

# Some thoughts and observations on the development - transport nexus

VERNON C. MULCHANSINGH

For decades most scholars, most authors, indeed most people spoke of some phenomenon called **economic** development. Moreover, for hundreds of years, textbooks fell into the trap of discussing this great goal, sometimes this mirage of **economic** development. To be sure, as Cameron (1980) has pointed out. "Economics has suffered much for early arrogance in claiming priority in the field of development studies". Only a few have had the presence of mind to discern that this fanaticism, this fetish with **economic** development has bred a global cult and whole generations of people engrossed in this business of what Paul Samuelson the renowned scholar and one-time Newsweek guest writer called 'GNPism'. One voice of reaction is that of the great Swedish scholar and nobelist Gunnar Myrdal (1976) who insists that there are no economic problems, no psychological problems, no anthropological problems, no agricultural or populations problems — just problems, plain and simple without the epithet. Indeed it is becoming more and more appreciated that "development problems can only be understood and solved if disciplines are abandoned. The object of study must be the totality which is development for we cannot hope to understand it by denying this complexity" (Leys, 1980). Indeed some savants today wish not be branded with a calling as 'economist' 'sociologist' or whatever. Some see themselves as mere scholars trying to understand the world, though not many would go as far as Boulding (1975), himself as economics and social science. We cannot deny, sometimes, that there is only one subject, knowledge.

The fact is, development is an amalgam. It is a product of a set of interlocking wheels, as in a watch, with each sub-wheel representing population, agriculture, industry, trade, technology, education and so on. Development, at the bottom line, is a phenomenon synonymous with improvement, betterment. It has to do with evolving to a higher stage, unfolding to reveal wealth or worth and potential, advancement from one stage to another, unravelling the hidden. And **all** of these are pregnant with **spatial implications**. To continue, it represents the availability to people in a country or region of more foods, more medicine, more doctors, more transport,

---

\* Department of Geography, University of the West Indies, Mona, Kingston 7, Jamaica.

more roads, more books and newspapers, more homes, more steel, cement, telephones, indeed more of everything good per capita with the progress of time: achievement of a region, development cannot be said to have occurred if poverty, unemployment and illiteracy have increased: to be sure, most scholars today are coming around to an understanding that while **singly** the criterion of per capita income is the most used, best known criterion representing a summation of the ninety-plus employed criteria of development, it is not without a number of faults and shortcomings which we will not go into here. Thus for some countries, to get at the truth, we have to use other criteria. For example we may take fifty countries, using ten criteria of per capital consumption steel, vehicles, newsprint, infant mortality, etc. By ranking each criterion for each of these countries one could then sum up the ranks for each country and arrive at a geography of economic health thereby. One of the few scholars in the history of writing on economic issues, geographer David Smith (1978) in fact does just this in a path breaking book defining Human Geography **who** gets **what**, **when** and **where**. Those who want more compact answers and pointers may suffice with the now widely used PQLI<sup>1</sup> (Morris, 1979) representing infant mortality correlates highly with some forty-five other well-known indices of development.

However, aggravated by the a-spatial view of development 'as if the world existed on the head of a pin' and this despite the multitudes of spatial studies executed over the last 110 years by scholars, not exclusively by geographers, Regional Scientists (**vide Jour. of Regional Science**) launched out some years ago on their own to emphasise this great **lacuna** in development scholarship — the crucial and pivotal **spatial perspective**. Who needs reminding that everything takes place in some **location**? By now the names of geoscientists John Friedmann (1966, 1980) and Friedmann and Alonso are household names. Friedmann and Alonso (1964) put it rather poignantly as follows:

"In the few years that nations have sought economic development as an explicit goal it has become clear that the arithmetic of macro-economics has need of and is made more powerful by the geometry of regional considerations. Not only must decisions be made on **how much** of a scarce resource shall be allocated to a given region and for a given purpose but also on **WHERE** investments shall take place. Regions and space are a neglected but necessary dimension of the theory and practice of economic development. Without the spatial point of view, the analysis is incomplete, somewhat like a two-dimensional projection of a three-dimensional project. The questions of social justice in the distribution of the fruits of economic deve-

<sup>1</sup> Physical Quality of Life Index.

lopmente are as important and as difficult in terms of regions as in terms of social classes. . . territory in certain rhythms and patterns that are **NEITHER ARBITRARY** nor the working of chance. They result rather from the interdependencies that give form to economic space. Where economic development occurs unequally across the national territory, regional differences in the level of welfare may become an **URGENT ISSUE** of a **POLITICAL** nature. . . **WHERE THE MATTER IN WHICH ECONOMIC SPACE IS ORGANISED AFFECTS THE PACE AND STRUCTURE OF ECONOMIC GROWTH, NATIONAL POLICY MUST TURN TO STRATEGIES OF SPATIAL EVOLUTION TO FURTHER THE GENERAL DEVELOPMENT OBJECTIVES OF THE ECONOMY."**

In this last sense planning is defined as "aberrant behaviour", for national development is a matter of integrated growth. What one has to look for, therefore, is whether the **links** between the different sectors are truly established in a manner conducive to all round development. More correctly, more geographically, one has to consider whether the **links between regions** and areally distributed assets are established in a manner conducive to all round development.

Development, for too long preserved by the economists has thus a glaring lacuna — the mastery over the natural and manmade environment or furthering the potential for such a mastery. As Crooks (1971) put it, "The ultimate goals of development are social and they pertain to improving the quality of life. Instrumental to this is the improvement of the quality of the total environment including both the man-made and the natural." To be sure, then Friedman and Alonso (1964) are absolutely and without qualification, correct. Development to deserve such an appellation, is achieved by successful **conquest** of space and the creation of **spatial** and functional links.

To a geographer, development is, to wit, a process by which the inhabitants **continually** and **creatively manipulate** the natural environment for the satisfaction of their material needs. Development does not just happen. Left to itself one might say that the tendency is to accrete not spread, to congeal, to agglomerate.

Mabogunje (1980) reminds us that:

"Development is an attempt to define new spatial relationships among members and between them and their environments. . . (and) . . . implies a strategy of spatial re-organisation. A strategy of spatial re-organisation is crucial for the whole process of political mobilisation of central state control over the planning of productive forces. . . Efficiency in spatial organisation arising from an ability to transform spatial structure in a manner consistent with a particular mode of production is a critical if not a major factor in the development of a country."

Development can also be seen as the progressive and **cumulative transformation of the structural make-up** of society, its ways of production and the very production of goods and services, the aims being manifold — inter alia, overcoming malnutrition, poverty and disease, providing equality of opportunities, full employment, social services, equitable distribution of income and political freedom, fulfilment of life or enjoyment, of plenty, of care, of variety. The **spatial** implications are clear. Mountjoy (1966) is clearly spatially concerned too, the least because he is a geographer. To him, "Development applies to all sectors (implying **spatial** sectors too) of an economy and implies a relative change in their order of importance with the applications of science and technology, raising productivity per worker and releasing labour and resources for yet other productive tasks." **If economic advancement fore-supposes mechanisation, technology, science and modernisation, spatial change is a natural concomitant.** Indeed it may be the **raison d'être**.

Pregnant with spatial implications also is the divergence-convergence development theory of C. Y. Thomas (1978). To him "underdevelopment results from the lack of an organic link in an indigenous technology, between the pattern and growth of domestic resources and the pattern and growth of domestic demands and (secondly) the divergence between domestic demand and the needs of the broad mass of the population." Development, in Thomas view thus must be a concerted effort at **convergence** of production and needs, the **convergence** of **production** and factor availability (as far as is reasonable) within the society. We can read clearly into Thomas theory the **convergent force** — of urban centres and rural food baskets, rural construction and non-urban wood/clay production, the convergence of urban industry and rural raw material/food production, for example. No society in fact has been built successfully without this tremendous inter-relationship — this symbiosis of **sectors**, of **space**. Heavily implicated with this sectoral/spatial convergent requirement **must** be the facilities of transport and communications for efficiency.

The train of events may be conceptualised in terms of a **RURAL-URBAN, POLE-PERIPHERY, CORE-PERIPHERY** relationship. Someone many years ago coined the term 'RURBANISATION SYMBIOSIS'. And apt term it is. Consider Figure 1 (a-c). In brief the following are the highlights:

### STAGE I

For all practical purposes, the urban modernised centre is a world apart. So is the rural sector. The former is upwardly mobile while the latter is being downwardly degraded. In the urban area life goes on as it would anywhere in a metropolitan setting in the U.S.A., while in the rural area the practices differ little from village neolithic life. In the former, things become cumulatively better. In the latter area everything becomes cumulatively worse. In the latter regions there are hardly any appur-

tenances of modernity. Negativism and fatalism are the order of day and a persistent characteristic is outmigration of capital, skill, the youth, the teachers, the entrepreneurs, in fact every attribute of the regions which would otherwise be of positive benefit to the economy and the **space** economy. The situation can be described as **HYPER/CEPHALIC** with neither sector achieving the fullness of mutuality that is possible.

### STAGE 2

In this stage of proto-symbiosis the former condition of pure subsistence in the rural sector is 'disrupted' by an incipient 'relation' with the crypto-urban sector. The farmers now produce for the urban workers. Some formerly imported food is replaced by locally-produced crops. Money flows from **urbs** to **rure**. Less people are inclined to abandon the rural for the urban parts. There is more money circulating in the rural areas. The success of the measure induces the government to make critical connections between the two spatial sectors — via road, rail, telephones, electrification. The urban industries can now sell more to the rural folk. So the factories gain better economies of scale and plainly increase their sales. A symbiotic relationship is incipient.

### STAGE 3

Stage 2 innovations are strengthened. More farm produce and other materials are consigned to the urban sector from the rural periphery. More money flows from the urban areas to the periphery and, in turn, money from the hands of farmers and others is used in greater quantities for the purchase of urban goods. Urban factories gain better scale economies as a result. The urban areas are now consuming more local produce and are importing less foreign produce with a consequent large saving in foreign exchange. With more cash available for disposal **in the rural periphery**, the way is open for the growth and development of **services** and service centres. The stage is set for the development of a **hierarchy** of settlements to take root. The triggers initiated in Stage 2 are likewise strengthened in Stage 3. A deep symbiosis now exists. There is a stronger urban sector which suffers less from the in-migration of hordes of rural people fleeing the land. Farmers are now much richer and are therefore able to **plough back** substantial amounts of their earnings into farm machinery, insecticides, pesticides, irrigation and many of the accoutrements of modernisation. Small towns flourish in the erstwhile periphery. Farmers being richer can pay more taxes. And, because so many more people remain in the rural areas, it is now economic for the government to inject sizeable capital

# THE 'RURBANISATION' SYMBIOSIS PROCESS

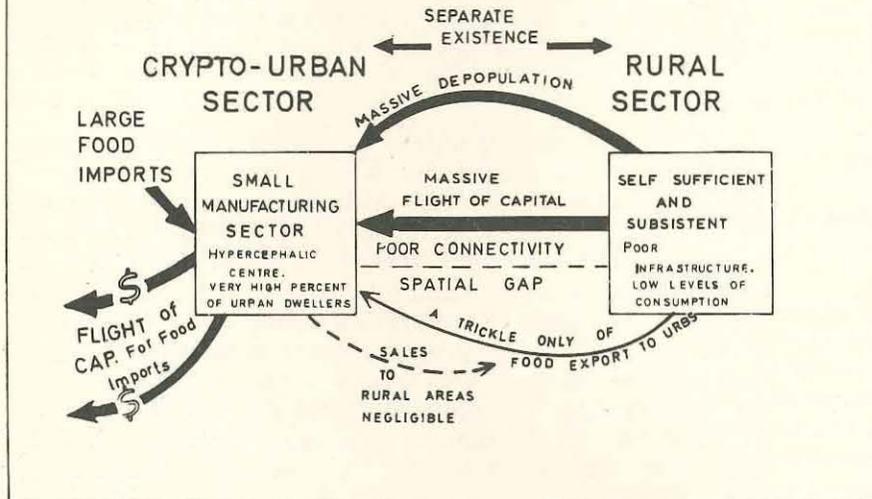
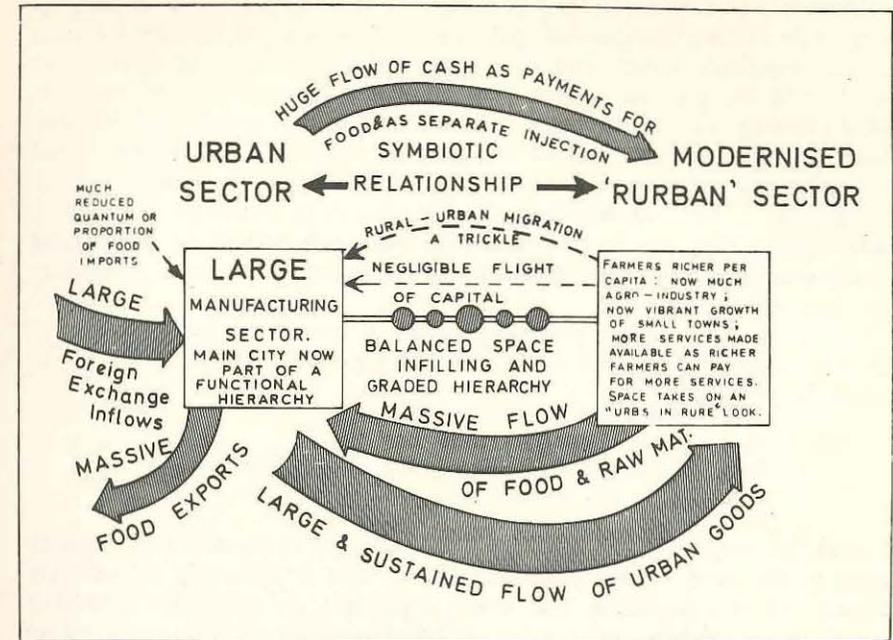


FIG. 1a



SOURCE: Devised by the author

FIG 1c

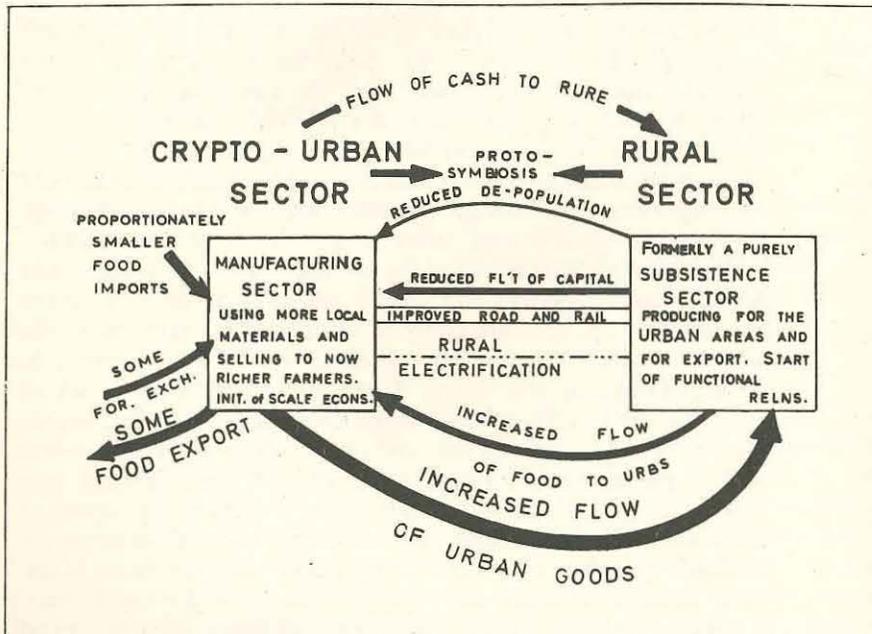


FIG. 1b

inputs into the region in the form of public utilities, infrastructure of many types and so on. With the application of science to farming and with the application of modern methods in all their manifestations, food produce in the periphery is far in excess of local needs. Agro-industrial centres spring up and so the whole gamut of **forward and backward linkages**, even joint **linkages**. The excess produce, raw or processed is now available for export so that there is a way open for the earning of foreign exchange in large proportions. In fact with the development of **space** and the **economy** of the former periphery the process of social movement may be reversed. Instead of an urban-ward movement there may even be a movement of people **from the city to the rural or semi-rural areas**. The mutual upliftment has been attained. The symbiosis is strong and so the process continues.

The 'rurbanisation' symbiosis idea just presented seems obvious enough. However, while developing countries have been attempting to understand the past in their "flight across the centuries" they have virtually fallen into same a-spatial trap. Rarely has any government given thoughts to the **spatial patterns** inherent in poverty, the **causes** of these patterns and the known remedies for same.



be able to give a quick answer such as "yes" or "no" or "in some ways". Given time, and given the seriousness of the question one would have to be far more systematic in an approach to an answer. It would be a good approximation to take the per capita income from the nearest Population Reference Bureau statistics. But this would be a short cut not rewarding in its singular use. A serious student must set out to find how the **GEOGRAPHY** of certain attributes has evolved, has concentrated, has been diffused, has waxed and waned or has remained spatially pinpointed at a pole. It is very common for people, especially politicians, to boast that tremendous development was achieved between such and such a time, adding that the GDP has grown by such and such a percentage. We have already pointed out that it is almost a sacrilege and a betrayal of a nation to call something, some phenomenon, development when the **people** are no better off and **space** is no better off. Dudley Seers was patently correct. As we have remarked, one can make do with the PQLI developed and popularised by Morris (1979). In terms of spatial aspects of development, however, out of the welter of measures one may consider the following, **inter alia**, but not including transport indices, the subject of this paper.

#### 1. URBANISATION

Number of cities, the percentage of urban dwellers, the size of cities, spread of urban hierarchy throughout space.

#### 2. POLE-PERIPHERY

The decrease in the disparity and spread of modernisation, the internalisation of urbanisation, the extension from the nuclear area (E.g. the coast) of the ecumene; the lessening of **area** outside of five miles from a hard top road.

#### 3. POPULATION and EMPLOYMENT

The level and variety of unemployment, the rate of population **growth**, the death rate, the infant mortality rate, balance of employment in primary, secondary and tertiary sectors.

#### 4. EDUCATION

Percentage of persons within appropriate age ranges in primary, secondary and tertiary institutions ratio of teachers to students, expenditure per student on education as versus say military; location and frequency of educational institutions.

#### 5. HEALTH

Ratio of persons to doctors, dentists, nurses, etc., number and distribution of hospitals, hospital beds per unit population. Location and frequency of health establishments.

#### 6. INDUSTRIAL PRODUCTION

Production per unit population of critical elements such as steel,

cement, chemicals, clothing, building, material good, industrial raw materials and so on.

#### 7. INVISIBLES

Income from tourism, sales/rental of patents, insurance, shipping, currency, repatriation.

#### 8. AGRICULTURAL PRODUCTION

**Quantity** of production, **variety** of production, surplus **and** location of processing (agro-industry)centres.

#### 9. SPATIAL SPECIALISATION and INTERREGIONAL SYMBIOSIS

The maximum fulfilment of space potential and inter-regional trade.

#### 10. POLITICAL INTEGRATION

Spatial telescoping and the withering of the tyranny of distance.

#### 11. EXPORTS and IMPORTS

The increased earnings of foreign exchange and the lessening of expenditure on foreign goods imports.

In terms of the progression of **real** change in any society a recurring decimal is **transport** under which we include:

- (a) The terrestrial routeways — surfaced roads, railways;
- (b) The non-planar routeways — airline routes;
- (c) Vehicles — cars, buses, trucks and other commercial vehicles, trans/carriages, planes;
- (d) The carriers of non-goods — telephones, cables.

Transport is an extremely crucial and pivotal part of the development process. Better put it is a cardinal part of the production purpose if we accept, and it is easy, that the purpose of production is consumption and that in a world not existing on the 'head of a pin' (Losch) the principal second problem of production is that of distance, a problem that all of the locationists — Launhardt, Palander, Weber, von Thünen, Christaller, Hoover, Isard et al have grappled with. It is simply because there is space, distance, time consumption, cost consumption that we have the geographic problem. The tyranny of distance has bedevilled man from the neolithic to the industrial age, even into the post-industrial age from the first Wave through the second into the Third Wave (Toffler, 1980). "Transport is one of the universal unputs in the development process and its influence is all pervasive. A major United Nations report concluded that 'In most developing countries a lack of transport facilities is one the main factors in world poverty and a major deterrent to rapid economic and social progress'. As a result of this lack of transport, the exploitation of natural resources has been retarded, industrialisation limited, trade expansion and entry into the



tap the resources of large areas and the world and, in turn, to send out finished products, settlements would remain in the 1980s as they were in the 9th century at the level of villages. Is it any wonder that Mark Jefferson titled his paper "The Civilising Rails"? And is it any wonder that **city** and **civilisation** have the same root — **civis**? Why, indeed, do we speak of someone as being urbane? Just why are London, New York, Tokyo, São Paulo, Chicago, Mexico City the largest cities in the world? Whatever the histories and explanations, one cannot escape the criticality of global transport connections in this scenario. One does not even have to be a geographer, nay indeed a college person to relate transport and development. Even a most casual observer, shown a map, say of Sao Paulo state and the Amazon will conclude, indeed discern, that there is more development (production, population, turnover, exchange, services, etc.) in the former. But is it that spatial transport development and socio-economic development **merely** go together? Or is it, more correctly that they symbiotically grow together causatively and repercussion-wise? If we take **rural** transport only, one can hardly do better at describing the effects of transport net development and socio-geographical/economic change than the following appraisal taken from the **Transport and Communication Bulletin for Asia and the Far East 48** (1972).

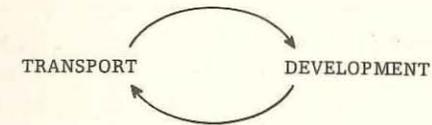
"The development of a well-planned rural road system is one of the basic factors contributing directly to rural development as a whole. Such a system facilitates farm mechanisation, effective utilisation and mobilisation of manpower and resources and access to land. It makes rural areas accessible to new developing industries, encourages dispersal of industries, increases employment opportunities and promotes regional development. Rural development reverses migration tendencies and reduces pressure on cities. Spreading industrial capital to rural areas reverses migration from overcrowded urban areas or at least encourages people to remain in the rural areas.

The development of rural transport which is a basic requirement for rural development and social welfare will increase employment opportunities and facilitate the provision of education, health services and other secondary services, thus encouraging the farm people to remain in the rural bases.

The development of rural roads will contribute to the national economy by extending the market and by providing mobility for people, products and natural resources. It also makes possible for governments to provide social services and strengthen the political unity of the country."

The ideas we now wish to explore at a quantitative level are that transport development is an index of development in general, that it is a precursor, a pre-requirement for evolution in its many aspects **and** that it is indeed a

result or a repercussion of development. It is no use asking the unanswerable — the chicken of the egg question. Transport (vehicles, rail, road, etc.) induces development and is itself an infrastructural asset laid out as a result of suggestions, needs, impetuses from the very development of a country or region. In short:



In order to pursue this thesis we revert to something we instinctively react against yet patronise at will. We shall, **ceteris paribus** take **per capita income** as a good surrogate of development. We also assert that the greater the number of private and commercial vehicles in a country on part thereof is an index, an indicator of certain facts and trends; some such trends are:

- (a) That there is high production, high incomes, savings and investment and a high level of disposable income beyond the needs for the basics of life which allows the acquisition of such hardware.
- (b) That the higher the number of vehicles (especially commercial vehicles) per unit population implies a high level of goods movement — hence trade and turnover — and obviously, consumption.
- (c) That there is mass inter-regional movement — hence intense **areal** or regional specialisation and spatial maximisation of production potential.
- (d) That the greater the intensity of vehicles, so too there is a high level of productivity per **unit of time** and a maximisation of product movement per **unit of time** likewise.

To test this **prima facie** conception that **transport** and **development** are intricately and inseparably mingled we thus, first of all, take as an index of transport development the measure of commercial and private vehicles per 100 persons ranking it for some 102 countries in 1982 (Table 1). Looking at some data in a slightly different way in terms of persons per vehicle we find a variation as follows:

United States of America	1.5	Argentina	7.14	Ethiopia	55.5
West Germany	2.43	Jamaica	12.5	Cuba	83.3
United Kingdom	3.19	Guatemala	31.2	India	142.9

**TABLE I**  
**TRANSPORT AND DEVELOPMENT — DENSITY OF VEHICLES**  
**AND PER CAPITA INCOMES FOR 102 COUNTRIES**

<i>Countries</i>	<i>Comm. and Private Vehicles per 100 Persons</i>	<i>Rank</i>	<i>Per Capita Income US Dollars</i>	<i>Rank</i>	<i>D<sup>2</sup></i>
United States of America	68.0	1	14090	4	9
Canada	54.0	2	12000	8	36
Australia	52.7	3	10780	11	64
Cayman Islands	47.0	4	9400	17	169
Luxembourg	46.7	5	12190	7	4
Iceland	45.6	6	10270	15	81
France	42.4	7	10390	13	36
Switzerland	41.7	8	16390	3	25
West Germany	41.2	9	11420	10	1
Sweden	37.7	10	12400	6	16
Norway	36.4	11	13820	5	36
Puerto Rico	36.4	11	3600	33	484
Kuwait	36.0	13	18180	2	121
Martinique	35.4	14	4270	28	196
Italy	35.4	14	6350	23	81
Japan	35.4	14	10010	16	4
Belgium	35.0	17	9160	18	1
United Kingdom	32.0	18	9050	19	1
Denmark	31.3	19	11490	9	100
Bahamas	31.0	20	4060	21	1
Brunei	31.0	20	21140	1	360
Finland	31.0	20	10440	12	64
Spain	26.3	23	4800	27	16
Malaysia	23.0	24	1870	42	324
Netherlands West Indies	23.0	24	4200	29	25
Ireland	22.4	26	4810	26	0
Bahrain	18.0	27	10360	14	169
Venezuela	15.6	28	4100	30	4
Argentina	15.0	29	2030	39	100
Libya	14.0	30	7500	20	100
Israel	13.9	31	5360	25	36
Trinidad and Tobago	12.0	32	7000	21	121
Antigua	12.0	32	1730	45	169
Chile	12.0	32	1870	42	100
Bulgaria	11.0	35	2900	35	0
Barbados	11.0	35	3930	32	9
Mexico	11.0	37	2240	33	16

(Continued)

TABLE I (Continued)

Brazil	8.7	38	1900	41	9
Fiji	8.0	39	1790	33	25
Singapore	8.0	39	6620	22	289
Jamaica	8.0	39	1300	51	144
Grenada	7.0	42	990	58	256
Costa Rica	7.0	42	1020	57	225
Panama	7.0	42	2070	38	16
Soviet Union	6.4	45	6350	23	464
St. Vincent	6.4	45	860	61	256
Congo	6.0	47	1230	52	25
Iran	4.5	47	2500	25	484
Guyana	4.3	49	520	73	576
Botswana	4.0	50	920	59	81
Mauritius	4.0	50	1150	51	16
Guatemala	3.2	52	1120	55	9
Zimbabwe	3.2	52	740	66	16
Morocco	3.1	54	750	65	169
El Salvador	3.0	55	710	67	144
Algeria	3.0	55	2400	36	
Colombia	3.0	55	1410	47	64
Dominican Republic	3.0	55	1380	50	25
Turkey	2.6	59	1230	52	49
Peru	2.6	59	1040	56	9
Sri Lanka	2.5	61	330	78	289
Paraguay	2.4	62	1410	47	225
Egypt	2.2	63	700	68	25
Nicaragua	2.1	64	900	60	16
Philippines	2.1	64	760	63	1
Zambia	1.8	66	580	71	25
Ethiopia	1.8	66	140	99	1089
Honduras	1.8	66	670	67	1
South Korea	1.8	66	2010	40	676
Sudan	1.6	70	400	76	36
Ecuador	1.5	71	1430	46	
Bolivia	1.5	71	510	74	9
Gambia	1.3	73	290	82	81
Pakistan	1.3	73	390	77	16
Cuba	1.2	75	1400	49	676
Liberia	1.2	75	470	75	0
Indonesia	1.1	77	560	72	25
Cameroon	1.1	77	800	62	225
Ghana	1.0	79	320	79	0
Chad	0.8	80	90	101	441

(Continued)

TABLE I (Continued)

India	0.7	81	260	88	49
Central African Republic	0.6	82	280	82	0
Haiti	0.6	82	320	79	9
B. Faso	0.5	84	180	94	100
Niger	0.5	84	240	89	25
Malawi	0.4	86	210	93	49
Madagascar	0.4	86	290	82	16
Afghanistan	0.4	88	160	96	64
Benin	0.4	88	290	82	36
Tanzania	0.4	88	240	89	1
Nigeria	0.4	88	760	63	625
Mali	0.3	92	150	97	25
Guinea	0.3	92	300	81	121
Vietnam	0.3	92	150	81	121
Uganda	0.6	92	220	92	0
Bhutan	0.2	96	85	102	36
Burundi	0.2	96	240	89	49
Rwanda	0.2	96	270	87	81
Bangladesh	0.12	99	130	100	1
China	0.10	100	290	82	324
Burma	0.10	100	180	94	36
Angola	0.06	102	670	67	1225

SOURCE: Basic Data from The Economist, **WORLD IN FIGURES** and Population Reference Bureau, **WORLD POPULATION DATA SHEET**, 1985. All arrangements and rankings by the author.

Tanzania	250.0
Burundi	500.0
China	1000.0

Unlike most writers in the past we purposely use the index 'vehicles' instead of 'cars' because we think it absolutely crucial to include **commercial** vehicles, the very movers of the fruits of industrial development. We next take as the usual surrogate for all development the commonly available per capita income in US dollars. These are also shown and ranked in Table 1. But we may, for these same twelve countries show the range in thousands of US dollars:

United States of America	14.1	Argentina	2.0	Ethiopia	0.14
West Germany	11.4	Jamaica	1.3	Cuba	1.4
United Kingdom	11.5	Guatemala	1.1	India	0.26
		Tanzania	0.24		
		Burundi	0.24		
		China	0.29		

Using the Spearman Rank Correlation Method we work as follows:

Correlation Index

$$\begin{aligned} \gamma_s &= 1 - \frac{6\sum d^2}{N^3 - N} \\ &= 1 - \frac{6 \times 13171}{102^3 - 102} \\ &= 1 - \frac{79026}{1061208 - 102} \\ &= 1 - \frac{79026}{1061106} \\ &= 1 - 0.0744751 \\ &= + 0.93 \end{aligned}$$

It will be seen that an extremely high positive correlation of **0.93** is achieved, an index within the 0.1% confidence limit. **Ceteris paribus**, then, and taking into account aberrations and explainable peculiarities we can aver that, *cederis locibus* a country cannot achieve development without access to a large number of carriers per unite population. Development means movement. But movement implies goods to move and, of course, this cannot materialise unless there are means to move them. How can one unravel this cycle? What comes first? Al one can say is that the bond is clear. The two measures, to put it simply, go together almost everytime — causatively and repercussionally.

Next we consider the all-important measure of areal net. The simplest and most obvious index of transport cover is some measure of density per unit area. Some scholars if asked to say which of three or more countries or regions in a country is the most developed would answer "Just show me maps of their transport network." A network takes time to evolve. It is to a large extent an ordely almost evolution as portrayed in that most-used model of Taafe et al (1962). If two regions have nets of 100 miles and 5 miles of roads respectively for 100 square miles each then the assumption one can make, a safe one, is that in the former case the net evolved to suit the demands of the population, the traffic, the trade of the area. Networks don't grow of their own accord. They are not laid down haphazardly and purposelessly. They are part of and contribute to the grand scheme of things.

It is also obvious that this index is merely an extension of the index in Table 1 — number of vehicles for a network grows to accommodate the

flows and frequencies and the time budgets of a society moving headlong into modernisation. In Table II we have laid out the quantum of paved roads and rail in aggregate and per 1000 people for 97 countries across the development spectrum. We may show the range by listing a few countries in terms of road/rail per 1000 population.

Australia	55.2	Austria	15.1	Cuba	5.0
United States of America	28.9	Greece	11.1	Puerto Rico	2.7
Sweden	23.5	Poland	9.0	Nigeria	1.0
		China	0.3		
		Uganda	0.2		
		Chad	0.05		

In addition to the relationships described above we must take the view, *inter alia*, that the greater the net of road and rail per 1000 population:

- The richer the country had to be to build that infrastructure in the first place.
- The transport net is serving a carrying capacity commensurate with its density.
- The higher the level of inter-regional symbiosis and hence the smaller the periphery or areas outside the ecumene or 'pale'.
- The higher the political integration and nationalism and thus the lower the level of 'feeling of neglect'.

It seems obvious just by at the randomly chosen twelve countries above.

Again we take per capita income for 1985 as a surrogate of development. For the very same countries listed above we find income in thousands of US dollars as follows:

Australia	10.8	Austria	9.2	Cuba	1.4
United States of America	14.1	Greece	4.0	Puerto Rico	2.0
Sweden	12.4	Poland	1.8	Nigeria	0.8
		China	0.3		
		Uganda	0.2		
		Chad	0.1		

The co-relation is inescapable. Rich countries have dense nets per unit population. Put to the Spearman Rank Correlation analysis a positive correlation index of 0.84 is achieved, a correlation well within the 0.1% confidence limit.

TABLE II  
TRANSPORT AND DEVELOPMENT — AREAL DENSITY  
OF TRANSPORT NET AND PER CAPITA INCOME  
1982/83

Countries	Popul'n (mill) 1982	km Paved roads and rail (000)	Paved roads and rail per 1000 pop'n	Rank road rail per 1000 pop.	Per cap Income 1985 US\$	Rank PCI	Diff. in Rank <sup>2</sup>
Switzerland	6.47	72	11.13	15	16390	1	196
United States	232.06	6700	28.87	5	14090	2	9
Norway	4.11	88	21.41	9	13820	3	36
Sweden	8.33	196	23.53	8	12400	4	16
Luxembourg	0.37	5.41	14.62	12	12190	5	49
Canada	24.63	996	40.44	3	12000	6	9
Denmark	5.12	73	14.26	13	11490	7	36
W. Germany	61.64	518	8.40	24	11420	8	256
Australia	15.17	837	55.17	1	10780	9	64
Finland	4.83	81	16.77	10	10440	10	0
France	54.22	1536	28.33	6	10390	11	25
Iceland	0.24	12.60	52.50	2	10270	12	100
Japan	118.45	1148	9.69	19	10100	13	36
Netherlands	14.31	112	7.8	26	9910	14	144
Austria	7.57	114	15.06	11	9210	15	16
Belgium	10.00	131	13.10	14	9160	16	4
United Kingdom	56.28	384	6.82	28	9050	17	121
New Zealand	3.16	100	31.64	4	7410	18	196
Trinidad/Tobago	1.1	7	6.36	32	6900	19	169
Italy	56.64	317	5.60	39	6350	20	361
East Germany	16.70	133	7.96	25	6000	22	9
Israel	4.02	13	3.23	46	5360	23	529
Ireland	3.48	94	27.01	7	4801	24	289
Spain	38.00	338	8.80	21	4800	25	16
Czechoslovakia	15.37	159	10.34	18	4500	26	64
Martinique	0.33	1.8	5.45	41	4270	27	576
Venezuela	14.75	21	1.42	58	4100	28	900
Greece	9.80	109	11.12	16	3970	29	169
Barbados	0.25	1.64	6.56	30	3930	30	0
Suriname	0.41	2.7	6.59	29	3520	31	4
Guadeloupe	0.34	2	5.88	38	3300	32	36
Puerto Rico	3.30	9	2.73	48	2890	33	225
Yugoslavia	22.65	143	6.31	33	2570	34	1
Uruguay	2.95	8.0	2.71	49	2490	35	196
South Africa	31.01	5.0	1.6	56	2450	36	441
Mexico	73.01	80	1.10	63	2240	37	729
Argentina	28.43	242	8.51	23	2030	38	225
South Korea	39.33	57	1.45	57	2010	39	324

(Continued)

TABLE II (Continued)

Rumania	22.64	106	4.68	45	1988	40	25
Hungary	10.70	95	8.88	27	1905	41	196
Brazil	126.81	83	0.65	77	1890	42	1156
Malaysia	14.77	25	1.69	55	1870	43	144
Poland	36.23	325	8.97	20	1800	45	625
Paraguay	3.37	1.31	0.39	88	1410	46	1764
Colombia	29.70	78	2.63	50	1410	47	16
Cuba	9.80	49	5.00	44	1400	48	16
Dominican Republic	5.74	6.4	1.12	62	1380	49	169
Jamaica	2.2	4.9	2.23	51	1200	50	1
Tunisia	6.67	12.10	1.81	52	1290	51	1
Congo	1.62	1.60	0.99	64	1230	52	144
Turkey	16.31	35	0.76	70	1230	52	324
Belize	0.15	1.6	10.67	17	1140	54	1369
St. Lucia	0.124	0.8	6.45	31	1060	55	576
Peru	18.79	6.3	0.33	91	1040	56	1225
Costa Rica	2.32	10.9	4.70	44	1020	57	169
Grenada	0.106	0.8	7.55	27	990	58	961
Botswana	0.80	5	6.25	35	920	59	576
Nicaragua	2.92	2.00	0.68	76	900	60	225
Swaziland	0.60	3.0	5.33	43	890	61	324
St. Vincent	0.10	0.3	3.00	47	860	62	225
St. Kitts/Nevis	0.05	0.314	6.28	34	820	63	841
Thailand	48.49	34	0.7	74	810	64	100
Cameroon	8.87	3.6	0.41	86	800	65	441
Philippines	50.74	24	0.47	83	760	66	289
Nigeria	82.39	75	0.9	68	760	66	4
Zimbabwe	7.54	1.3	1.7	53	740	68	225
Ivory Coast	8.57	8	0.933	60	720	69	1
El Salvador	5.00	2.11	0.42	84	710	70	196
Egypt	44.67	34	0.76	70	700	71	1
Honduras	3.96	2.51	0.63	78	670	72	36
Zambia	6.16	6	0.97	66	580	74	64
Indonesia	153.03	33	0.20	96	560	75	441
Guyana	0.92	0.9	0.98	65	520	76	121
Liberia	2.11	1.20	0.48	82	410	77	25
Sudan	19.45	7.5	0.38	89	400	78	121
Pakistan	87.13	62	0.71	73	390	79	36
Kenya	17.86	9.3	0.52	81	340	80	1
Sri Lanka	15.19	9	0.6	79	330	81	4
Haiti	5.20	4.3	0.83	69	320	82	169
Ghana	12.24	8.95	0.74	72	320	82	100
Benin	3.62	1.3	0.36	90	290	84	36
China	1008.0	261	0.25	94	290	84	100
Rwanda	5.28	7	1.33	59	270	86	729
India	711.66	460	0.65	76	260	87	100
Somalia	5.12	2.15	0.42	84	250	88	16
Niger	83.29	8.01	0.10	98	240	89	81
Tanzania	19.11	10.6	0.55	80	240	89	81
Uganda	14.06	3	0.2	96	220	91	25

(Continued)

TABLE II (Continued)

Malawi	6.27	6	0.96	67	210	92	625
Nepal	15.40	5.1	0.33	91	170	93	4
Afghanistan	16.79	19	1.13	61	160	64	1089
Zaire	30.82	7	0.227	95	160	94	1
Mali	7.34	2.1	0.29	93	150	96	9
Vietnam	56.71	13	0.4	60	150	96	1369
Ethiopia	32.78	76	1.3	87	140	98	121
Bangladesh	92.62	6.6	0.07	99	130	99	0
Chad	4.64	242	.052	100	90	100	0

SOURCE: Data on Population from: Economist, *World in Figures*, 1984z Data on Income from Pop. Rereference Bureau, *World Population Data Sheet*Data on Rail and Road from n.o 1; IRTU, *World Transport Data*, 1983, *South 120* (Supplement of *South*, October 1985).

In common parlance and in common knowledge and planning transport hardly ever goes alone. 'Transport and Communicatios' has almost become one word, maybe hyphenated. These two simply cannot be separated one from another. One is to a point useless without the other. In any case one is stymied, less effective rather impotent, without the bolstering effect of the other. It is true that there is a certain amount of tautology involved here for the former term implies the means of/and the moving of people and goods whereas the latter, *au fond* has *todo*, *inter alia*, with the movement of **ideas, knowledge, command, requests, greetings** and so on. The modern age, of course, is characterised by a kind of communications which boggles the mind and could never have been conceived even ten years ago. We refer, of course, to earth-sensing satellites and communication satellites which literally make the world one big village. But in this paper we shall deal merely with a very old means of communication which, has, in its own way transformed the world of distances. We refer to the telephone. The density of telephones in a given area portrays (reflects) a number of truths. **Inter alia**, these may be listed:

- More telephones per unit of population is a reflection of income or the economic ability of a population to secure such assets.
- The telephone density reflects the technology, the competence of a nation.
- The telephone density implies an equivalent **need for and use of** such facilities.
- The number of telephones an order of tripsaving, time saving, gasolene saving, etc. which would not be possible in a communication-starved country.

On the last point it is critical to refer to the paper on "Time and

Decentralisation" by Spreng and Weinberg (1980) brought to our attention by Dr. Emery Castle, President of the **Resources for the Future** in his 1980 Presidential Report (1980). It is worth quoting Castle at length:

"There now is widespread recognition of the importance of energy, but there as been much less discussion of **time and its value**. Perhaps this is because it often is assumed that the amount of time available to any of us is fixed, and there is little we can do about it. Yet a moment's reflection will demonstrate how incorrect such a notion is. In addition to longer life spans, we value highly those things which further the amount of time available to us and which make possible the more efficient use of time. We drive cars rather than walk or take public transportation. **we reach for the telephone rather than pen and ink and we use airplanes rather than rains or ships. The increased value of human time as been associated with economic development: indeed it may be considered and index of such development.**" (Page 7, Castle, 1980).

There is little need to belabour the role of a **time saver** like telephones in the total context of **development** which, for all practical purposes is synonymous with **improvement** in access to the good things in life and the lessening of the pains of living — more good, less bad.

For all the countries in the world telephone density varies from a high of 1071 per 1000 people to 1 per 1000 people. Per capita income (1982) varies from a high of US\$18000 to a low of US\$90.

In order to highlight the hierarchy we may note the telephone densities per 1000 population for a few countries:

Monaco	1071	Guadeloupe	3.3	Egypt	0.7
Denmark	669	Soviet Union	3.4	Malawi	0.2
Italy	361	Antigua	1.7	India	0.3
		Ethiopia	0.14		
		Zaire	0.16		

Intuitively we know that this list is also an order of merit of total development or development as measured by any single index. We may thus look at income levels for these very countries thousands of US dollars. The order reads as follows:

Monaco	11.0	Guadeloupe	3.3	Egypt	0.7	Ethiopia	0.14
Denmark	11.5	Soviet Union	3.4	Malawi	0.2	Zaire	0.16
Italy	6.4	Antigua	1.7	India	0.3		

The same order obtains. The co-incidence is too exact to be haphazard.

To test the hunch that these two phenomena are related and, bearing in mind that per capita income is reflective of a range of indices combined in one index (Smith, 1979, pp. 72) we have produced Table III. We first

TABLE III  
COMMUNICATIONS and DEVELOPMENT  
Telephones and Income  
1982

Countries	Telephones Per 1000 Pop.	Rank	Per Capita Income US\$	Rank	Diff. in Rank <sup>2</sup>
Monaco	1071	1	11,000	11	100
Bermuda	846	2	13,000	5	9
Sweden	828	3	12,400	6	9
United States	788	4	14,090	3	1
Switzerland	741	4	16,390	2	9
Canada	624	8	12,190	7	1
Denmark	670	6	12,000	8	4
Luxembourg	669	7	11,490	9	4
New Zealand	594	9	7,410	21	144
Finland	552	10	10,440	13	9
Netherlands	544	11	9,910	17	36
Australia	531	12	10,780	12	0
France	498	13	10,390	14	1
United Kingdom	495	14	9,050	20	36
West Germany	488	15	11,420	10	25
Norway	485	16	13,820	4	144
Iceland	480	17	10,270	15	4
Japan	479	18	10,100	16	4
Austria	321	19	9,210	11	64
Belgium	387	20	9,160	19	1
Italy	361	21	6,350	24	9
Singapore	343	22	6,620	23	1
Bahamas	340	23	4,060	32	81
Israel	333	24	5,360	25	1
Spain	327	25	4,800	27	4
Greece	303	26	3,970	33	49
Barbados	267	27	3,930	34	49
Puerto Rico	231	27	2,890	39	144
Czechoslovakia	210	29	4,500	29	0
Ireland	208	30	4,810	26	16
Martinique	196	31	4,270	36	25
Guadeloupe	154	32	3,310	37	25
Kuwait	151	33	18,120	1	1024
Portugal	146	34	2,190	42	64
Bulgaria	139	35	2,900	38	9

(Continued)

TABLE III (Continued)

Hungary	121	36	1,905	45	81
Argentina	103	37	2,030	44	49
Uruguay	99	38	2,490	40	4
Poland	97	39	1,800	49	100
Panama	93	40	2,070	43	9
USSR	89	41	3,400	36	25
St. Kitts	73	42	820	64	484
Mexico	71	43	2,240	41	4
Trinidad/Tobago	69	44	7,000	22	484
St. Lucia	64	45	1,060	57	144
Brazil	62	46	1,890	46	0
St. Vincent	58	47	860	67	400
Venezuela	48	48	4,100	31	289
Colombia	57	49	1,410	52	9
Jamaica	55	50	1,300	55	25
Grenada	52	51	990	59	64
Chile	51	52	1,870	47	25
Antigua	43	53	1,730	50	9
Belize	43	53	1,140	56	9
Suriname	43	52	3,520	35	400
Malaysia	42	56	1,870	47	81
Cuba	37	57	1,400	53	16
Ecuador	33	58	1,430	51	49
Dominican Republica	30	59	1,380	54	25
Guyana	28	60	520	74	196
Peru	27	61	1,040	58	9
Bolivia	24	62	510	75	169
Nicaragua	22	63	900	62	1
Gabon	21	64	4,520	28	126
Botswana	15	65	920	61	16
El Salvador	15	65	710	68	9
Dominica	13	67	970	60	49
Egypt	12	68	700	69	1
Kenya	12	68	340	79	121
Ivory Coast	11	70	720	67	9
Zambia	10	71	580	72	1
Honduras	7	72	670	70	4
Angola	6	73	670	70	9
Ghana	6	73	320	81	81
Sri Lanka	6	73	330	80	49
Tanzania	5	76	240	86	100
Benin	5	76	290	83	49
Malawi	5	76	210	88	144

(Continued)

TABLE III (Continued)

Haiti	5	76	320	81	25
Lesotho	4	80	410	76	16
Pakistan	4	80	390	77	9
India	4	80	260	85	25
Cameroon	4	80	800	65	225
Uganda	4	80	220	87	49
Indonesia	3	85	560	73	144
Sierra Leone	3	85	380	78	49
Ethiopia	3	85	140	92	49
Nigeria	3	85	760	66	361
Mali	2	89	150	91	4
Chad	1	90	90	94	16
Bangladesh	1	90	130	93	9
Burma	1	90	180	89	1
Rwanda	1	90	270	84	36
Zaire	1	90	160	90	0

SOURCES: Data on Telephones from: Economist **World in Figures**, 1984  
 Data on Population from: Pop. Reference Bureau **World Population Data Sheet**  
 All calculations by the author.

list telephone density in descending order for ninety-four (94) countries and then set out the matching per capita incomes, ranking same. To find the scientific relationship, again we use the Spearman Rank Correlation method of analysis. Having once in this paper set out the formula and the details of the working we need here only that the correlation index this time within the 0.1% confidence level. Such a high correlation speaks for itself. Communications promote development and development in turn promotes more communications:

COMMUNICATIONS → DEVELOPMENT  
 COMMUNICATIONS ← DEVELOPMENT

### CONCLUSION

There is little need for an extended statement. Historical and present-day evidence clearly and unequivocally indicate that there can be no development without the setting down of a modern, efficient well-managed complexity of transport and communications — minimally, the ways the means of movement — the paths on the surface, in the air and on wires. We cannot wait for the repercussional chain. That, will come. We need to build up the infrastructure and all things will then fall in place.

This paper is only in a sense partial. We have not dealt with air travel nor information, nor news papers, nor satellites or television and radio as these can be subjects of separate papers.

## REFERENCES

- BOULDING, K. (1975) "On Economics," *New York Times*, March 2, pp. 25-32
- CAMERON, J. et al (1980) "Teaching economics principles as part of development studies," *IDS Bulletin*, 11, 3
- CASTLE, E. (1980) "Information: the human resource," *Res. for the Future*, April
- CROOKS, R.J. (1971) "Planning for developing countries," *Jour. Roy. Town Plann. Inst.*, 67, pp 251-256
- FRIEDMANN, J. & ALONSO, W. (1964) *Regional Development and Planning*, MIT Press, Cambridge, Mass.
- FRIEDMANN, J. (1966) *Regional Development Policy: Case Study of Venezuela*, MIT Press, Camb., Mass.
- FRIEDMANN, J. & WEAVER (1979) *Territory and Function*, Edward Arnold, London,
- GINSBURG, N. (1961) *Atlas of Economic Development*, U. Chicago, Dept. of Geog. Res. Papers, 68
- HILLING, D. (1973) "Open roads for exports and imports", *Geog. Mag.* XLV
- LEYS, C. (1980) "Changing development concepts," *Bulletin, Ins. Devel. Stud.*, 11, 3, pp 4-12
- MABOGUNJE, A. L. (1981) *The Development Process — A Spatial Perspective*, Hutchinson, London
- MORRIS, M. D. (1979) *Measuring the World's Poor*, Pergamon, Oxford
- MOUNTJOY, A. B. (1966) *Industrialisation and Underdeveloped Countries*, Hutchinson, Oxford
- MYRDAL, G. (1976) Taken from an interview, *New York Times*, Sept., 26
- SEERS, D. (1969) "The meaning of development," *Internat. Devel. Review*, Vol. 11, 4, pp 2-6
- LOGAN, M. I. (1972) "The spatial system and planning strategies in developing countries," *Geog. Rev.* 62, 4
- SMITH, D. M. (1979) *Human Geography — A Welfare Approach*, Edward Arnold, London
- SMITH, D. M. (1979) *Where the Grass is Greener*, Pergamon, Middlesex, England
- TAAFE, et al (1962) "Transport expansion in underdeveloped countries." *Geog. Rev.* 53, 4, pp 303-529
- TOFFLER, Al in (1980) *The Third Wave*, Bantam, New York