

Appropriate Nonautomotive Technology Urged for Rural Needs in Developing Countries

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Past transport strategy for developing countries has been dominated by an institutional preoccupation with the provision of roads suitable for conventional motor vehicles. The supply of those vehicles has been left largely to the private sector, and their technological appropriateness unquestioned to the extent that the type of vehicle is not a variable in road design. The result has been high road construction cost, slow network development, and the neglect of the movement needs of small-scale farmers and of traditional forms of transport.

Attention should be focused on improving the technology of basic vehicles that are appropriate to the needs of many rural developing countries, rather than on building roads to a preconceived design to accommodate sophisticated motor vehicles. In most developing countries, transport has generally received more resources in the past three decades than any other sector has; yet in the same period the number of persons living in absolute poverty has increased and their conditions of life wors-

Guatemalan residents carry heavy loads on their backs while earth-moving equipment prepares the foundation for a new highway.



ened. While past transport policies may not have caused the increase in poverty, they have not prevented it.

The "rural transport problem" in developing countries has been seen as one of providing or improving the quality of access. The term "access" has meant almost exclusively road access. Past road investments have favored the construction or improvement of major rural highways rather than urban or minor rural roads, although this emphasis is changing slowly. The only recognition that developing countries might have special rural transport problems has been the effort devoted to the subject of low-cost roads. Until 1976 there had been no comparable effort devoted to low-cost vehicles or to any other type of road vehicle particular to developing-country needs.

In retrospect, this omission is very odd. Transport

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Bullock cart traffic on highway.

comprises a system: some form of vehicle and a track or route on which that vehicle moves. We have expended considerable time, money, and effort in seeking to optimize the one to the almost total exclusion of the other.

The generally accepted design standards for highways in developing countries recommend essentially U.S. standards—probably the most generous ever developed—for low-cost highways. In most developing countries, however, the current number of motor vehicles per capita is extremely low, and the expectation is that it is unlikely to rise very rapidly. One study of 93 developing countries showed that, in 1968, average motor vehicle density was 9.2 units for each 1000 people, and this is expected to rise to only 11.8 units by 1980.

For rural societies, simpler and cheaper vehicles might be more appropriate. Slower and lighter vehicles would allow the alignment, strength, and width of roads to be reduced, and this could be accompanied by a considerable saving in costs.

Recent rural transport strategy has pursued development from the top downward, using the technology of developed countries, that is, a progression from major primary to secondary and only latterly to tertiary highways, all built on the basis of design philosophies imported from the developed countries. The result is skeletal road networks that, in the poorer countries, plainly do not serve effectively the majority of the population, and vehicles so expensive that they are beyond the means of all but the affluent. Moreover, past transport planning has failed to recognize that many people live far from the (motor vehicle) road system and have movement needs that could never be satisfied by conventional vehicles.

What vehicles are appropriate for rural areas of developing countries? Six categories of basic vehicles can be

defined: aids to carrying loads on the head, shoulders, and back; handcarts and wheelbarrows; pedal-driven vehicles; animal transport; motorcycles; and basic motorized vehicles.

Although human portage is limited to loads of around 40 kg, and to relatively short distances, it seems likely that this will remain an important means of rural transportation in the foreseeable future. The Georgia Institute of Technology and Korea's Soong Jun University have researched improvements to the traditional chee-ke back-loading frame used in Korea and have developed an improved model that can be easily converted to a wheeled carrier. In China, wheelbarrows are built with the single wheel below the center of gravity of the load, which makes it possible to carry about 180 kg, rather than 120 kg for the Western wheelbarrow, on which the wheel is positioned in front of the barrow.

Bicycles are widely used in developing countries. They can carry a passenger or up to about 80 kg of cargo, and they offer a significant increase in speed over walking. The type of bicycle that predominates in developing countries has not changed in any significant way for many years and is typical of designs produced in Western countries 30 or 40 years ago. Bicycles are habitually used in developing countries to carry passengers and/or heavy cargo loads on rough, unsurfaced tracks and paths, and they are expected to stand up to arduous use for many years. They are a basic load carrier for rural areas rather than a convenient means of short-distance personal transport, yet no bicycle has ever been designed to meet these very different operational requirements.

Animal-drawn carts are a major form of rural transport in the Asian region. In India, it is estimated that they now number some 14 million, and more than 60 percent of all goods carried from farm to market are moved by animal cart. However, existing carts are excessively heavy, many are badly balanced, the traditional bullock yoke is inefficient, and the traditional wooden wheel is heavy and uses inefficient bearings. Redesign of animal carts would result in increased capacity and would offer the possibility, in many cases, of one bullock being used instead of two.

Single-axle tractors and power tillers have been developed in China, in the Philippines, and in Crete, to meet the needs of small farmers.

All of the vehicles described could be operated on roads of a lower standard, and hence of lower costs, than that prescribed by the requirements of conventional motor vehicles. Some may be described as two-dimensional in that they have height and length, but not significant width. This makes them suitable for use on footpaths and narrow tracks.

There seems to be no logical reason why governments and aid institutions should not play as dynamic a role in the provision of basic vehicles as they have done in the provision of roads. Indeed it seems irrational for them to do otherwise, given that the track and vehicle are complementary and mutually dependent parts of the road transport system.