

Sustainable Transportation For Developing Countries

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A quiet revolution is underway to resurrect and reinvigorate human powered forms of transportation. This article describes the birth of a bicycle culture in El Salvador, the involvement of the American group Bikes Not Bombs, and concludes with a discussion of sustainable transportation strategies.

Like thousands of others in Jakarta, Ahmad lost his livelihood, his savings, and his home when the government seized and threw into the sea his becak, a three-wheeled cycle rickshaw, which he drove during the day and slept in at night. Ahmad fell victim to a law banning becaks from Jakarta, adopted because Indonesia's elite sees pedal-powered vehicles as backward and holds them responsible for traffic congestion. Today, Ahmad pays bribes to skirt the law, rents another man's becak, and earns less than he did before, dodging insults and traffic, waiting for fares. Like hundreds of millions around the world, Ahmad is being ground into the dust beneath the fast moving wheels of motorization.

Just as unsustainable natural resource policies have destroyed the diversity of ecosystems in many parts of the world, so too are unsustainable transportation policies destroying the balance between high-cost motorized and low-cost non-motorized transportation modes. Rapidly increasing global motorization is retarding development for the majority of Third World people. Wrong-headed transportation strategies are a leading cause of the dangerous mountain of debt accumulated by Third World nations and the growing environmental problems that now threaten global changes in climate.

The dream of an automotive society is simply well beyond the means of most of the world. There is not enough petroleum, capital, and infrastructure around for this to be a near-term global goal. Motorization is a pleasure attainable only by a small minority of the world's people.

Yet many of the world's transportation decision makers subscribe to the common perception that "motorization equals modernization" and spend staggering amounts of scarce foreign currency earnings for their transportation systems. El Salvador, Haiti, Kenya, and Thailand are just a few of many countries that spend a third to half of their

foreign exchange earnings to import petroleum and motor vehicles. Nevertheless, out of every one thousand people, less than four are car owners in Mozambique and India; less than five in Haiti, Pakistan, El Salvador, and Indonesia; less than seven in Bolivia, Zaire, and Honduras; and less than fourteen in Liberia and Thailand. In Brazil and Mexico sixty out of one thousand own cars, compared to three hundred in Europe and five hundred in the United States. The budding "automobile cultures" in these countries leave the poor walking and mortgage the future of these countries for current gasoline consumption by the small middle and upper classes.

While motorization is occurring in many parts of the developing world, traditional, non-motorized, and low-cost transportation modes, such as bicycles, carts, trishaws, small locally produced boats, and ox carts, generally are ignored or dismissed without study as backward and inefficient. Little data are collected about these modes, reinforcing the impression among transportation professionals that these modes are of little consequence. The most basic mode, walking, is similarly neglected as an area of serious inquiry.

Yet a quiet revolution is underway in many places to resurrect and reinvigorate these human-powered forms of transportation. Among the signs of change in thinking are the birth of a bicycle "culture" in El Salvador, the beginning of a bicycle industry in Nicaragua, and new thinking about transportation strategies at the project level in the Sub-Saharan Africa region of the World Bank.

The Salvadorean Experience

The Salvadorean Center for Appropriate Technology (CESTA) has laid the groundwork for moving away from

the motorizing framework of the Salvadorean society. CESTA is taking intelligent steps to change thinking, through examples of the right blend of cycle technology and credit access, to make possible a bicycle "culture," which exists only in the developing world of Asia.

Ricardo Navarro, head of CESTA, spent many years in the United States and Europe studying and practicing appropriate transportation technology. Upon his return to El Salvador, he surveyed workers in San Salvador for their preference among seven different kinds of bicycles to use on a daily basis for commuting and hauling goods. An all-terrain bicycle design, the most popular type of bicycle in the United States, was unanimously chosen. It offers the potential for widespread application in the Third World. The all-terrain bicycle's strength (from new alloys), stability (from wide handle bars), and traction (from "balloon" tires) make it ideal for rough Third World conditions.

Most of the workers in San Salvador indicated that they would be willing to spend up to \$250 if they could get credit and pay off the purchase over a two year period. This would mean monthly payments of an amount equivalent to bus fare. With \$400,000 in start-up grants, CESTA is beginning a domestic bicycle assembly industry in El Salvador to meet this market need.

CESTA is also designing new lightweight carts which are intended for introduction to those carrying heavy loads. This is crucial for people whose caloric intake and hard living conditions make movement of loads by foot particularly onerous.

Rural Applications

Rural productivity can be greatly improved with such tools. In many parts of the world, people spend hours each day carrying fuel, water, and produce over significant distances unaided by carrying devices or simple vehicles. The most practical way to do this is to carry things on one's head, a practice known as "head-loading." Thampil Pankaj, a World Bank economist, recently noted that "the head-loading and foot-path economy not only constrains production and marketing, but also limits other forms of rural mobility and access to schools and health facilities, severely affecting the development of human capital and the quality of life. Extensive head-loading also causes a severe health problem (cervical spondylosis) due to constant trauma to the neck and spine and remains the most burdensome chore affecting the rural woman's life...Head portage effectively limits the time and energy available for farm activities, particularly because the peak of transport activity coincides with the peak of farming activity in the harvest season."

To solve this problem, the World Bank is supporting a pilot project in northern Ghana to build low cost "single blade" roads at eight percent of the cost of conventional

feeder roads. The pilot project will also provide low-cost non-motorized vehicles such as bicycle trailers and hand-propelled farm carts to villages served by these new cart tracks. The World Bank has also agreed to fund slow moving traffic lanes in two urban rehabilitation roadway projects in Mozambique.

Bikes Not Bombs

The transportation crisis in Nicaragua, coupled with Swiss, Dutch, and American technical and humanitarian assistance, has fostered a huge growth in both supply and demand for bicycles. Since 1984, the American group Bikes Not Bombs (BNB) has sent over 3,000 recycled bicycles, tools, and parts, with a combined total value of over \$350,000, for distribution to Nicaraguan workers in health, education, and production. BNB is a project of the Washington, DC based Institute for Transportation and Development Policy.

The BNB campaign is an international solidarity and assistance project formed with the purpose of sending donated and recycled bicycles, parts, tools, and technical help for the development of a bicycle infrastructure in Nicaragua. Sturdy, used bicycles are collected in over twenty-five towns and cities in the United States, Canada, and Europe. The bicycles are sent to the bicycle mechanic training and assembly workshops established with the assistance of BNB and other European and American soli-



These two Nicaraguan workers reduced their round-trip travel time from three days on foot to just one-half day after receiving bicycles from Bikes Not Bombs.



Bike mechanic, Managua, Nicaragua

darity groups in Managua and Leon. The staff of the shops consist of several full-time foreign project coordinators and mechanic trainers, many short-term volunteers, and nearly two dozen Nicaraguan salaried employees. The Leon workshop, organized with a group of disabled veterans, also manufactures wheelchairs.

In Nicaragua, BNB works with the Ministry of Transportation, various non-governmental organizations and numerous Nicaraguan organizations and labor unions to ensure effective distribution of the bicycles at subsidized low costs. The donated bicycles undergo complete overhaul and reconditioning at the BNB workshop. The Nicaraguan BNB workshop charges recipient organizations a modest assembly fee for each bicycle to cover the cost of Nicaraguan salaries, shop overhead, and bicycle project development in Nicaragua. International staff stipends are paid for by the Institute for Transportation and Development Policy and other American solidarity groups.

Following the model established by CESTA's Ricardo Navarro, and the Swiss-Nicaraguan group Sofonias, BNB is working cooperatively with Dutch, Swiss, and Nicaraguan groups to help establish a bicycle assembly industry in

Nicaragua. Shipments of recycled, sturdy, used bicycles from the United States and elsewhere to Nicaragua are being stepped up to respond to the near-collapse of the Nicaraguan economy and transportation systems.

In the United States an important aspect of BNB is its political and educational outreach work. BNB promotes solutions to the current conflicts in Central America and American foreign policy that respects the rights of all people to guide and determine their own development. BNB national and local coordinators have come together through cycling, environmental, religious, civic, and Central American solidarity organizations, bringing newcomers into the movement who promote negotiated settlements of conflict in Central America and an end to United States military and economic warfare in the region.

BNB hopes to respond to growing requests for on-site repair classes in urban work centers and rural cooperatives so they can maintain their own bike fleets, with BNB providing initial parts, tools, and technical training. BNB also promotes urban planning for sustainable transportation development in Nicaragua, in light of the expected long-term shortages of capital for petroleum imports and the need for non-motorized transportation.

Any country can start a bicycle industry, but it must start small and assemble imported bicycles. Only gradually should a country substitute imports with "home-grown" frames and parts. The Institute for Transportation and Development Policy is working to emulate the Nicaraguan and Salvadoran models of indigenous bicycle industry development in two other countries: Haiti and Mozambique. Models to be avoided include Tanzania's large-scale, tariff-protected bicycle industry. Brazilian and Taiwanese export-oriented bicycle industries offer models for large-scale bicycle production in the context of heavily industrializing economies with substantial available capital investment.

Sustainable Transportation: Concepts and Technical Options

In the broader sense, these projects are linked to a global challenge to promote and implement sustainable transportation options. There is hope for the mobility of the poor, particularly with the emergence of "sustainable development," a concept drawing much attention currently in the development community. Sustainable transportation calls for a more holistic approach to transportation policy and investment planning with emphasis on achieving a diverse and balanced mix of non-motorized and motorized transport modes; more attention to unmet local mobility needs of low-income people; and more awareness of the impacts of transportation systems on environmental quality and resource utilization. Sustainable transportation strategies



Ambulance workers receive bicycles from Bikes Not Bombs at the BNB Managua workshop, Nicaragua.

are those that can meet the basic mobility needs of all and be sustained into the foreseeable future without environmental destruction.

For short-distance movement of people and goods, low-cost, non-motorized transport modes powered by renewable energy sources are the natural complement to motorized public transport modes. Public transport modes best provide movement in corridors with moderate to high-volume flows and moderate to long trip lengths. By facilitating the use of different modes to meet diverse travel demands, the transport system can be optimized to yield broadly distributed benefits at minimal societal costs.

Major global lending organizations, like the World Bank and U.S. AID, however, have done little to encourage such diversity in transport system development. The World Bank, for example, wrote a 400-page report on the transport sector in China that did not include even the word "bicycle," although more than 270 million bicycles are the main means of urban and rural mobility in China. The World Bank's recently reissued Urban Transport Policy paper ignores non-motorized transport, except to note that it causes traffic congestion. Most World Bank lending aids motorized transport. Pressures of the global debt and environmental problems are leading some officials of the World Bank, however, to rethink priorities for transportation lending, with greater recognition of the vital role

played by truly low cost transport modes.

The Institute for Transportation and Development Policy has been lobbying Washington for more attention to non-motorized and low-cost transportation modes in development programs. As part of last year's foreign-aid package, Congress indicated its interest in seeing such a change in policy. Nevertheless, further legislation is needed. The "Human Needs and Mobility Joint Resolution" and the global warming bill sponsored by Representative Claudine Schneider (Republican, Rhode Island) would both direct appropriate changes in the World Bank and American transportation development assistance programs.

Sustainable Transportation Strategies

Assess Alternatives

Impact statements should be required for all transportation projects funded by the World Bank and other development lending institutions. These statements would identify alternatives to the proposed project and anticipated impacts on (1) the environment, (2) other transportation modes, (3) the poor, and (4) long-term foreign currency requirements. Structural adjustment programs should include changes in transportation spending priorities to ensure economic and environmental sustainability.

Enhance Access to Tools for Mobility

Programs should be developed to enhance poor people's access to low-cost vehicles and efficient carrying devices. Such tools increase the labor productivity of the poor and their access to services and local markets.

Provide Access to Credit in Small Amounts

The provision of low-cost credit to the poor to buy bicycles, carts, pack animals, and similar vehicles, should be a high priority to ensure that the poor have access to affordable mobility. In Hyderabad, India, commercial banks were encouraged to lend to rickshaw operators for the purchase of vehicles. And in the Dominican Republic, a credit union of tricycle drivers helps finance vehicle purchases and assembly projects.

Produce Low-Cost Vehicles Locally

The development of local bicycle assembly and cart production capabilities for domestic use should be encouraged. By starting with small, low-capital-cost assembly workshops, countries with little or no industrial base can begin to develop appropriate domestic transportation vehicle manufacturing capabilities at little risk.



Bikes Not Bombs bikeathon in Boston, Massachusetts

Emphasize Infrastructure Needs

Transportation investment policies should place more emphasis on roads and trails suitable for low-cost vehicles.

Mix Land Uses

Urban land use planning needs to move towards mixed land use patterns. Greater decentralization of employment can reduce the need for motorized commuting as well as

encourage greater community integration. Growing cities should locate employment clusters and affordable housing in corridors well served by rail or bus transportation.

Restrict Auto Use

The automobile should be subject to far greater restrictions in dense central city areas. Area licensing schemes, successful in Singapore, should be more widely adopted along with more widespread automobile free zones.

Eliminate Subsidies for the Automobile

Taxes on automobile purchases and operation, particularly for private use, should be sharply increased to reflect the true costs of automobile use on the environment. Subsidies for automobile use of urban road space should be eliminated. Taxes on bicycles, public transportation vehicles, and non-motorized vehicles should be lifted or drastically reduced.

Amend Road Construction Standards

Road construction standards should be reduced and more labor-intensive lighter weight motorized and non-motorized vehicles should be favored over heavy weight vehicles. Exceptions to this would be for certain types of raw material and bulk commodities transport on selected routes. In some cases this traffic might be well served by rail. These strategies can create jobs and substantially reduce the costs of roads.

Redistribute Land

The development of new roads should be accompanied by land redistribution and secure land tenure to those living near the new roads. Otherwise, most benefits of the new roads will accrue to the landowners or those with the capital to take advantage of increased market access.

Educate the Public

Diverse programs and actions should be undertaken to influence public opinion in favor of less resource intensive transportation modes. Moreover, traffic discipline and safety should be promoted in the operation of both motorized and non-motorized modes.

Reassess Transport and Development Priorities

Rural extension agents should be afforded bicycles to enhance their productivity at low cost and to counter low-status associations that human-powered modes have in many countries. For the same cost of sending one jeep to

the front office of a development project, a whole fleet of all-terrain bicycles and carts can be sent to provide mobility to project participants, organizers, and agents.

Broaden Professional Education

Transportation professionals at all levels should be encouraged to consider non-motorized and informal modes of transport seriously when collecting and analyzing data; when designing facilities and policies; and when evaluating alternative solutions to mobility problems. Textbooks designed for traffic planning in the highly motorized and affluent United States are inappropriate for India, Mexico, or China.

Increase Funding for Research and Development

Funding for research on transportation problems in developing countries should be increased and a South-South technology transfer encouraged. Relatively small investments could produce significant improvements in traditional carrying devices and vehicles powered by humans, animals, wind, and sun, extending their range and utility at low cost. Funding is needed to support demonstration projects for the transfer of emergent low-cost technologies.

Build Institutions and Invite Community Participation

Technological research and training centers should study and respond to local needs and build community leadership and skills. Transportation projects should be designed in consultation with representatives of the poor and the users of slow transportation modes to identify alternative strategies for mobility enhancement; unmet travel needs; and ways of making projects most compatible with the interests of all potential users.

Conclusion

Most developing countries must look to each other for their models of development, not to the rich countries of the North, where high-capital and energy-intensive technologies have often displaced more sustainable low-cost and renewable-energy-powered technologies. Africa and Latin America have much to learn from Asia, where human-powered transport plays a vital economic role. In contrast the United States, with its dangerous dependence on the automobile, is a poor role model for transportation policy. Even at high levels of development, modernization does not need to imply full motorization, as demonstrated by many healthy and wealthy Dutch, Swiss, and Japanese communities.

Changes in development and transportation policies and programs are needed not only in the Third World, but also

in many advanced industrial and post-industrial countries, if development is to meet the needs of more than just the world's elite. The costs of failing to redirect transportation policies today will be paid in the decades to come through a sharply reduced quality of life in the world's cities; increased conflict between the mobile elite and the mobility-restricted poor; and reduced capacity for the global system to deal with the emerging problems of fuel, capital shortages, and atmospheric carbon dioxide build-up. The time for changes in policy is now.

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Sustainable transportation strategies provide for basic mobility needs.