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Abstract	Focuses on the initial period of Malayan development which reflected an effort to exert administrative control and extract tin ore through a complementary rail and road system. Provision of a base for the development of rubber estates in the period when the road network became recognized as the most flexible form of transportation; Association of the road network growth with social and economic objectives at the rural level.

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TRANSPORTATION AND THE DEVELOPMENT OF MALAYA*

THOMAS R. LEINBACH

ABSTRACT. The initial period of Malayan development reflected an effort to exert administrative control and extract tin ore through a complementary rail and road system. The network system provided a base for the development of rubber estates in the subsequent period when the road network became recognized as the most flexible form of transportation. After the formation of a basic grid, road network growth was associated with social and economic objectives at the rural level. The network expansion generally follows the "ideal-typical sequential" model and may be viewed as a process rather than discrete historical stages. The primary transportation corridor was reinforced through interaction with the evolving larger cities in the rubber and tin zones. The self-reinforcement of the network, along with the urban concentration process, and feedback expressed through recurrent or abandoned demand, provide support for a more general model of transportation and city-system development. **KEY WORDS:** *Administrative control, Mining, Road network, Road-rail competition, Rubber, Rural development, Tin, Urban growth.*

A concern has emerged in recent years for the spatial organization of development.¹ One of the most critical problems is the tendency for extreme economic polarity as investments flow toward well established core region centers. The imbalance may be improved or prevented by creating new investment opportunities in peripheral areas or by altering the configuration of channels through which information, people, and commodities are propelled. Such strategies of regional development must utilize the transportation system as a mechanism for reorganization. Before we can hope to use the transpor-

tation network as an efficient development tool, however, we must understand more completely the nature of its growth and impact. This paper is concerned with the role of transportation in the development and modernization of Malaya.² The objectives are to examine the impact, influences, and growth of the road and rail systems. A cartographic analysis of the road network density and change along with administrative annual reports and published materials were used. The maps also allow insight into the process of transportation and urban development.

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¹ For example E. A. J. Johnson, *The Organization of Space in Developing Countries* (Cambridge: Harvard University Press, 1970); John Friedmann, *Regional Development Policy: A Case Study of Venezuela* (Cambridge: The M.I.T. Press, 1966); and Tormod Hermansen, *Spatial Organization and Economic Development: The Scope and Task of Spatial Planning* (Mysore: Institute of Development Studies, 1971).

DEVELOPMENT BEFORE 1874

Although the Portuguese and the Dutch occupied the Straits of Malacca earlier, Britain was the sole European power in the Malay Peninsula at the end of the eighteenth century. By 1825, British control had spread from Penang through the other Straits Settlements (Fig. 1). Perhaps as early as the eighteenth century Chinese mined tin for export in the Peninsula.³ The European, Chinese, and In-

² The use of the term Malaya was correct for the major portion of the period under study and is retained here. The current official name of the area is Peninsular Malaysia.

³ P. P. Courtenay, *A Geography of Trade and Development in Malaya* (London: G. Bell and Sons, Ltd, 1972), pp. 78-82.



FIG. 1. States of Malaya and Singapore. In the current political structure, the Dindings is a district in Perak, and Penang Island and Province Wellesley form the state of Penang. The date associated with each area refers to the official commencement of British administration.

dian mercantile communities in the Straits Settlements grew and expanded as a result of mining. Chinese merchants in Malacca and Penang advanced capital to Malay chiefs, who in turn organized the mining activity in their districts. Between 1815 and 1850 mining was well underway in the states of Selangor, Negri Sembilan, Malacca, and Perak (Fig. 1). The tin lodes closest to the sea were mined first, but extraction gradually diffused inland as the early mines were depleted. Rivers such as the Linggi in Negri Sembilan, the Klang in Selangor, and the Larut in Perak were the major lines of communication and trade.

Gradually a group of native political units evolved on the Peninsula.⁴ Each sultanate was generally defined as the watershed of a river or group of rivers. Mobility within such a basin unit or "negri" relied heavily upon river trans-

port, and travel by sea was the major means of communication among the states. A loosely joined system of footpaths and tracks evolved over time, but rivers served as the most reliable and efficient mode of transportation. The control point for each state was an administrative center located on the river estuary. Here the ruler could extract a tax on imports and exports. The districts within the state were also bound together by the riverine networks, and a similar control point existed at the downstream boundary of the district.⁵ There was no centralized political control. This dispersed local control and limited mobility in the Malay states set the stage for British expansion from the Straits Settlements.

Although there were virtually no roads in the Native States in 1870, settlement and transport had expanded in Penang, Province Wellesley, and Malacca. The daily administrative functions of the Resident Councillors, such as revenue collection and peace maintenance operations, required a means of communication. The first "roads" in these settlements were constructed to insure political control and to provide access to the main towns.

Tin was mined in Malacca during the early 1800's, but the meager return forced miners to turn elsewhere. A part of the Chinese population migrated to richer mining regions, and others turned to commercial agriculture. Tapioca initially attracted attention, and the period

useful accounts (upon which the following sketch relies) are in J. M. Gullick, *Indigenous Political Systems of Western Malaya*, London School of Economics Monographs on Social Anthropology, No. 17 (London: Athlone Press, 1958); James C. Jackson, *Planters and Speculators: Chinese and European Agricultural Enterprise in Malaya, 1786-1921* (Kuala Lumpur: University of Malaya Press, 1968); and Emily Sadka, *The Protected Malay States, 1874-1895* (Kuala Lumpur: University of Malaya Press, 1968).

⁵ For interior and east coast states river transport was integral to administration and development well into the twentieth century. "In the absence of roads the Pahang River is still a very important artery of communication for Malays and the transport of timber and produce in the districts of Lipis and Temerloh. Apart from the road between Kuantan and Pekan communication on the east coast is mainly by sea in the form of steamers, launches, and native craft." Federated Malay States, *Pahang Annual Report, 1932* (Kuala Lumpur: G.P.O., 1933), p. 38. See also a note on early river communications in Pahang in R. G. Cant, *An Historical Geography of Pahang*, Monograph No. 4 (Singapore: Malaysian Branch Royal Asiatic Society, 1972), pp. 29-31.

⁴ There is no single authority on the political organization and economy of early Malaya, but extremely

from 1850 to 1870 was one of rapid expansion.⁶ The government improved accessibility to planting and mining land and established overland communication with the adjacent native states. By 1867 Malacca had a good system of cart roads. A number of tapioca "factories" and plantations and a dozen police outposts had been built along the roads which stretched as far as the frontiers of the Negri Sembilan.⁷

In Penang too the residents opened up land for agriculture and mining and encouraged trade with towns. The planting of pepper began quite early with the hope of attracting trade and contributing toward the cost of administration. Small scale agricultural schemes which provided local food supplies were developed around the perimeter of the towns along crude bridle paths. Chinese enterprise also gained a firm foothold in Province Wellesley where sugar estates had been cultivated as early as 1820. Later European planters entered the sugar industry and prompted the British administration to develop a network of cart roads throughout the settlement.⁸

MINING AND ADMINISTRATION: 1874-1911

The shift of tin mining to locations farther inland and the arrival of British Residents in the states of Perak, Selangor, and Negri Sembilan provided a new dimension for development (Fig. 1). Administrative centers established in the more prosperous mining villages, such as Kuala Lumpur, Seremban, Ipoh, and Taiping, were to dominate the pattern of urban growth for a century.

The rivers continued to serve as natural highways upon which tin ore could be transported from major fields in the Larut, Kinta, and Klang valleys to the coast. As the mining activity moved farther from the waterways, river transport was supplemented by bridle paths which joined the mines to riverine kampongs. The administrators quickly realized that a more effective communications system was imperative to insure continuing prosperity. The road network had developed mainly from the major coastal towns in Province Wellesley, Penang, and Malacca. It expanded from these areas as set-

tlement, agriculture, and mining developed. In other states roads were pushed out from coastal and inland tin centers to tap the surrounding regions. Eventually the rivers were supplanted by cart tracks which permitted land communication between coastal and inland points.

The addition of the railway to this simple transport system provided a more reliable form of haulage. Although his immediate goal was the establishment of connections between mining centers and ports, the Governor General of the Straits Settlements envisioned the railway as the means by which agricultural and mining districts could be developed up and down the peninsula.⁹ The growth of the road network from railway terminals complemented railway construction.

Two major themes are applicable to the growth of a road network. First, the road network provides an "openness" or "flexibility" which is critical to development. New opportunities may be created and advertised, particularly in remote rural areas, through transport development. Other forms of transportation are less flexible for the development of local economic and social potential. Second, the theme of prior dynamism is illustrated well in Malaya.¹⁰ A region which is growing rapidly has a high demand for transport infrastructure. Such growth areas can become constraints in the regional system if transport facilities are not expanded. Thus the probability of success of transportation investment is highly dependent upon the growth capacity of a region. The discovery of such dynamism, for example in the form of mineral or agricultural resources, suggests where additional roads should be located. Continued demand for transport services provides a measure of the degree of utilization and forms the basis for upgrading and maintaining the network capacity.

The most conspicuous feature of the road network in 1887 was the concentration in the Straits Settlements of Province Wellesley and Malacca where the British first took hold (Fig. 2). Small density domes around Taiping and

⁹ Colonial Office 273/120, No. 209, Memorandum from F. Weld, Governor, Straits Settlements to Earl of Derby, Colonial Office, 28 May 1883.

¹⁰ George W. Wilson, "Toward A Theory of Transport and Development," in G. W. Wilson, et al., *The Impact of Highway Investment on Development* (Washington, D.C.: The Brookings Institution, 1966), pp. 211-12.

⁶ Jackson, op. cit., footnote 4, pp. 52-56.

⁷ *Map of Malacca Territory* (Singapore: Surveyor General, 1867).

⁸ Jackson, op. cit., footnote 4, pp. 128-40.

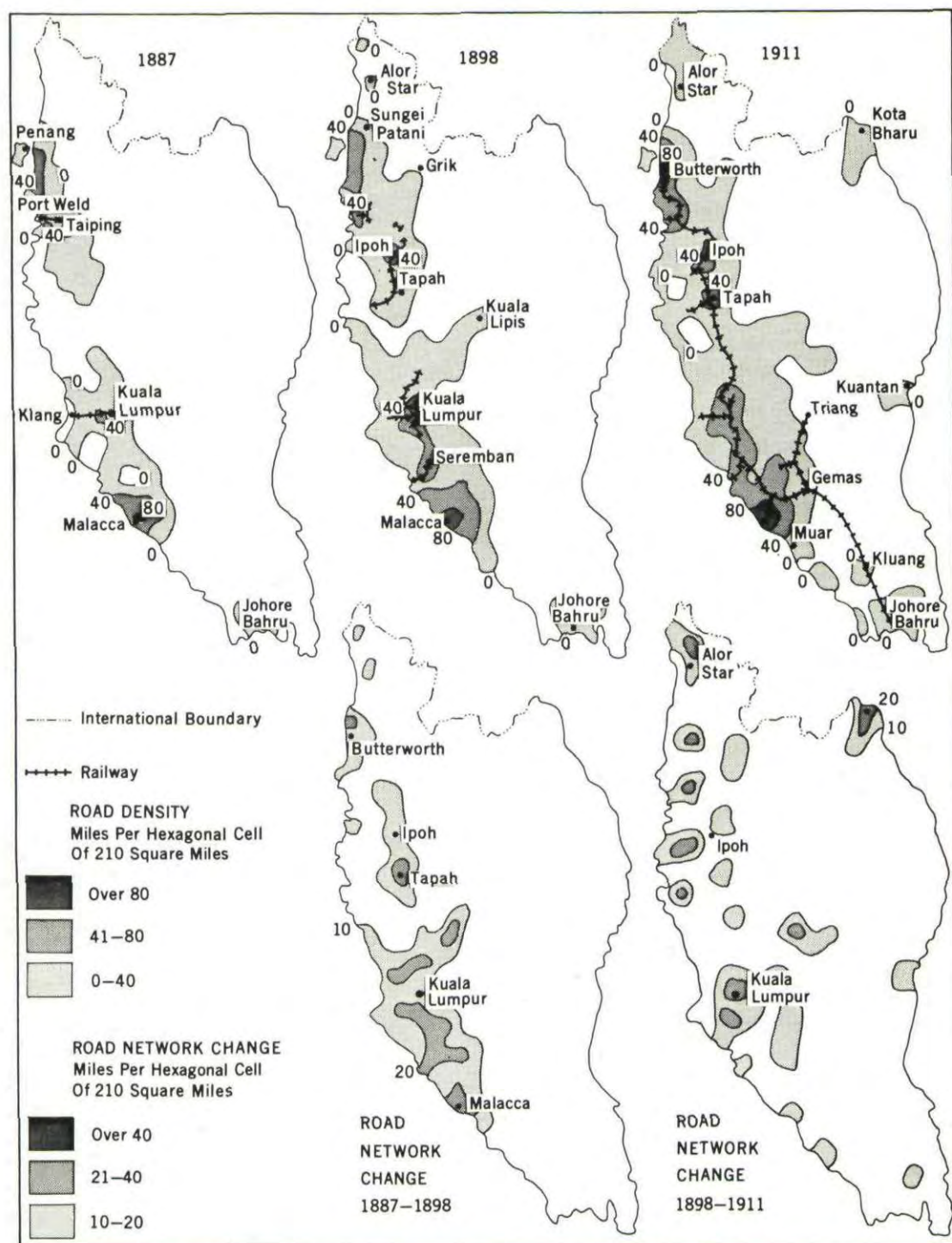


FIG. 2. Road network density and change in Malaya: 1887-1911. The existing railway at each date is superimposed upon the road density maps.

Kuala Lumpur, for example, reveal the complementary influences of the administrative centers, mining activity, and the growth of the network. The theme of modal complementarity is brought out by two rail segments which connected the mining centers of Taiping and Kuala Lumpur with Port Weld and Klang.

After 1897 the road network spread out to connect frontier economic potential with settled areas, and network densities increased inside settled areas. New urban centers, such as in Alor Star and Tapah, which were merely collections of homesteads a decade earlier, had emerged as evidence of the impact of transport lines. The completion of a cart road from Kuala Lumpur to Kuala Lipis established communication to the interior of Pahang for the first time. The road encouraged Chinese immigration from the western states and provided a psychological lift as economic change was observable and the feeling of remoteness was lifted.¹¹ Although road development acts as a catalyst when added to other preconditions for growth, the early annual reports hint that a creative capacity in some situations, such as the Lipis road, was also important.

There was concern for physical integration at the state and district level. Nodal interconnection was vital for economic purposes, but it was the political function associated with the British administrative concept of the Federated Malay States that prompted quick network development. The progress in the construction of the rail line by 1898 revealed concern over interstate administrative unity as well as an attempt to maximize the efficiency of commercial flows. The efforts toward efficient administration are reflected in the increase of road densities by 1898 as remote districts were linked with state administrative centers. Frontier roads to Grik and Kuala Selangor were of this nature. Similarly, the integration of several settlements by a trunk road is clearly depicted by the closing density gap between north and south from 1887 to 1911.

By 1911 the transportation network had expanded considerably, for the trunk road had established through connection between Penang

and Malacca. The largest undertaking was the Kuantan road which would ultimately link the east coast with the development corridor of the west. The cross peninsular link was undertaken mainly for political purposes. An administrative outpost had been developed at Kuantan to organize a revenue collection system and law enforcement agency. Previously the settlement was in touch with the west coast only by a long journey via Singapore by coastal steamer.

The northern states of Kedah, Kelantan, Perlis, and Trengganu (Unfederated Malay States) had been transferred from Siamese to British hands in 1909. The road construction around Alor Star and Kota Bharu reflected administrative efforts in those regions. Penetration roads were also pushed out of coastal and inland nodes in Johore, although there was no connection between Batu Pahat, Muar, and Johore Bahru other than sea communication. Muar and Batu Pahat were administered for many years as separate states with independent policies.¹²

The completed rail line from Butterworth to Johore Bahru spurred the growth of additional towns, such as Kluang in Johore. The growth of the east coast rail line to Triang and the construction of the Johore line emphasized the need for new agricultural lands and for accessibility for the interior of the peninsula. The political influence in the effort to reach Kelantan was also apparent. It was no coincidence that the completion of the Johore line also marked the extension of British influence into that sultanate.

The additions to the road network between 1887 and 1911 were mainly in the western development zone, but the greatest change between 1887 and 1898 was in a pocket along the Kuala Lumpur-Malacca axis and in its coastal outlets (Fig. 2). The mining activity of Perak, the north-south trunk road, and the link to Pahang show clearly. Network change between 1898 and 1911 was quite fragmented, and reveals the outward movement of settlement and administration from the initial foci. Although some network addition was associated with the main trunk line and the forward movement of road penetration, there is also evidence of interstitial filling between the coast and the main

¹¹ Federated Malay States, *Annual Report of the Resident General, 1898* (Kuala Lumpur: G.P.O., 1899), p. 17; and Thomas R. Leinbach, "The Spread of Transportation and Its Impact upon the Modernization of Malaya, 1887-1911," *Journal of Tropical Geography*, Vol. 39 (1974), pp. 54-58.

¹² *Johore Annual Report, 1911* (Singapore: G.P.O., 1912), pp. 12-13; and Leinbach, op. cit., footnote 11, p. 60.

development axis. Other pockets of change reflect new mining and agricultural schemes.

The initial phase of transport expansion was related to regional economic exploration. Feedback from the trial period in the form of tin revenues either produced a recurrent demand for upgrading and expansion of the network or the onset of regional decay. Major roads linking states or districts were capable of survival, but often simpler roads (costing as little as three hundred dollars per mile) which linked mines to district centers and main villages could not survive. The depletion of mineral resources and the high cost of transporting goods caused their failure. At the same time, other local roads which provided access to police stations and markets were fundamental to the emerging economic and urban development.

ROAD-RAIL COMPETITION AND RUBBER: 1911-1939

Commercial agriculture originated in Malaya in the early nineteenth century, but the development of gambier, sugar, pepper and tapioca "estates" by the Chinese immigrants was often extensive rather than intensive. Tapioca, for example, was planted on newly cleared land for several years and then abandoned once the soil was drained of its fertility. Planting spread concurrently with the road system in the Straits Settlements but cultivation often decayed when the distance from the market proved limiting.¹³

Coffee cultivation was successful at the end of the nineteenth century, but rubber soon became the major cash crop. A boom was well underway by the first decade of the twentieth century. Accessibility was as critical for rubber as it had been for tin, and planting was concentrated along the major transportation lines. The expansion of tin mining had assisted the growth of the rail and road systems and much of the additional infrastructure in the west coast states. The rubber industry settled into areas already served with a transport system, and in particular near areas leading to a major port where the rubber could be exported and capital, consumer goods, and labor could be easily imported to the estates. During the first decade of growth, eighty percent of the rubber planted was in the states of Perak, Selangor, and Negri Sembilan. The spread of the crop

into other states was closely associated with road and rail accessibility.¹⁴

The major changes in the accessibility pattern between 1911 and 1920 were in the states of Kedah, Johore, Selangor, and Pahang (Fig. 3). The completion of the trunk road between Alor Star and Sungei Patani and the Sungei Patani-Baling road accounted in part for the expansion of the road density in Kedah. There were also significant road extensions in Johore as administrative control spread into that state, and coast roads were pushed through to connect the formerly separate and isolated district headquarters. Batu Pahat was linked with Kluang, and a road from Kluang was begun to meet the link from Mersing. Road density also expanded around Muar and Segamat, where additional land was opened for rubber cultivation. Outlying areas were connected to the main growth poles at Penang, Ipoh, and Kuala Lumpur. In central Pahang the Kuantan road linked east with west.

By 1920 rail construction had commenced in Kelantan and the railway had been extended to Kuala Lipis. The interior mines and administration of Pahang had reliable accessibility for the first time. The rail line, which linked the Thailand border with Penang, was completed on the west coast. Along with the trunk road put through earlier, it secured British influence in the former Siamese states of Perlis and Kedah.¹⁵ The growth of the railway line generated considerable debate over the role of railways and roads in the stimulation of new development. The consensus was that the rail line would be effective in opening new land only if supported by an extensive network of feeder roads.¹⁶

In September, I urged that the government spend a large sum of money on road construction in the immediate future for the opening up of suitable planting country. We already have a railway in Pahang and what we want now is not further railway construction but the provision of feeder roads. Particularly Pahang and northern Perak are in need of roads and it will be money well invested. The great difficulty of anybody coming here is that they can't get about the country. If they can see the land, they will make application.

¹⁴ Courtney, op. cit., footnote 3, pp. 98-103.

¹⁵ Chai Hon-Chan, *The Development of British Malaya, 1896-1909* (Kuala Lumpur: Oxford University Press, 1967), Chapter 5.

¹⁶ Federated Malay States, *Proceedings of the Federal Council, 1925* (Kuala Lumpur: G.P.O., 1926), p. 17.

¹³ Jackson, op. cit., footnote 4, Chapters 3 and 4.

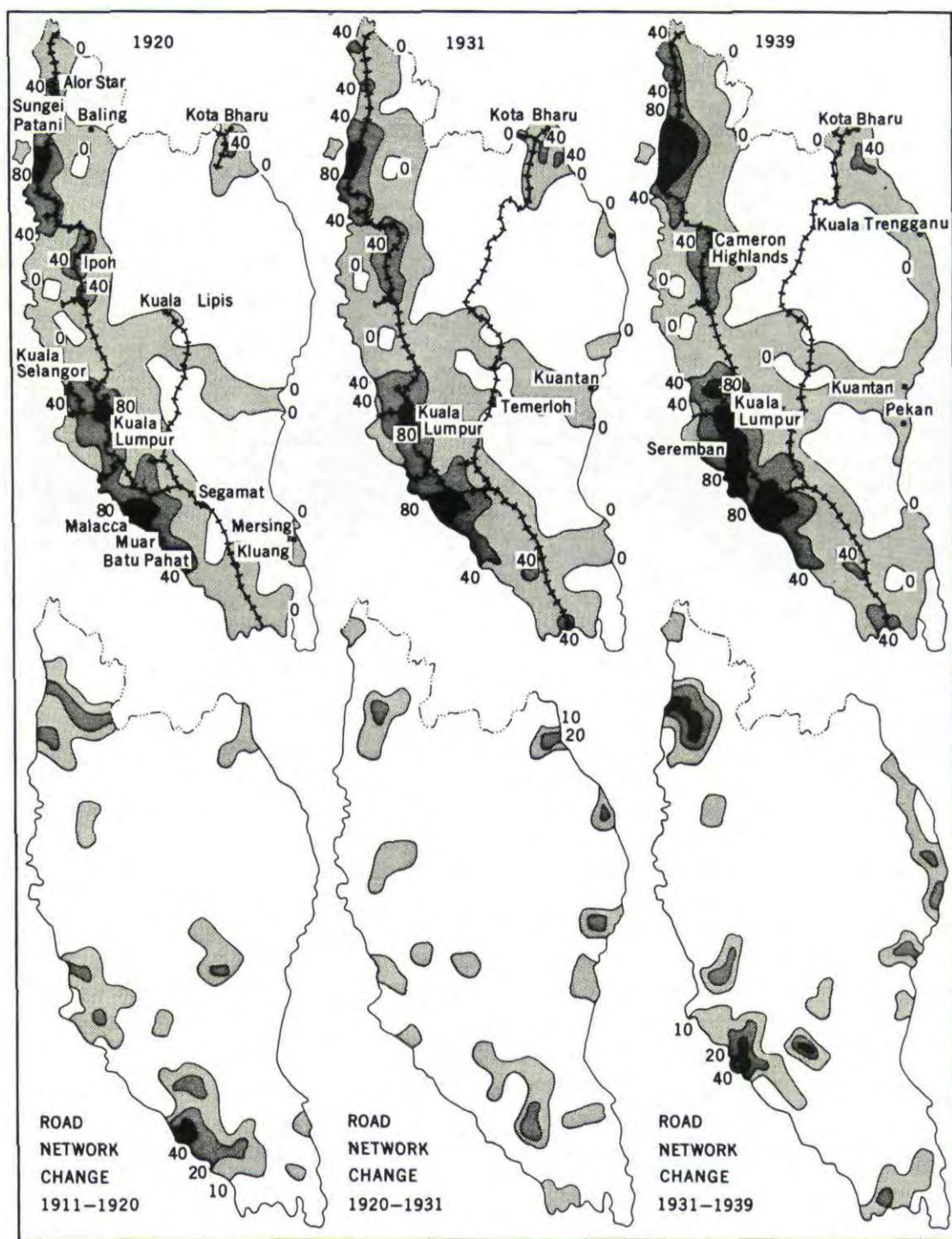


FIG. 3. Road network density and change: 1911-1939.

Rubber prices fell in the early 1920s. The increased acreage of rubber produced an oversupply, and a sharp drop in American demand triggered the fall in price.

Between 1920 and 1931 the network changed only slightly in the well developed core areas (Fig. 3). The greatest change was on the frontier as emerging growth poles, particularly on the east coast, enlarged their hinterlands. The expansion of the road network in southern Kedah and central Johore along the rail line emphasized, however, the continuing influence of rubber in shaping the development pattern of Malaya despite the earlier threat of estate bankruptcy.

In the 1920s the rail network reached its greatest length with the completion of the east coast line from Gemas to Tumpat in Kelantan. Simultaneous expansion of both rail and road, however, had serious consequences.¹⁷

The Federated Malay States Railways in common with other Railways which have had to compete with an extensive system of roads, have suffered severely during the year from a rapidly developing road competition as well as sustaining serious losses due to the world wide acute depression in general trade. The opening of the Rengam-Kluang and Kampar-Telok Anson roads during the past year has adversely affected railway revenue.

The Kuala Selangor and the Kuala Pilah railway branch lines were closed because of road competition. Rate cutting on the railway resulted in a very low return per ton mile. Many railways lost short haul traffic to the roads, but the loss of long haul traffic in Malaya was disastrous. Much of that traffic went to coastal shipping, since vessels could call at numerous ports without paying a harbor fee.¹⁸

The Depression caused a decline in American automobile production and forced large scale unemployment in Malayan mines and estates. The drop in government export tax revenue on rubber and tin, along with the severe impact upon service industries, forced a policy of retrenchment in which many capital expenditures were cut off. Despite the economic crisis, the network did grow in the late 1930s. The expansion of rubber acreage, both on estates and on smallholdings, accounted for much

of the change in Selangor, Negri Sembilan, Johore, and Kedah.¹⁹ Administrative outposts on the east coast were connected when the trunk road linked Kota Bharu and intervening settlements with Kuala Trengganu. In 1939, however, Kuantan still had no through connection.

The growth of the road network between 1911 and 1939 emphasizes two critical goals of the development process. Major new routes welded frontier administrative outposts to the main development cores. The Kedah trunk road, the Kuantan crosspeninsular link, and the east coast road are examples. Lateral roads branched off the main corridor across the north-south mountains and hills to produce physical political integration within states and districts. Administrative control to provide stability was an important theme from 1911 to 1939, as it had been earlier. Several main frontier roads were pushed to the east before 1911, but most lateral extensions were coastal lines. Between 1911 and 1939 there was more concern with cross grain linkages to connect the expanding settlement on the enlarged frontier to the east.

The political theme was important, but it was primarily the economic potential of rubber cultivation which encouraged the growth of the road system. Despite the earlier utility of the railway as a development tool, the strong road-rail competition which developed after 1911 forced major decisions on transportation policy. The administrators, hoping to maximize income, recognized the road as the most flexible means of developing that potential.

Some roads failed to generate the anticipated development. High costs of transport, the depletion or weak reserves of mineral resources, and even competition from other roads placed alternative markets within closer reach. It is quite appropriate, therefore, to view the development of the transportation system as a self-perpetuating feedback process. Revenues and traffic generated from the road would lead to further extension and upgrading or abandonment. Recurrent demand and new activity flows would revitalize the cycle. Investment decisions

¹⁷ Federated Malay States, *Railways Annual Report, 1930* (Kuala Lumpur: G.P.O., 1931), p. 11.

¹⁸ Federated Malay States, op. cit., footnote 17, p. 12.

¹⁹ Lim Chong-Yah, *Economic Development of Modern Malaya* (Kuala Lumpur: Oxford University Press, 1967), pp. 107-11 and Appendix 4.4, p. 330.

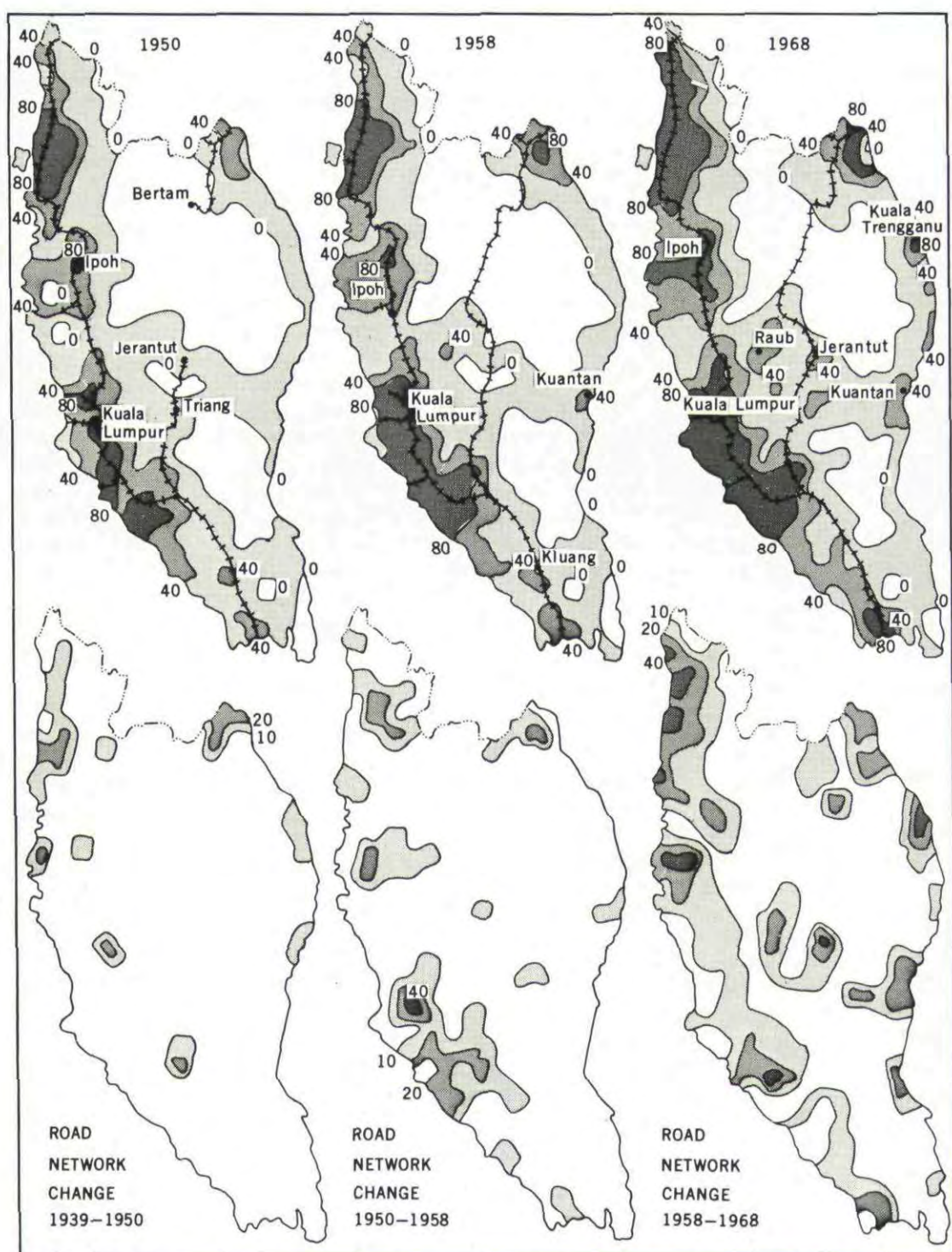


FIG. 4. Road network density and change: 1939-1968. The Japanese removed 200 miles of railway between Mentakab and Kuala Krai during the war. Reconstruction was interrupted by guerilla activity during the Emergency and in 1950 a gap of 114 miles between Bertam and Jerantut remained to be completed. The Tronoh and Malacca branch lines, also removed during the Occupation, were not replaced.

based upon poor information, or more often upon too little information, retarded development.²⁰

RURAL MODERNIZATION: 1939–1968

Few roads were constructed on the peninsula during the Japanese occupation, but the road network expanded after World War II (Fig. 4). The largest amounts of road construction were in Province Wellesley, Kedah, and Kelantan. By 1958 postwar recovery was in progress, and many areas had new roads. The most dramatic change was in Selangor, Negri Sembilan, and Kedah. In central Kedah, a detailed web of secondary roads had been developed. Many of these roads had been constructed to combat the communist insurgency and to provide access to new rubber areas and irrigated padi land. The growth also reflected the rapid development of road transport. Agriculturalists and manufacturers recognized the advantages of road transport over rail. Continued growth in urbanization, population, and per capita income triggered phenomenal growth in road services and the construction of new roads. Since a trunk road system had been established by 1950, much of the new growth consisted of rural secondary roads.

By 1968 road density had increased nearly everywhere on the peninsula (Fig. 4). There were few interior areas where no roads had penetrated. For example, in southern Kelantan the east coast railway line served small and otherwise inaccessible villages. After its completion many villages along the railway grew to become viable central places, and roads were extended laterally to encourage trade. The earliest roads were built from small centers such as these, but road expansion gradually declined as rail traffic became a minor source of support. Feeder roads were forged from frontier settlements near the edge of the jungle into inaccessible land. The expansion and upgrading of the network around major urban places went hand in hand with the development of commerce as connections to the outlying trade areas

were improved. Many villages were connected to a central place.

Much of the development between 1950 and 1968 came about through a national development strategy aimed at rural modernization. New feeder roads were constructed to provide access to new agricultural land, medical clinics, schools, and markets. Planned settlement schemes were an important part of the development strategy. Projects initiated by the Federal Land Development Authority provided rubber and oil palm smallholdings to landless people in frontier areas.²¹ The aim was to bring additional land into productivity and to reduce underemployment and unemployment in rural areas. From 1958 to 1968, 520 miles of internal village roads and feeder roads were built to link the settlements to the main road network. Schemes in Johore, Pahang, and Negri Sembilan accounted for approximately sixty percent of the total mileage (Fig. 4), but major additions were also made in Kedah, Perak, and Trengganu.²² Rural development road construction also took place in anticipation of and response to agricultural development within the Muda and Kemubu irrigation schemes of Kedah and Kelantan.

Interstitial filling continued. Network redundancy took place in Kedah between the trunk road and coastal routes and in central Johore between the trunk road and the railway (Fig. 4). Major trunk road additions were not important, since the basic framework had been laid, but several important linkages were constructed, such as the Bahau-Jerantut road parallel to the railway in central Pahang and the upgrading of the Kuantan-Mersing-Singapore link on the east coast. These were intended to improve accessibility to areas which had economic potential but poor connections to ports or other trading centers.

TRANSPORTATION AND SOCIAL SERVICES

The transportation pattern evolved to permit effective administrative control and economic development, but it also facilitated the spread

²⁰ Allan R. Pred and Gunnar E. Törnqvist, *Systems of Cities and Information Flows: Two Essays*, Lund Studies in Geography, Series B, Human Geography, No. 38 (Lund: Royal University of Lund, Department of Geography, 1973), pp. 55–58.

²¹ Johnson, op. cit., footnote 1, pp. 393–99; and R. Wikkramatileke, "State Aided Rural Land Colonization in Malaya: An Appraisal of the F.L.D.A. Program," *Annals*, Association of American Geographers, Vol. 55 (1965), pp. 377–403.

²² Jabatan Kerja Raya, *Panjang Jalan-Jalan Felda Rangkaian* (Kuala Lumpur: JKR, 1973).

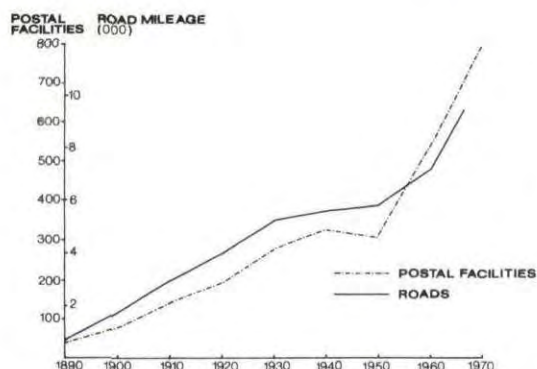


FIG. 5. The growth of postal facilities and road mileage: 1890–1970. Source: Public Works and Postal Department Annual Reports.

of social services. In the Straits Settlements and elsewhere, the spread of police outposts was an important corollary of network expansion. Travelling dispensaries which provided drugs and vaccinations were able to visit the rural people. Roads had to provide regular physical communication before postal and telegraph agencies could be established (Fig. 5). By 1900, small rural postal agencies had begun to appear along the road and rail networks in settlements where the flow of mail and other needs did not warrant the investment of a building and full-time postmaster. In many cases, arrangements were made for a clerk or railway station master to keep a supply of postage stamps and to accept letters and parcels for dispatch and delivery. The postal agency often had a short existence where mining fields were depleted or tin ore was not uncovered. In other cases, the rural agency was upgraded to a post office with a savings bank, money order facilities, and a full range of postal services. Postal services and later commercial banks, health centers, schools, and telephone exchanges were able to penetrate the rural areas as a result of the spread of the road network.

The growth of information disseminating institutions, such as health centers, post offices, and particularly schools, in rural areas had important implications for the spread of family planning, agricultural technology, and other innovations. It is more difficult to marshal firm evidence which links the growth of roads to attitude change, yet occasional reports in annual state records suggest that roads encouraged

a positive outlook and initiated a demand for education and change.²³

SUMMARY AND CONCLUSIONS

The initial period of transportation development reflected an effort to bind the several states under British administration into a well knit political unit. Trunk linkages were forged to connect state capitals and second order roads were built to allow communications among districts within states. The road and rail networks also served to extract tin ore along the west coast and provided a more reliable form of haulage than the rivers. Tin revenues were invested in additional and upgraded transportation linkages. Roads had a dual function; they served and created development in areas remote from the railway, and they channelled trade to the railway. The railway provided support and thus was an impetus to road growth in many areas.

The network that was established during the formative period provided a base for the development of agriculture. Estates first spread to accessible areas in mining districts, initially as ribbon developments along the railway, but gradually spreading axially. The flexibility of the road was recognized as a tool in economic development when rubber smallholdings became successful. Road and rail were largely complementary up to 1930, but thereafter the pervasive feeling was that roads could open up new country more efficiently. Between 1911 and 1939 secondary roads were used to open new land and fill the interstices in the main road system in the west coast zone of development, and major and secondary linkages were built to extend administrative control to the expanding eastern frontier.

Since World War II feeder and secondary roads have been extended as part of a massive rural development effort to increase accessibility to markets, schools, medical clinics, new agricultural land, and urban places. The growth of accessibility has had a significant impact upon the spread of communication and health services, such as mobile postal units and rural medical clinics. The more efficient diffusion of

²³ Unfederated Malay States, *Trengganu Annual Report, 1920* (Kuala Lumpur: G.P.O., 1921), p. 8; and Federated Malay States, *Selangor Annual Report, 1933* (Kuala Lumpur: G.P.O., 1934), p. 80.

information must effect the modernization process.

The emphasis in the development objectives of the road system in the late nineteenth century was economic and administrative. The economic objective has remained, but with the completion of a basic road grid by 1950, the emphasis in road construction has been upon social rather than political objectives.

Transportation development followed a general model of scattered ports, penetration lines, lateral interconnections, and feeder growth.²⁴ There were no discrete historical stages in network expansion. Trunk construction joined separate parts of a political unit while secondary development roads penetrated the frontier. Newly settled east coast areas were connected while the construction of secondary and feeder roads produced interstitial filling on the west coast. The early establishment of administrative-commercial centers along the western foothills with outlet channels to the coast set a rigid pattern for development. With the interconnection of the centers, a development axis and a set of core regions with coastal offshoots emerged and crystallized. The growth of the urban places along the main transportation path may be likened to the process of port concentration.²⁵ Select centers emerged to dominate the urban hierarchy as comparative locational advantages shifted. Kuala Lumpur, with a major port outlet, centrality, and political advantages, emerged as the dominant center on the peninsula over Penang, Taiping, Ipoh, and Malacca (Fig. 6).

Several ideas in the network growth process in Malaya provide support for a more general model of transportation and city-system development.²⁶ The trunk road which connected the initial major nodes was self-reinforcing. Initially the concern for administrative unity demanded interaction but later the concentration of specialized economic activities also provided

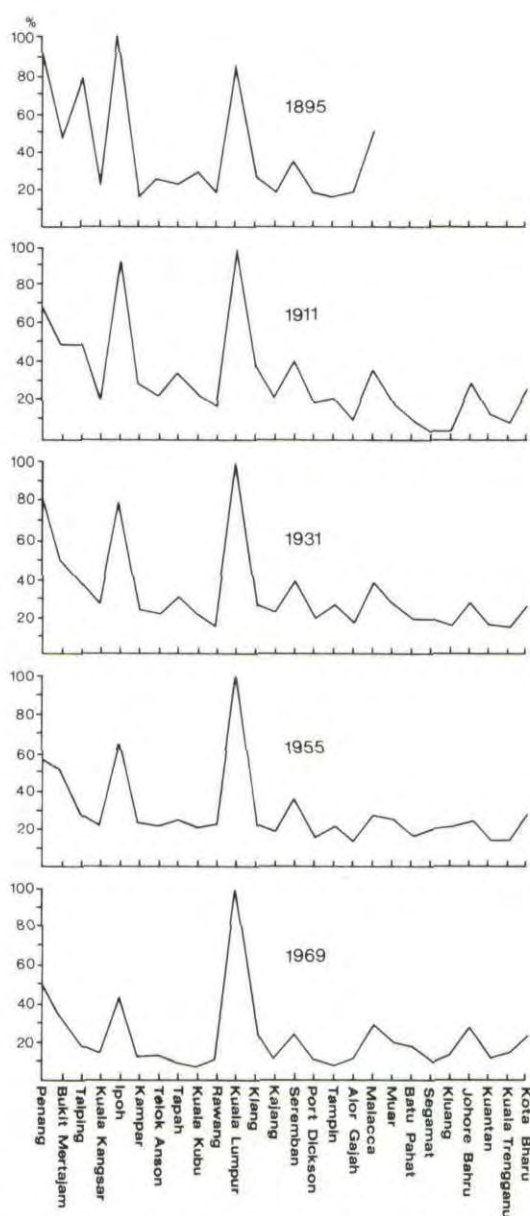


FIG. 6. Modernization profiles: 1895-1969. The profiles were constructed from "scores" which were derived from a principal component analysis of socioeconomic variables for the major urban areas. The "score" for each urban cell was expressed as a percentage of the highest value in each time period; Thomas R. Leinbach, "The Spread of Modernization in Malaya, 1895-1969," *Tijdschrift voor Economische en Sociale Geografie*, Vol. 63 (1972), pp. 262-77.

²⁴ Edward J. Taaffe, Richard L. Morrill, and Peter R. Gould, "Transport Expansion in Underdeveloped Countries: A Comparative Analysis," *Geographical Review*, Vol. 53 (1963), pp. 503-29.

²⁵ Taaffe, Morrill, and Gould, op. cit., footnote 24, pp. 506-11; and Peter J. Rimmer, "The Changing Status of New Zealand Seaports, 1853-1960," *Annals, Association of American Geographers*, Vol. 57 (1967), pp. 88-100.

²⁶ Pred and Törnqvist, op. cit., footnote 20, pp. 55-58; and Donald G. Janelle, "Spatial Reorganization: A Model and Concept," *Annals, Association of American Geographers*, Vol. 59 (1969), pp. 348-64.

a strong base for complementarity. The interaction which took place generated further economic growth and further response in flows. Transportation improvements took place among

the larger towns such as Penang, Ipoh, and Kuala Lumpur, and also between the cities and their tributary areas. The result was a decline in the friction or significance of distance between places. The impact of "time-space convergence" is not homogeneous, for the declining significance of distance benefits the larger more distantly spaced cities more than it does the smaller ones.²⁷ The early establishment of a set of interconnected growth centers combined with the influence of "time-space convergence" caused by network upgrading produced a self-reinforcing system. Urban concentration and the dominance of Kuala Lumpur were aided through special locational and transportation advantages.

Recurrent demand for network growth was a critical aspect of Malayan transportation and urban development. The upgrading of linkages within the network occurred where anticipated traffic was realized. New or improved linkages stimulated additional growth which led to further elaboration of the network. Tin, and later rubber, revenues were used for transportation

investment capital. The impact of the constructed linkages permitted new network growth in untapped areas. Lower order urban places also were the recipients of the benefits of rubber and mining expansion. Additional services were demanded and generated from the new economic growth. Consequently, linkages were improved among the rubber and mining clusters and small towns. Thus in Malaya it is useful to view the expansion and upgrading of the network and the growth of urban places as an intermeshed process. Commercial flows are triggered from the rural production zones and urban consumption points in the hierarchy simultaneously, and lead to a recurrent investment in the road network. Exploratory linkages which produced little or no positive feedback were allowed to decay and recurrent demands were shut off.

The growing body of evidence which relates transportation and urban growth has relevance for regional development policy. At a time when there is considerable interest in planned growth centers, alternative network improvements and the total impact of such improvements, particularly transportation sensitivity to social values, must be critically examined.

²⁷ Donald G. Janelle, "Central Place Development in a Time-Space Framework," *Professional Geographer*, Vol. 20 (1968), pp. 5-10.

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