COMMUNICATION AND FUTURE SPATIAL STRUCTURE – SOME POSSIBLE SCENARIOS

DR. ELIAHU STERN

Ben-Gurion University of the Negev.

Die invloed van 'n toenemende gesofistikeerdheid ten opsigte van beskibare tegnologie en kommunikasiestelsels is reeds bekend. In hierdie artikel word verwys na die lektuur in dié verband en die voorspellings van bekende deskundiges op dié gebied. Na aanleiding hiervan is dit duidelik dat kennis geneem moet word van hierdie verwikkelinge en hulle invloed met betrekking tot toekomstige stedelike strukture, vervoersisteme en gedragspatrone moet bestudeer word.

The growing importance of the effects of communications and high technology devices on our spatial behaviour is being recognized more and more in the literature. Whether we consider decisions about residential location, recreational travel, or industrial and store location, information is critical (Abler, 1974). As already mentioned, we are moving into an era of telemobility, and from mechanical into electronic environments (Berry, 1970). Some researchers call it the communication era (Lowenstein, 1970), and some the cybernetic age (Lehman-Wilzig, 1981). Such an era involves a widespread use of computers and high speed information transfer through a sophisticated, nationally integrated communication network. No doubt that a new spatial order will emerge in such an era. Bakis (1981) has already pointed out some of the spatial consequences of this cybernetic revolution. Berry (1970), for example, sees the gradients of distance-accretion will replace those of distance-decay. Persons of greater wealth and leisure will find homes and work among the more remote environments. Further, Berry asks: "What of corporation headquarters, of the daily tides of commuters, of expressways and mass transit systems if communication is substituted for movement? What if the geography of face-to-face contacts, of physical movement, of skyscrapers is replaced by a thin film of electrons spread over the countryside? Where then did Boswash, Chipitts, and Sansan go?"

The effects of new technologies on future urban structures, transport systems and behaviour, should therefore be studied. The following essay is aimed to present some evidence to our intermediate developmental stage between the mechanical and the electronic spatial structures.

POSSIBLE DEVELOPMENTAL STAGES

The high density compact urban form of the past has already been changed in many countries as transport isochronic lines shifted outward. The emerging sub-urbanization process now characterises most urban areas.

The rising costs of enegery, and its concomitant effects on intra-urban movement led several researchers to forsee the rebirth of higher density and even more compact urban forms than the old ones. However, several other options are possible. Some researchers (e.g. Lehman-Wilzig, 1981) claim that substituting many forms of today's transportation means with telecommunication devices may make cities obsolete. One of the theories (Gottmann, 1977) for example claims that maintaining and developing the telephone will favour the dispersion of work places and habitation in a completely scattered pattern where cities are dissolved. At a lesser extreme we may think of another scenario – that of multinucleation (Boyce, 1981). Thus, suburbia might be expected to become more functionally balanced while the inner portions of the city might show very little growth, if not decline, as now experienced in most American central cities.

Figure 1 presents a multi-dimensional model which can be used to get a

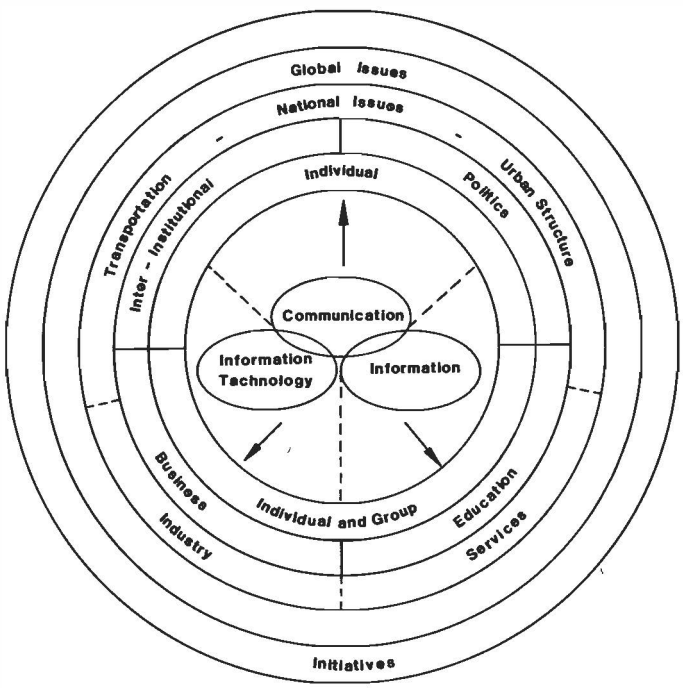

Figure 1 The effects of technology on individuals and society (After McHale, 1976)

clearer understanding of how information technology affects the individual and society that comprise its environment. The information technology might enable those people working in such fields as education, law, media, finance, etc., to stay at home (or very close by) in pursuit of their careers. As a result some social institutions like banks, schools, libraries, and others, may disappear at least in their present manifestation. Undesired trips like personal business trips or rush hour work trips will be kept at minimum while leisure and social trips may become dominant. The spatial pattern of trips will also change since the orthodox locational factors will not be viable any more. Certain industries as well as many office functions will not be bound to their present locations. The present clustered pattern of such activities is likely to be decentralized (for example, see Erickson, 1976; Goddard and Pye, 1977). In spite of the fact that head-office functions in the United States and Britain are still increasing rapidly in the cores of large metropolitan areas, there is however considerable decentralization of functions. Part of this decentralization can be ascribed to falling information-transfer costs as a result of recent dramatic improvements in telecommunication technology (Scott, 1982). The future course of metropolitan change also depends on the dynamics of industrial development. Continued capital deepening and restructuring will tend to bring about deskilling and the streamlining of labour processes at ever higher levels of technological autonomy. These processes wil simultaneously tend to encourage successive waves of decentralization and dispersal of economic activity. However, it appears doubtful that purely localized initiatives of these sorts can stem the tide of economic decentralization and dispersal. As Scott (1982) states, "This is all the more the case given the likely boost to the whole process that will assuredly occur as a result of continued incursions of electronic and microprocessor technologies into assembly, processing, and clerical functions."

Between the two extreme situations of a highly compact and centralized urban form, and a completely dispersed and decentralized pattern there is an intermediate stage - the city region, or alternatively a regiopolis (Gradus and Stern, 1980). This is a new element of spatial order, combining centre and periphery within a single unit. The regiopolis is one of the concepts which have been put forward in the endeavour to capture the expanding scale of urban life. Friedmann and Miller (1965) used the term "urban field", which they defined as enlargement of the space for urban living that extends far beyond the boundaries of existing metropolitan areas into the open landscape of the periphery. This spatial expansion is already evolving with the aid of telecommunications which overcomes the friction of distance. Highly industrialized areas exhibit such a pattern of dispersed small clusters although in many of them commuting is still more dominant than telecommunication.

SOME EVIDENCE OF DECENTRALIZATION

The first pioneers in changing the traditional location patterns in our post-industrial era are the high-technology, mainly electronics, industries and research and development (R&D) laboratories. The Silicon Valley in California is one of the best examples of the electronic era spatial structure where many small high technology industries locate in dispersed clusters at the periphery of a metropolitan area. Another example is the trend found by Malecki (1979) of R&D laboratories locating in smaller Standard Metropolitan Statistical Areas (SMSA's) rather than in large metropolitan areas.

The effect of high technology on the shift towards the non-metropolitan areas is evident when one compares the spatial urban patterns of regions with different levels of development. Morrill (1979) for example, noticed that the older industrial states (in the U.S.A.) exhibit non-metropolitan growth, whereas newly industrializing states continue to show vigorous metropolitanization. Thus, most advanced areas are in a stage of decentralization, while the less mature areas are still experiencing heavy urbanization. Recently published figures in the United States indicate that contemporary American population dynamics favour the growth of non-metropolitan and small metropolitan areas. (Beale, 1975, Fugwitt, et al. 1979). Non-metropolitan population growth rates currently exceed those of metropolitan areas in the aggregate. Expansion and intensification of commuting fields associated with employment centres within the periphery were found to be at least as important as growth in commuting to adjacent metropolitan centre (Taaffe, et al., 1980, Fisher and Mitchelson, 1981a).

The regiopolis which has been developed in the Israeli Negev arid area (Gradus and Stern, 1980) is another example of the new spatio-functional pattern. The Negev regiopolis tends to function as one metropolis; but instead of being a continuity of built-up areas, there are islands of small and medium-sized urban communities and industrial complexes, separated by arid vacant land connected by a network of roads (and telecommunications in the near future). The intensive and independent commuting pattern (Figure 2) which has developed is an important determinant of the way in which the Negev system functions as an integrated unit. The pattern suggests that we are dealing with a mobile interconnected system of shared interests, which acts as both a single labour market area and a single service unit. The decrease in the importance of distance in residential and place of work preferences is clearly noticed in Figure 3. It is clear that most of the commuters in the region travel 30-50 kilometres to work daily. There is also a general decrease in the importance of distance in location decisions (Halverson, 1975) which will further accelerate the emergence of regiopolitan areas. This might occur in spite of the possible future increase of energy cost. Evidence assembled by Small (1980) provides little support for the view that overall urban decentralization will be substantially altered in the next one or two decades by energy shortages. A system of cities and towns linked by adequate transportation and communication might therefore serve better the purpose of regional growth than any single city.

In contrast to the undirected tendency of decentralization in the United States or Britain, South Africa has already implemented the practice of a directed decentralization strategy aimed at dis-

persing economic activity in order to support a less concentrated settlement pattern. The success of this strategy has however been limited. It can be argued that the friction of distance is still a major deterrent to spatial decentralization in South Africa. However projections of population dispersion, employment, and commuting patterns in the eastern part of the Pretoria, Witwatersrand, Vereeniging (PWV) region show a clear decentralization trend, particularly from Johannesburg. (Figure 4).

The 1985-2000 projected changes in the percentage of locally employed residents out of the total local labour force in the eastern traffic zones of the PWV region indicate both a reduction in the number of local commuters and an increase in the number of locally employed residents and/or local work opportunities. Growth is expected to take place in zones like Bronkhorstspruit, Delmas, Witbank, and the areas north of Pretoria.

A decline, on the other hand, would characterize the Johannesburg metropolitan area indicating a reversal in the commuting direction as well as a clear decentralization trend away from Johannesburg. Although this spatial trend is sought to be achieved by a directed dispersion of industry and other economic activites, it will undoubtedly start to gain momentum only after achieving a significant reduction in the friction of distance. Industry located away from its main complementary services must have communication substitutes. Telecommunication has probably the largest potential in achieving this end. One example is the structural shifts in the American economy which have been accompanied by dispersal of even market-orientated service employment (Fisher and Mitchelson, 1981b). Both regional differences in the business climate and falling information transfer costs reinforced this trend.

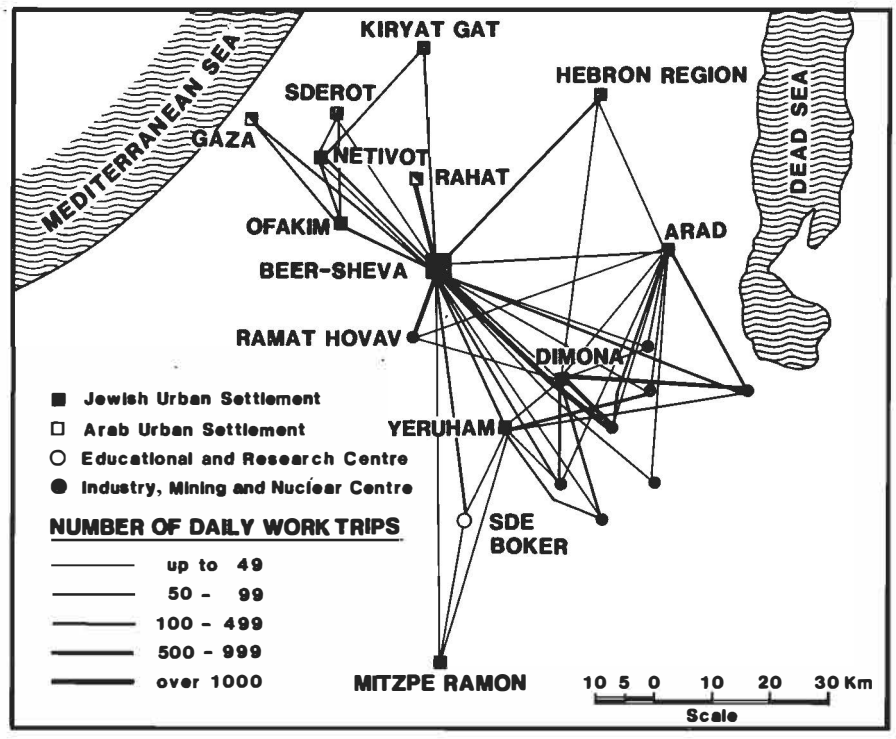

Figure 2 Commuting pattern in the Negev Regiopolis, 1978

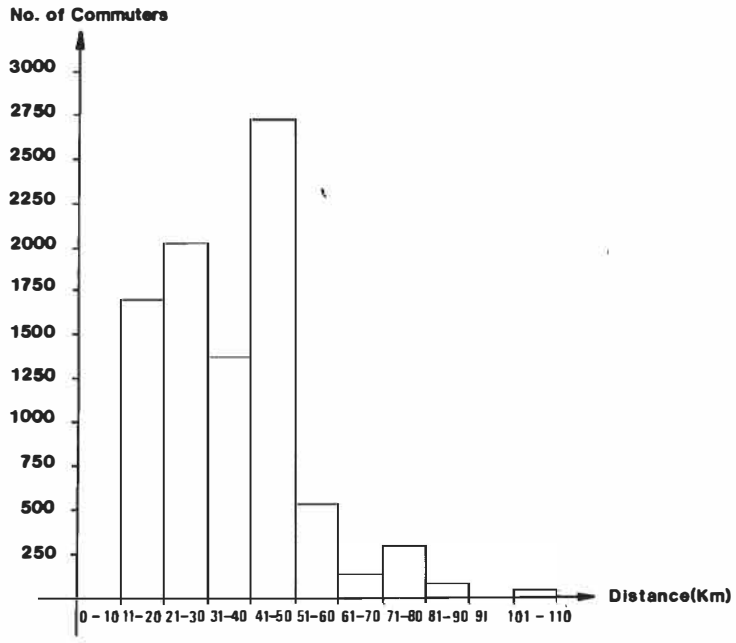

Figure 3 Distribution of commuters in the Negev by distance

DIRECTIONS FOR FUTURE RESEARCH

The introduction of telecommunication may alter time and space. A new social space-time is presently in the process of rapid development. Consequently, several studies should be undertaken to understand this new spatial structuring.

The first topic to be studied is the impact of telecommunication on the location of various activities and thus on the changing urban and regional structures. It is obvious that urban change will be associated with changes in travel patterns and transport systems. Therefore, we should find out the interrelationships between transport and communication. Could the latter substitute the former? How? In what way? We expect, for example, less short passenger trips than long distance trips but also a decrease in total personal trips versus an increase in commodity flows. What patterns of commodity flows will emerge? What transport systems will accommodate them? What effect will they have on the environment?

At a second level we should study the complexity and diversity of the interac-

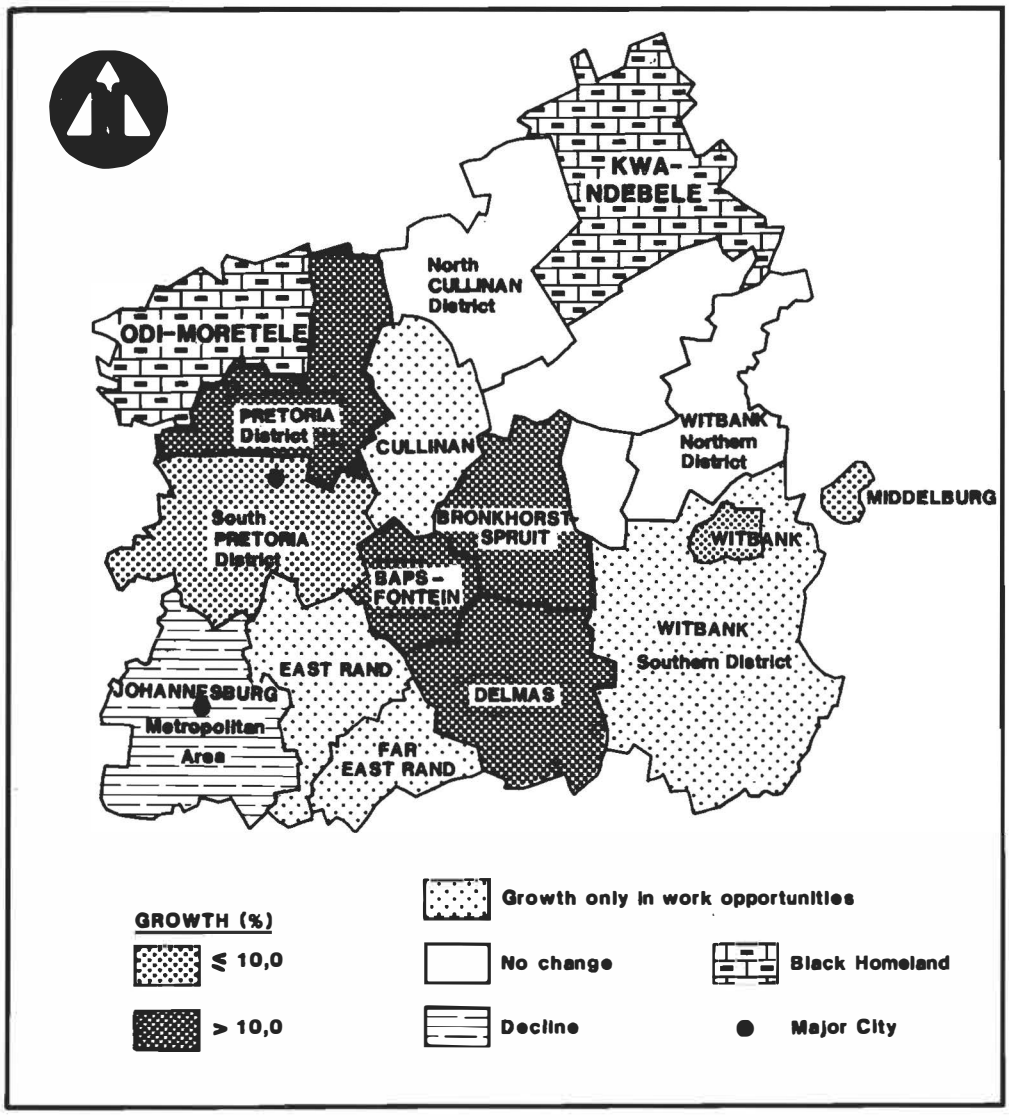

Figure 4 1985-2000 projected change in the percentage of locally employed residents out of the total local labour force in the eastern part of the PWV region

tion between telecommunications and social and economic development. What types of social problems can be expected in the free distance-friction city? What will be the impact of such innovations on the spatial organization of industry and service in different countries, and at various levels of development? Comparative studies of this nature would enable us to gain a better grasp of the problems we will have to face in the future telemobility era.

From a planning point of view, any meaningful attempt to deal with the spatial consequences of this era will call for policy and planning initiatives at the highest level of government. Should these initiatives indeed eventually be forthcoming, they will also need to be an integral part of an overall national economic policy that addresses in some coherent way the interdependent problems of production, employment, trade relationship, and urban and regional development.

REFERENCES

Abler, F. R. 1974. The Geography of Communications, in Michael E. Hurst (ed.), *Transportation Geography*, McGraw Hill, pp. 327-345.

Bakis, Henry 1981. Elements of a Geography of Telecommunication, *Geographical Research Forum*, No. 4, pp. 31-45.

Beale, C. L. 1975. *The Revival of Population Growth in Non-metropolitan America*, Washinton: Economic Develpment Division, U.S. Department of Agriculture.

Berry, J. L. Brian 1970. The Geography of the United States in the Year 2000, *Ekistics*, vol. 29, pp. 339-351.

Boyce, R. Ronald 1981. The Energy Crisis: A Case for Further Decentralization, The South African Geographer, vol. 9(2), pp. 95-100.

Erickson, A. Rodney 1976. The Filtering-Down Process: Industrial Location in a Non-Metropolitan Area, *The Professional Geographer*, XXVVIII, No. 3, pp. 254-260.

Fisher, S. James and Ronald L. Mitchelson 1981a. Extended and Internal Commuting in the Transformation of the Intermetropolitan Periphery, *Economic Geography*, Vol. 57(3), pp. 189-207.

Fisher, S. James and Ronald L. Mitchelson 1981b. Forces of Change in the American Settlement Pattern, *The Geographical Review*, Vol. 71(3), pp. 298-310.

Fugwitt, G. V., P. R. Voss and J. C. Doherty 1979. *Growth and Change in Rural America*, Washington: The Urban Land Institute.

Goddard, B. J., and R. Pye 1977. Telecommunications and Office Location, *Regional Studies*, vol. 11, pp. 19-30.

Gottmann, Jean 1977. Megalopolis and Antipolis: The Telephone and the Structure of the City, in Sola Pool (ed.), *The Social Impact of the Telephone*, MIT Press, Cambridge, pp. 303-317.

Gradus, Y., and E. Stern 1980. Changing Development Strategies: Toward a Regiopolis in the Negev Desert, *American Planning Association Journal*, vol. 46(4), pp. 410-423.

Halverson, L. Peter 1975. The Critical Isochrone: An Alternative Definition, *Proceedings of the Association of American Geographers*, 7, pp. 84-87.

Lehman-Wilzig, S. 1981. Will Cities Become Obsolete?, *Telecommunication Policy*, December, pp. 326-328.

Lowenstein, Werner R. 1970. Intercellular Communication, *Scientific American*, 222(5), pp. 78-86.

Malecki, J. Edward 1979. Locational Trends in R&D by Large U.S. Corporations, *Economic Geography*, vol. 55, pp. 309-323.

McHale, John 1976. *The Changing Information Environment*, Pauls Elek, London.

Morrill, Richard 1979. Stages in Patterns of Population Concentration and Dispersion, *The Professional Geographer*, vol. 31(1), pp. 55-65.

Scott, J. Allen 1982. Production System and Metropolitan Development, *Annals of the American Association of Geographers*, Vol. 72(2), pp. 185-200.

Small, A. Kenneth 1980. Energy Scarcity and Urban Development Patterns, *International Regional Science Review*, Vol. 5(2), pp. 97-117.

Taaffe, E. J., H. L. Gauthier, and T. A. Maraffa 1980. Extended Commuting and the Intermetropolitan Periphery, *An- nals of the Association of American Geographers*, Vol. 70, pp. 313-329.