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By Degrees

Buses May Aid Climate Battle in Poor Cities

By [ELISABETH ROSENTHAL](#)

BOGOTÁ, [Colombia](#) — Like most thoroughfares in booming cities of the developing world, Bogotá's Seventh Avenue resembles a noisy, exhaust-coated parking lot — a gluey tangle of cars and the rickety, smoke-puffing private minibuses that have long provided transportation for the masses.

But a few blocks away, sleek red vehicles full of commuters speed down the four center lanes of Avenida de las Américas. The long, segmented, low-emission buses are part of a novel public transportation system called bus rapid transit, or B.R.T. It is more like an above-ground subway than a collection of bus routes, with seven intersecting lines, enclosed stations that are entered through turnstiles with the swipe of a fare card and coaches that feel like trams inside.

Versions of these systems are being planned or built in dozens of developing cities around the world — Mexico City, Cape Town, Jakarta, Indonesia, and Ahmedabad, India, to name a few — providing public transportation that improves traffic flow and reduces smog at a fraction of the cost of building a subway.

But the rapid transit systems have another benefit: they may hold a key to combating [climate change](#). Emissions from cars, trucks, buses and other vehicles in the booming cities of Asia, Africa and Latin America account for a rapidly growing component of heat-trapping gases linked to global warming. While emissions from industry are decreasing, those related to transportation are expected to rise more than 50 percent by 2030 in industrialized and poorer nations. And 80 percent of that growth will be in the developing world, according to data presented in May at an international [conference in Bellagio, Italy](#), sponsored by the Asian Development Bank and the Clean Air Institute.

To be effective, a new international climate treaty that will be negotiated in Copenhagen in December must

include “a policy response to the CO2 emissions from transport in the developing world,” the Bellagio conference statement concluded.

Bus rapid transit systems like Bogotá’s, called [TransMilenio](#), might hold an answer. Now used for an average of 1.6 million trips each day, TransMilenio has allowed the city to remove 7,000 small private buses from its roads, reducing the use of bus fuel — and associated emissions — by more than 59 percent since it opened its first line in 2001, according to city officials.

In recognition of this feat, TransMilenio last year became the only large transportation project approved by the [United Nations](#) to generate and sell carbon credits. Developed countries that exceed their emissions limits under the [Kyoto Protocol](#), or that simply want to burnish a “green” image, can buy credits from TransMilenio to balance their emissions budgets, bringing Bogotá an estimated \$100 million to \$300 million so far, analysts say.

Indeed, the city has provided a model of how international programs to combat climate change can help expanding cities — the number of cars in China alone could increase sevenfold by 2030, according to the [International Energy Agency](#) — pay for transit systems that would otherwise be unaffordable.

“Bogotá was huge and messy and poor, so people said, ‘If Bogotá can do it, why can’t we?’ ” said Enrique Peñalosa, an economist and a former mayor of the city who took TransMilenio from a concept to its initial opening in 2001 and is now advising other cities. In 2008, Mexico City opened a second successful bus rapid transit line that has already reduced carbon dioxide emissions there, according to Lee Schipper, a transportation expert at [Stanford University](#), and the city has applied to sell carbon credits as well.

But bus rapid transit systems are not the answer for every city. In the United States, where cost is less constraining, some cities, like Los Angeles, have built B.R.T.’s, but they tend to lack many of the components of comprehensive systems like TransMilenio, like fully enclosed stations, and they serve as an addition to existing rail networks.

In some sprawling cities in India, where a tradition of scooter use may make bus rapid transit more difficult to create, researchers are working to develop a [new model of tuk-tuk](#), or motorized cab, that is cheap and will run

on alternative fuels or with a highly efficient engine. “There are three million auto rickshaws in India alone, and the smoke is astonishing, so this could have a huge impact,” said Stef van Dongen, director of [Enviu](#), an environmental network group in Rotterdam, the Netherlands, that is sponsoring the research.

Bus rapid transit systems have not always worked well in cities that have tried them, either. In New Delhi, for example, the experiment foundered in part because it proved difficult to protect bus lanes from traffic. And a system that does not succeed in drawing passengers out of their cars just adds buses to existing vehicles on the roads, making traffic and emissions worse.

But with its wide streets, dense population and a tradition of bus travel, Bogotá had the ingredients for success. To create TransMilenio, the city commandeered two to four traffic lanes in the middle of major boulevards, isolating them with low walls to create the system’s so-called tracks. On the center islands that divide many of Bogotá’s two-way streets, the city built dozens of distinctive metal-and-glass stations. Just as in a subway, the multiple doors on the buses slide open level with the platform, providing easy access for strollers and older riders. Hundreds of passengers can wait on the platforms, avoiding the delays that occur when passengers each pay as they board.

Mr. Peñalosa noted that the negative stereotypes about bus travel required some clever rebranding. Now, he said, upscale condominiums advertise that they are near TransMilenio lines. “People don’t say, ‘I’m taking the bus,’ they say, ‘I’m taking TransMilenio,’ ” he added, as he rode at rush hour recently, chatting with other passengers.

Jorge Engarrita, 45, a leather worker who was riding TransMilenio to work, said the system had “changed his life,” reducing his commuting time to 40 minutes with one transfer from two or three hours on several buses. Free shuttle buses carry residents from outlying districts to TransMilenio terminals.

To the dismay of car owners, Bogotá removed one-third of its street parking to make room for TransMilenio and imposed alternate-day driving restrictions determined by license plate numbers, forcing car owners onto the system.

With an extensive route system, TransMilenio moves more passengers per mile every hour than almost any of

the world's subways. Most poorer cities that have built subways, like Manila and Lagos, Nigeria, can afford to build only a few limited lines because of the expense.

Subways cost more than 30 times as much per mile to build than a B.R.T. system, and three times as much to maintain. And bus rapid transit systems can be built more quickly. "Almost all rapidly developing cities understand that they need a metro or something like it, and you can get a B.R.T. by 2010 or a metro by 2060," said Walter Hook, executive director of the [Institute for Transportation and Development Policy](#), in New York.

Although TransMilenio buses run on diesel, their efficient engines mean they emit less than half the nitrous oxide, particulate matter and carbon dioxide of the older minibuses. Cleaner fuels were either too expensive or did not work at Bogotá's altitude, 9,000 feet above sea level.

TransMilenio is building more lines and underpasses to allow the buses to bypass clogged intersections, but for the moment the real challenge is overcrowding. Juan Gómez, 21, a businessman, takes TransMilenio only on days when he cannot drive, and he griped that it was often hard to find a seat.

"It's O.K., but I prefer the car," he said.

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