegible]
.35311	-.37417	-1.0[illegible]067	-.20[illegible]43	[illegible]	[illegible]	[illegible]
.91067	-.32177	[illegible]	[illegible]	[illegible]	[illegible]	-1.2[illegible]40
.97567	-.37615	-1.31107	[illegible]	[illegible]	[illegible]	-.77[illegible]74
.72704	-.44472	-1.21905	-.42470	-.12467	[illegible]	-.43234
1.05375	-.15317	-1.32035	.37522	-.30186	[illegible]	.57107
.90821	-.26373	-1.32315	[illegible]	-.30752	[illegible]	-.24404
.77459	-.64512	-.30977	1.43723	[illegible]	[illegible]	[illegible]
.83537	2.15033	-1.66153	-.53[illegible]51	[illegible]	[illegible]	-.15421
.35554	-.37017	-1.30055	-1.13[illegible]34	[illegible]	.01174	.09595
.83251	-.14135	-1.34941	[illegible]	-.04344	1.795[illegible]	.24606
1.76506	-.70397	[illegible]	.07746	-.32132	[illegible]	[illegible]
1.65917	.52594	-.57513	.0[illegible]44	-.71162	[illegible]	[illegible]
1.13942	2.55954	-1.63647	[illegible]	[illegible]	-.77352	[illegible]
.51975	-.67917	-.65347	-.73[illegible]83	[illegible]	[illegible]	[illegible]
1.05722	[illegible]	-.75711	[illegible]	.03756	[illegible]	-.2[illegible]277
.71055	-.30546	[illegible]	-.750[illegible]1	[illegible]	[illegible]	[illegible]
1.31773	-.43542	[illegible]	[illegible]	[illegible]	[illegible]	-.54574
.17643	-.43074	[illegible]	[illegible]	[illegible]	-1.32316	[illegible]
1.43517	-.43177	1.2275[illegible]	[illegible]	-.74661	[illegible]	[illegible]
1.22949	-.33691	.27320	[illegible]	-.65120	[illegible]	[illegible]
.16115	.11326	-.23760	[illegible]	-.67473	[illegible]	[illegible]
1.36013	.31138	-1.53941	[illegible]	-.94000	[illegible]	-2.54913
1.51654	-.36116	.33617	[illegible]	-.27241	-1.57002	[illegible]
1.32733	.23237	1.54705	-.52[illegible]35	[illegible]	-1.34707	[illegible]
1.20245	-.30137	[illegible]	[illegible]	-.65056	[illegible]	[illegible]
.96299	-.33560	[illegible]	.41[illegible]44	[illegible]	.60177	-.15205
1.25701	[illegible]	[illegible]	[illegible]	-.65421	.74476	-.45477
1.14276	.30719	.31534	[illegible]	-.64371	[illegible]	[illegible]
1.17631	.73727	-.61537	[illegible]	[illegible]	.7172	[illegible]
1.16347	.05317	-.92160	[illegible]	-.67444	[illegible]	[illegible]
1.47425	.51177	-.64916	[illegible]	[illegible]	.64557	[illegible]
1.27350	-.33724	-.51333	[illegible]	[illegible]	[illegible]	[illegible]
1.64395	.85956	-.74350	[illegible]	-.74245	[illegible]	[illegible]
1.49163	.23256	.37723	.32515	.77403	[illegible]	-.4776
1.14125	-.63135	.40761	[illegible]	.70052	[illegible]	[illegible]
1.03707	-.60133	[illegible]	.21[illegible]10	[illegible]	[illegible]	.1731[illegible]
1.06253	-.94735	.41247	.14[illegible]30	[illegible]	[illegible]	[illegible]
.71911	-.20135	-.5[illegible]171	[illegible]	[illegible]	[illegible]	.1576[illegible]
1.61[illegible]	.06593	[illegible]	.47[illegible]95	[illegible]	[illegible]	[illegible]
1.11696	[illegible]	[illegible]	[illegible]	-.1[illegible]577	[illegible]	[illegible]
.95764	-.66477	-.75044	[illegible]	[illegible]	[illegible]	1.11707
.91070	-.41156	-1.74200	[illegible]	[illegible]	[illegible]	[illegible]
.47765	-.76477	[illegible]	[illegible]	-.14416	[illegible]	1.[illegible]7554
1.77339	1.25074	[illegible]	[illegible]	-.71027	1.751[illegible]	-.1[illegible]617

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