

stated frequently, so it is possible to make some assessment of the efficiency of policies. The governments have aimed at integration of the province into the wider Indonesian economy, at 'raising' the modes and standard of living of the Irian-born to those of other Indonesians and at increasing provincial economic activity and the province's contribution to national economic development.¹⁰ These goals have been attended by the broader objectives of spreading national ideology and language and extending Indonesian administration within the province.

The general economic reforms in the late 1960s, including removal of public utility, transport and consumer goods subsidies, made a major contribution towards more efficient resource allocation. But the rice subsidy remains a very large drain on the budget. The subsidy causes provincial resources to be allocated inefficiently: high cost rice is substituted for low cost foodstuffs and rice production is discouraged in the few locations where it is economically feasible. The subsidy's welfare effects are skewed against the Irian-born, whose taste for rice is less well developed. Abolition of the rice subsidy would yield large economic benefits even if compensating public service salary increases were required. Abolition of the subsidy would make migration to Irian Jaya less attractive, but subsidised consumption at a new location seems an inefficient way of raising the welfare of poor persons from other provinces.

It is difficult to quarrel with the emphasis of the major development programs. Improvement in transport and communications was necessary merely to provide access to information required for more sophisticated planning. Rehabilitation of the communications infrastructure was also a prior requirement for any village development effort. Investment has been concentrated on restoration of former Dutch facilities. However, it is now clear that the old transport and communications structures are not always suited to the very new economy that is developing and a new approach is required. Communications have improved sufficiently to allow effective expenditure on village welfare. But villagers' incomes have fallen in many areas, despite Indonesian aims, and projects contributing directly to village welfare have received low priority in allocation of funds. These and other important planning questions will be discussed further.

¹⁰ See especially Direktorat Irian Barat, *Irian Jaya Development Plan*, Jakarta, 1967, pp. 1-16; Acub Zainal, *Operation Koteka - the community development of the inland areas of Irian Jaya, 1971/73*, Jayapura, 1971; and *Nota Keuangan dan Rantjangan Anggaran Pendapatan dan Belandja Propinsi Irian Barat 1972/73* [Financial Note and West Irian Budget 1972/73], Jayapura, 1972.

6 Transport, Communications and Trade

Fundamental technological factors constrain the growth of incomes in Irian Jaya. The development problem in Irian Jaya is dominated by the small scale of human settlements and the high cost of small-scale transport and communications. The division of labour depends on the extent of the market and trade between scattered villages requires long walks over difficult terrain for a small enlargement of the market.

A new division of labour has become possible with the establishment of links with the world market. Once a few beachheads of the international economy were established, short-distance trade with the ports could link adjacent, coastal villages into the world system. But where inland villages are separated from the ports by mountains and rivers the small scale of potential trade has made the cost of land transport prohibitive. Rivers in Irian Jaya, unlike Kalimantan, can play only a limited role in linking inland areas to the coast. Economies of scale are less important in transport by aircraft, but unit air transport costs are high, so that isolated villages can participate in the national and international economy only through trade in high-value-to-weight commodities.

Improvement in village welfare is possible without trade where services and high-value commodities are made available by gifts from outside the village. Where external aid supports a commitment to social and economic change, transport and communications must play a key role in the process. Costs are high and efficient supply of these services is a major planning problem.

Communications for administration

Extensive air and telecommunications networks are crucial to effective government administration in Irian Jaya. Indonesian policy has given high priority to development of the infrastructure that is necessary to support province-wide administration. The focus has been on restoration of the telecommunications and transport systems that existed in colonial times but deteriorated in the first seven years of Indonesian administration.

Between 1962 and 1969 there was almost no maintenance of the telecommunications system. The Indonesian systems were themselves desperately short of qualified technicians, and unable to handle the additional burden. A direct telegraph link with Jakarta was established, but it was unreliable and in 1971 it cut out completely. The telegraph link with Sydney cut out in about 1970 and other international links were chronically unreliable. The links between major centres in Irian Jaya were operational only about half the time despite a large government subsidy.¹ Rehabilitation awaited the onset of the Fundwi program. The first foreign expert arrived in late 1968 and three more through 1969. For over a year efforts were directed at stemming the decline in services. Since then, this project has proved to be one of the more successful of the Fundwi efforts. However, the urgency of rehabilitation has combined with a chronic scarcity of technical skills to prevent development of an efficient, integrated provincial telecommunications system.

The absence of skilled personnel has been a constant problem. Under the Fundwi program, the technical institute in Bandung undertook to train thirty technicians from the province each year. In the first year of the scheme, however, only ten applicants were considered sufficiently well qualified to attend the course. Indonesian technicians born outside the province have been difficult to retain in Irian Jaya. The number of trainees who have become useful operatives is very small and there is a danger that the private telecommunications systems being established by the mining companies will cream the very small pool of technicians. Offering salaries two to three times the national telecommunications company (Perumtel) rate, Freeport Indonesia and Pacific Nickel have already attracted several of the best local staff.

The Fundwi project has proceeded in two stages. The first telecommunications project plan, prepared in April 1970, aimed at restoration of equipment already in the province. But it soon became apparent that much equipment was more cheaply replaced than repaired and changes in international practices required other improvements if the province was to be linked with world systems. More funds were available for new equipment from June 1971 and a more comprehensive attempt to rebuild the system could be made. Telephone services have not been a major concern of the project to date and work has been confined to restoring the old connections.

By the time of completion of the project, telegraphic systems will have more modern equipment than in Dutch times although only thirteen stations are serviced. Jayapura operates as a leader station. Biak, Manokwari, Sorong, Fak-Fak and Merauke are to be connected by telephone and teleprinter.

¹ IBRp 5 million in 1969 (approximately Rp 50 million).

In late 1972 work had been completed except at Merauke, where transport difficulties had delayed installation. Seven other centres are to be connected into the provincial system by single-side band telephone and morse.

The small total demand for telecommunications services has been a cause of high costs, reflected in high charges. Small volumes have confined the province to old shortwave techniques. This single channel equipment is very much more expensive than well utilised multi-channel equipment. The Fundwi project manager estimated that a five-fold increase in demand could bring costs down to average Indonesian levels. It is thus particularly unfortunate that the large Freeport and Pacific Nickel telecommunications centres are not integrated into the provincial network. Supply of these two projects alone may have made adoption of multi-channel equipment economic, allowing costs to fall with future increases in demand. Freeport Indonesia's installation, costing around \$2 million, is so different from the provincial system that integration will not be possible without scrapping this investment. The Pacific Nickel Company has offered to finance several million dollars expansion of the Perumtel network. The telecommunications company has felt doubtful of its administrative and technical ability to maintain an enlarged system, but there is some prospect that current negotiations with Pacific Nickel will lead to use of compatible equipment and facilitate future integration.

The Fundwi project manager advised us that introduction of microwave, multi-channel international connections via Jakarta could cost a total of \$7-8 million. An investment as small as \$10,000 could provide a microwave link with Vanimo in Papua New Guinea and hence with the world-wide system that includes Jakarta. However, there may be political objections to reliance on the link via Papua New Guinea.

Air transport is more important for government administration in Irian Jaya than in any other province of Indonesia. There are about 113 airstrips throughout the province, adjacent to most populated areas. Over 60 per cent of these are grass strips that are able to receive only Cessnas and other small craft. Fourteen strips can take DC3s, while most of the remainder can receive craft in the Twin Otter class.

Of the larger airstrips, all but the Freeport strip service the main urban centres and are maintained by the Directorate-General of Air Communications. Most of the larger strips, including those at Merauke, Sentani (Jayapura), Biak, Sorong and Kaimana, were constructed in wartime. Despite slight maintenance, most remained serviceable through the 1960s and the Fundwi program has been directed at stemming further deterioration and at improvement of

safety equipment and procedures. Fak-Fak remains the only *kabupaten* capital without an airstrip, early Fundwi proposals having been dropped for lack of funds. There has been a continuing expansion in the number of small, Cessna strips, which are usually built and maintained by the missions with the help of village people.

In 1963 Merpati Nusantara replaced NNGLM as the government appointed commercial airline. At first it attempted to maintain most of NNGLM's schedules, but services were very poor by the time of the visit of the Fundwi consultant in transportation economics in 1967. The airline's principal assets in Irian Jaya, three DC3s, were repeatedly grounded awaiting spare parts. There were severe problems of employee morale and, owing to irregular operations and low fares, financial difficulties persisted. The low fares made Merpati dependent on government subsidies which were not always forthcoming. The mission groups had continued to operate at their former levels and were the province's major carriers, providing unscheduled services to most airstrips as demand and limited capacity allowed.

Much of the Fundwi air communications effort has gone into strengthening Merpati's Irian Jaya operations. Early management support included pressure for the passenger fare rise in 1970. A number of Merpati staff were granted fellowships in flying, technical and management training. Most of the \$2.4 million in equipment, spares and materials distributed by Fundwi to September 1972 went to Merpati: three new Twin Otter aircraft with spare parts for three years plus spares for older aircraft. This expanded the Merpati fleet to four DC3s and five Twin Otters. Under bilateral agreement signed in July 1972, directed at upgrading civil aviation in the whole of Indonesia, the Canadian International Development Agency (CIDA) granted a concessional loan to Merpati for the purchase of two more Twin Otters. In addition CIDA is to provide a management adviser to assist Merpati for a period of two years.

The quality of air services has improved markedly. Twice weekly or more frequent flights connect Biak, Manokwari, Sorong, Jayapura, Merauke and Wamena. Biak is the maintenance and depot centre and receives daily flights from Surabaya and Ujung Pandang. Merpati and Trans Australia Airlines jointly maintain a weekly service into Papua New Guinea. Merpati flew 7950 flight hours in 1971, more than tripling the 1967 total. In 1971 Merpati carried 48,000 passengers and flew more hours than the major mission operator, the Mission Aviation Fellowship, for the first time.²

Travel by government officials comprises 85 per cent of the demand for

² Merpati Nusantara Airlines, Biak; and Biro Sensus dan Statistik, Irian Barat dalam *Angka Tahun 1970*.

Merpati services, and freight runs to inland areas from Nabire, Jayapura and Manokwari are primarily for delivery of consumption goods to civil servants. A Hercules is chartered monthly to drop rice and other supplies to government officials in Wamena.

Air transport into smaller centres including the whole of the south coast west of Merauke and most of the central highlands still remains dependent on unscheduled mission flights. The missions' Cessna aircraft carry large quantities of non-mission personnel and cargo. One mission group estimates that two-thirds of all passengers and one-third of all goods carried by their aircraft are for outside persons or organisations.

Telecommunications and air transport reach only a limited number of centres and contact with many people depends on use of traditional communication networks. Webs of footpaths cross all inhabited areas and are linked by tracks over the least habitable country. On slippery and steep sections steps are carved into rock or paths are reinforced with timber. The main paths are clearly marked, crossing streams by log bridges and rivers by wood and vine suspension bridges. In the swamp and river areas, the canoe remains an efficient means of linking the villages to the outposts of the sophisticated communications systems. In the foreseeable future, half the province's indigenous population will remain accessible to administration only by foot and canoe. From some accounts the importance of these simple modes of transport is not fully appreciated by some departmental field staff.

In some areas, more efficient communications may be achieved through modification of traditional practices. The canoe with a robust outboard motor can provide cheaper personal transport than larger boats built to modern specifications. On some mountain tracks, beasts of burden like the donkey could be profitably introduced. Bullock carts have long been used by Javanese settlers in the flat country of the southeast: the practice has been followed by some local villagers and there is room for its extension. The integration of the post office, the airstrip and the jetty with the simpler communications systems presents an important challenge to planners in Irian Jaya.

Trade by sea and land

Despite the switch to supplies from other parts of Indonesia described in chapter 4, imports have continued to grow from the very low levels to which they fell in the mid-1960s (see Table 3). The construction of the copper mine and exploration activities of other enclave investors have expanded

rapidly the value of imports. In 1971 the volume of imports (300,000 tons) was almost double the 1970 level, 161,000 tons. The value of imports at \$30 million exceeded colonial levels for the first time.

There has been a change in the relative importance of Irian Jaya's various international trading partners (see Table 17). Imports from the Netherlands have declined markedly since 1961 and accounted for only 4 per cent of total imports in 1971. Supplies have come mainly from Japan, Singapore, Hong Kong, and the United States, whose very high share in 1971 is entirely a reflection of her importance as a supplier to the copper project. Singapore and Hong Kong have replaced the Netherlands as the principal markets for village exports and, since crude petroleum with a high gasoline content was discovered in Australia, Japan has become the main oil customer. Japan is also the market for prawns, the largest export in 1972, and is likely to be the main buyer for tuna, non-ferrous metal ores and timber.

Reorientation of international shipping to Irian Jaya has accompanied the change in the direction of trade. Decline in the frequency of international shipping services following the departure of the Dutch contributed to the sharp fall in foreign trade levels in the mid-1960s.³ Today, international services are provided by three to five ships a month from Singapore and Hong Kong to the major northern ports. There are less frequent calls from Europe and Australia to Jayapura and, with special inducements, to other northern ports.

The poor quality of local shipping has also affected adversely the level of village exports, and the decline has been magnified by falling prices (see Table 4). Although most of the Dutch coastal fleet survived the transfer of

Table 17 Irian Jaya's trading partners: percentage shares in exports and imports by value, 1961-71

Country	Share of exports				Share of imports			
	1961	1965	1969	1971	1961	1965	1969	1971
Netherlands	23	19	3	0	48	22	11	4
Singapore	16	0	23	29	19	0	35	12
Japan	34	50	48	64	2	20	16	19
Hong Kong	0	10	10	6	3	22	15	5
Australia	14	7	0	0	8	15	6	11
United States	0	0	0	0	1	1	1	45

Sources: Biro Sensus dan Statistik, *Irian Barat Dalam Angka Tahun 1970*; *Report on Netherlands New Guinea, 1961*; Records of Kepala Inspeksi Bea dan Cukai, Jayapura. (For some known flaws in 1971 data, see note to Table 2.)

³ The situation was most serious 1963-6 when the trading link with Singapore was broken during confrontation.

sovereignty it was decimated by mechanical breakdowns and by export of parts to other Indonesian provinces during the currency problems of the mid-1960s. Subsidies were large enough to offset the high cost of operating on a regular basis only to the four largest ports, Sorong, Manokwari, Biak and Jayapura. Minor ports, including the river ports of the Merauke *kabupaten*, ceased to have access to any shipping services.

There has been some improvement since the mid-1960s but many problems still remain. Although sea transport has been given first priority in the Fundwi development plan the results so far have been limited. Improvement of port facilities had barely begun in October 1972. Some wharves were in serious disrepair and the ship repair program was far behind the original schedule. The coastal fleet had expanded to fifteen coasters totalling 3500 tons and eleven barges totalling 1610 tons after Fundwi provision of two vessels each to Pelni and PT Jayawijaya on easy terms⁴ and a presidential gift of five small vessels to PT Jayawijaya.

Under-capacity does not seem to have been a problem with only 50 per cent of cargo capacity being utilised. Early ambitions to restore the full range of former Dutch ports of call have been abandoned for the present and it has not even been possible to maintain regular calls at ten ports. Other ports are visited subject to inducement. The absence of regular shipping is a major limitation on trade from minor coastal centres.

Transport of fuels requires special discussion since the high cost of kerosene, aviation fuel and especially diesel fuel is a major contributor to high costs of electricity, air transport and other services. PN Pertamina maintains bulk depots for diesel fuel at Jayapura, Sorong and Biak and for aviation fuel at Biak. Petroleum is distributed in drums to other ports. Vessels of 150 tons are chartered to carry drums to the southern ports, at an average cost of almost 20 Rp per litre including delays and backloading. Drum depots in Manokwari, Fak-Fak and Merauke provide supplies for smaller ports. Because of low total demand, from three to six months' stocks are commonly held at Fak-Fak and Merauke. Diesel oil costs would fall dramatically if demand in the south rose to levels that justified calls by larger tankers. Since Freeport alone will require at least 2000 kilolitres per month of high speed diesel oil there are likely to be important economies in the establishment of at least one south coast installation.⁵

⁴ The companies are to pay the Joint Development Foundation for the vessels over fourteen years without interest.

⁵ Pertamina personnel associated with bulk transport have suggested that 500-900 ton bulk barges hauled by tugs could be used on the Irian Jaya coast to service such installation.

The deterioration of roads connecting some village areas with the coast further contributed to the decline of village exports in the past decade and prevented the fruition of some Dutch agricultural export projects. The roads from Teminabuan (60 kilometres), Manokwari (40 kilometres), and Jayapura (65 kilometres) to nearby cocoa plantations have all fallen into disrepair and at best can be passed only by four-wheel drive vehicles. New roads, mostly built under the central government *kabupaten* scheme, have concentrated on linking towns to prospective vegetable-producing areas. The most successful of these appears to have been the 40 kilometre road linking the town of Biak to Korim on the north coast of the island. Freeport has built a 120 kilometre road to the south coast at Amapere.

In general, however, roads can play only a relatively minor role in Irian aya development. Large areas of swamp, especially in the south, and a precipitous terrain in other regions make road construction impossible or extremely costly. Poor agricultural land in all but a few areas, the small size of urban population and dim prospects for village exports all suggest the need for a critical approach to major road investments.

The recent completion of a 45-kilometre road from Wamena to Pyramide in the central highlands with assistance from village volunteers confirms the lesson of the Papua New Guinea highlands, that construction of simple, low-cost village road networks is possible.⁶ Such development in a heavily populated area like the Baliem Valley can raise considerably the income gains associated with a given level of external trade or subsidy by facilitating internal trade.⁷

There appears little prospect that a road linking the highlands with the coast will be economically justifiable in the near future. Irian Jaya's rugged natural environment would make a highlands-coast road more costly than in Papua New Guinea.⁸ It is doubtful whether the national or provincial budgets could justify the very large investment that would be required to bring relatively small economic and social benefit.⁹ There is no present

⁶ The Wamena-Pyramide road was estimated to cost approximately Rp 140,000 (approximately \$300) per kilometre in money; three small bridges had still to be constructed to complete the road in mid-1972.

⁷ Again costs need to be carefully scrutinised and the welfare benefits compared with those which may derive from alternative investments.

⁸ For estimates of the cost of various new roads to the highlands of Papua New Guinea see UNDP, *Transport Survey of the Territories of Papua and New Guinea*, 1969, chapter 8.

⁹ Built to sophisticated specifications a 100 kilometre road from Lake Paniai to Nabire might cost \$50-100 million and a 200-300 kilometre road to Jayapura \$100-200 million. A dirt road able to carry only four-wheel drive traffic could be built much more cheaply.

indication that any of the mining companies are preparing to build such a road although current exploration keeps future possibilities open.

However some growth in exports from inland areas could be maintained through better utilisation of capacity on returning aircraft. At present there is considerable imbalance between the size of cargoes airfreighted into and from inland strips. Virtually no cargo is carried from Lake Paniai area to Nabire and planes carrying passengers on these routes maintain a load factor of only 10-20 per cent. Backloading cargo rates from Wamena have been reduced by 50 per cent to IBRp 2.50 per kilo. Return flights now average about 70 per cent of capacity, of which 20 per cent comprises air cargo.

Because transport and communications over long distances between small centres are characterised by important economies of scale, the cost of future services depends on predicting accurately and developing systems to meet the growth in demand. The cost of transport and communications has a major bearing on the profitability of many industries, so that the planning of industries needs to be undertaken concurrently with planning of infrastructure. Moreover, very substantial cost saving can be achieved through the integration of public communications systems with those set up by the large enclave investors. Some thought has been given to the possibility of developing an integrated telecommunications network over the next twenty years. Long-term planning of telecommunications and transport industries, especially sea communications, would bring considerable benefits. Certainly it is necessary for planners to look beyond the simple goal of restoration of services available in colonial times: this goal has allowed an early start on projects to improve communications and transport infrastructure, but is poorly suited to the very different economy that is emerging.