

SMARTCITIES:

Curitiba

TIM CAMPBELL

To be competitive, cities must act a little like companies, creating a learning milieu by building a knowledge machine.

CURITIBA, A CITY OF 2.3 MILLION PEOPLE IN southeastern Brazil, is a reference point, even an archetype, for any number of areas in urban planning and design. It is viewed as sustainable and green among environmentalists; as an innovator in bus rapid transit among urban transport specialists; as a creative user of property-rights swaps to create parklands among planners; and as a place of exemplary local leadership among those in governance. How can a city be considered an example of success for so many different specialties in urban development?

The answer is an often-overlooked factor that for three decades has played an important role in these innovations and that to this day helps keep the city “smart.” That factor is the unassuming Curitiba Urban Research and Planning Institute (Instituto de Pesquisa e Planejamento Urbano de Curitiba, or IPPUC). IPPUC (pronounced *eepooke*), an analytical group that serves as the cerebral center for the city, makes important contributions to scores of innovations, yet is scarcely recognized by professionals.

Smart cities are places that have formed a capacity to gather and hold data, share stored memory, and use this information intelligently to solve problems and innovate. A growing number of cities in many parts of the world are building this capacity, partly in response to global pressures to hold or advance a competitive position in trade or deal making. Bilbao, Spain; Seattle, Washington; and Curitiba all fit this description, though each has attained “smartness” by different means and with different agencies. (See “Smart Cities: Bilbao,” July 2006, page 56.)

Founding Moments: Rapid Growth over a Gossamer Plan

To understand how Curitiba began to get smart, one must turn back to the 1940s when the city had less than one-tenth its current metropolitan population. Then, from the 1950s to the 1970s, it was Brazil’s fastest-growing city. As a center of European migration and the site of Brazil’s first university, Curitiba benefited from influences that were atypical of Brazilian cities. One was the creation in 1943 of a city plan, the Agache Plan, which laid out radial corridors for future growth.

Though unpopular at the time, the plan turned out to be a fortunate move for Curitiba. Pressures of agricultural mechanization and falling coffee prices, complemented by the attraction of urban opportunities, began to push rural populations off the land and into cities. Curitiba’s population shot up from 127,000 in 1943 to 461,000 in 1960 to over 609,000 in 1970. Rapid growth brought many familiar problems—congestion in the center, incomplete infrastructure, and squatter settlements. One acute issue was settlement by the poor in floodplains surrounding the city, resulting in recurring losses of property and life during years of heavy rainfall.

With the onset of military dictatorship and economic expansion in Brazil’s “miracle years” of 1964 to 1973,

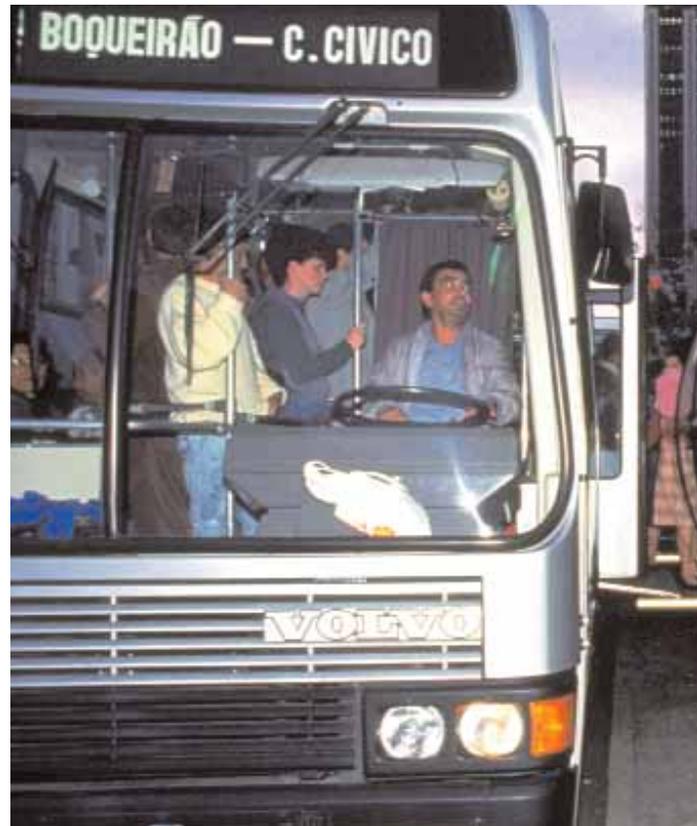




The Curitiba Urban Research and Planning Institute/Instituto de Pesquisa e Planejamento Urbano de Curitiba (IPPUC) broke the automobile's grip on the city back in 1967 by closing a street, later named Flower Street, to vehicle traffic in favor of a sidewalk mall in the middle of downtown.

Curitiba's Time Line

1943	Agache Plan (Curitiba's city plan) created
1965	IPPUC created
1966	Curitiba master plan approved
1967	Creation of pedestrian mall in city center
1972	Inauguration of Flower Street
1974	First two busways begin service
1989	Jaime Lerner elected mayor
	Inauguration of "Trash That Isn't Trash" program
1991	Express bus with tube stops begins service
	Inauguration of Green Exchange program
1992	Bi-articulated buses begin service
	Passage of Curitiba Resolution, a founding document for Agenda 21 of the United Nations Earth Summit in Rio de Janeiro
1993	Flood control works begun and parklands completed
1995	Lerner becomes governor of Paraná
1996–1997	Revitalization of historic quarter in city
2000	Intensification of public participation in city and linkage of city to residents



the automobile began to exacerbate traffic jams in cities. Most Brazilian cities took advantage of the military government's ambitious investment program to build highways and viaducts, thus establishing the predominance of the private car. Curitiba, however, developed an alternative course of action, even though cities enjoyed comparatively little autonomy in those days.

Feeling the pressures of growth, city leaders began to put in place machinery to reach a new vision of the city—"Curitiba Tomorrow," a master plan to loosen the knots and tangles of rapid expansion. The Agache Plan was a starting point. It had given the city transit rights-of-way and confidence that city planning could help. City leaders spoke of an integrated transport system, reducing congestion and preserving the traditional center of the city. They also sought to address the issue of sprawling settlements in floodplains.

IPPUC was created in 1965 to carry out the plan. Most cities count on their internal planning departments to create urban plans; IPPUC was designed to go further. The founders saw to it that IPPUC had the power to

propose regulations and laws needed to make the plan work, as well as the muscle to implement it. The institute was given contractual powers, plus authority to conduct urban research, and collect and manage data on the city. Much work was needed to win the support of neighborhood organizations, commercial groups, and the business community.

Like a city manager handles chief executive functions in U.S. cities, IPPUC handled planning and analysis in Curitiba. As the city's thinker and doer, IPPUC was given private sector features—for instance, high salaries for employees and the freedom to hire and fire—enabling it to attract top analytical talent and to escape the deadening impact often seen in quasi-public agencies in Latin American cities. IPPUC is supervised and regulated by a board of directors with political and technical representation.

One of the first, and perhaps signal, achievements of IPPUC was to break the grip of the automobile on the city. Though more common today, IPPUC's idea to close a street to vehicle traffic in favor of a sidewalk mall in the middle of downtown was unheard of in Brazil at the



“Fast routes”—dedicated traffic lanes—run from outlying neighborhoods to downtown Curitiba, greatly facilitating bus speed to the city center. Tube stations, shaped like long cylinders, have above-grade platforms where passengers embark and disembark at the same level as the bus carriage, plus fares are prepaid inside the tube—both cutting transit time required at bus stops.

to commercial establishments. On streets crossing fast lanes, construction was allowed up to a density of 12 times the area of the land, with 16-foot (5-m) setbacks.

The fast routes greatly facilitate bus speed to the city center. Buses are given dedicated lanes; small curbs keep automobile traffic from intruding into bus expressways. Automobiles run in single lanes parallel to the bus routes. Though these ideas were not complicated technically, and by today’s standards are somewhat routine, planners and managers worked for three years to achieve public understanding and acceptance of the scheme. In the end, IPPUC had helped Curitiba to create a rapid busway before the term even existed.

Experienced leaders such as Jaime Lerner, one of the first directors of IPPUC and later three-time mayor of Curitiba and governor of Paraná, helped integrate land use and the transport system, bring in private operators and revenue sharing, and emphasize equity in service for the poor. (See page 73.)

Each step of expansion and improvement built on previous innovations. For instance, electronically coordinated signaling systems created “green waves” conveying speedier traffic. Later, with the help of TV cameras and electronic scanners installed at strategic intersections in town, computerized control allowed traffic counting and adjustment of traffic lights during commuting hours.

IPPUC played a role in developing innovation upon innovation to create one of the world’s best public transit systems. In effect, the Curitiba system is a bus service that runs on the surface similar to the way subway systems run underground. The innovations include:

■ **Unified tariffs and revenue sharing, established across the city.** This system not only encourages bus transit, but also makes it possible for operators of small bus lines, including feeder and transfer lines on the periphery where little money can be made, to stay in service. A cross-subsidy compensates operators on smaller and less popular routes.

■ **The tube station.** Shaped like a long cylinder, the tube station is an above-grade platform where passen-

time. Initially, commercial businesses mounted stiff opposition to closing the roadway, later to become Flower Street, but the idea prevailed and quickly won widespread support.

The meek beginning at Flower Street was tied to a much larger scheme. Planners sought a wholesale restructuring of the city’s traffic, envisioning linear routes, preserved from the days of the Agache Plan, radiating from the city center. Along the spokes, residential and commercial establishments would be formed with the help of land use regulations. High densities along these routes, with declining densities perpendicular to the main axes, would reinforce the feasibility of the transit scheme.

In addition, a new land use plan was approved. It established building regulations that permitted construction density of up to 22 times the land area between the “fast routes”—dedicated traffic lanes running from outlying neighborhoods to downtown. The master plan required that buildings facing public transportation routes have a fixed percentage of their area dedicated

gers embark and disembark at the same level as the bus carriage, much as is done on a passenger platform at a subway station. Bus fares are paid inside the tube before passengers board. These two innovations—level of entry and prepaid fares—greatly cut the transit time required at bus stops.

■ **High-speed express buses and bi-articulated buses.**

These were introduced on the more heavily traveled north-south routes. The bi-articulated buses—jointed buses with two extra axles and seating areas—have a larger capacity of about 270 passengers, allowing up to 11,000 passengers per hour to travel in one direction during rush hour.

Step by step, with critical input from IPPUC, a new and innovative form of public rapid transit was invented in Curitiba and has inspired similar systems in Bogotá, Colombia; Mexico City; Santiago, Chile; and many other cities in Latin America and elsewhere.

New Challenges: Social Issues, Trash, Flooding

A protracted period of hyperinflation in the 1980s, coupled with political and administrative decentralization that constituted a wholesale change in the role of governments, created a need for new attention to social issues. IPPUC—able to draw on data on needs for schools, health clinics, and daycare centers—played an important role in analysis and proposals in many realms.

■ **Street vendors.** Many cities in the developing world have problems with street vendors—petty traders who take to the streets to sell merchandise or food. IPPUC participated in the organization of these small-scale (often called “informal-sector”) merchants into an association in which 600 people were registered. A program was launched to support a project to design and build 600 metal carts, which were attractively painted and covered with small awnings, then placed in regulated parking lots on 200 corners in the downtown area. The carts were leased at low rates to the vendors. The vendors association was instrumental in preventing new informal vendors from establishing themselves in the downtown area.

■ **“Trash That Isn’t Trash” program.** Squatters in Curitiba, as in most cities of Latin America, form high-density settlements in areas such as hillsides and floodplains, where mechanized methods of solid waste removal do not operate well. A publicity and education campaign, along with food donations, helped persuade low-income residents to separate their trash into organic

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and inorganic waste and deposit colored bundles at collection points. The recyclable waste was collected by a private contractor once a week and taken to a processing center owned by the city. Beginning in 1989, the city employed homeless people and recovering alcoholics to sort the trash into different types of materials. The trash-purchase scheme and the “Trash That Isn’t Trash” program were linked: proceeds from the sale of the recycled materials went to finance the purchase of surplus food from farmers. In 1991, the trash program evolved into Green Exchange, through which food was given to the poor in exchange for collected trash.

■ **Flood control.** The city’s horizontal expansion had been encroaching on floodplains since the 1950s. Flood control works were completed in the 1990s, but large tracts of land were still vulnerable to occupation and flooding. Ribbons of riparian floodplain were assembled with the help of clever property swaps in which landowners were offered parcels outside the floodplain. Soccer fields, playgrounds, and recreational areas were placed in the vulnerable areas, helping prevent renewed settlements. About this strategy, Lerner later quipped, “Nobody squats on a soccer pitch in Brazil.”

The result of Curitiba’s land reclamation program is a city with one of the highest ratios among Western cities of green area per inhabitant—540 square feet (50 sq m). The floodplains-turned-parkland provide Curitiba with more than 87 miles (140 km) of bicycle paths, plus neighborhood parks and in-city forest reserves.

Q&A with
JAIME LERNER

CHARLES LOCKWOOD

The city was characteristically inventive in its public education program about cities and rivers. School materials were developed to raise children's awareness as a technique to educate their parents, the voters, about the importance of rivers in the cities. One technique was to paint pictures of inquisitive fish in school buildings and apartment elevators. The fish asked the viewer, "Where is the nearest river?"

How Cities Get Smart

Though it is not the only center of planning and analysis in the city, IPPUC has made singular contributions to innovations in transport, land use, solid waste, low-income settlements, parklands, and flood control. Most of these breakthroughs entail many smaller changes, and these evolved in mutually reinforcing ways. Few, if any of these innovations would have been possible without the analytical and executive powers of IPPUC.

IPPUC did not have the scope of vision of the development agency in Bilbao nor Seattle's aggressive acquisition of knowledge. IPPUC's view has been tempered by practical, operational considerations. Like Bilbao's development agency, IPPUC did have the technical data—the lifeblood of planning, analysis, and community education—that helped it explain and sell its ideas both to the city and to metropolitan stakeholders and government officials at all levels.

Curitiba shows that to be competitive, cities must act a little like companies, organizing themselves to create a learning milieu by building a knowledge machine—a mechanism to harvest and absorb information over time and make it available for analysis, planning, and implementation. **U**

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(An article on Seattle will appear in a future issue of *Urban Land*.)

Jaime Lerner of Curitiba, Brazil, has won worldwide recognition as an architect and urban planner, a professor, the governor of the state of Paraná in southern Brazil, and, in particular, as mayor of Curitiba, a city that has become a model of sustainability, social betterment, and economic growth. Now, Lerner is focusing on these critical issues in other nations, including China. Few people better understand what makes for a successful and humane city than Lerner.

**What do you see as the most serious sustainability problems in the world?**

Many people are starting to be concerned about the seemingly impossible sustainability issues worldwide. Sometimes, we start to feel like terminal patients—like there is nothing we can do about the problems.

In my view, the most serious sustainability problem facing the world is failing to understand the role that cities can play. What are the main problems of carbon emissions? Most of the problems are related to our misconception of the city, particularly to mobility and to the misuse of the automobile. It's simply not enough to have green buildings, and it's not enough to have new sustainable materials. Instead, it's in the conception of the city, and of urban transport, where we can begin solving the problem.

Besides the normal problems of cities—like housing, education, health care, the care of children, safety—there are three main environmental issues that are fundamental, not only for one particular city, but for all of mankind.

The three main environmental issues are mobility, sustainability, and social diversity.

Let's speak about mobility. I am concerned about how, in every city, we are postponing the

problem. We know that cars are responsible for such a large percentage of carbon emissions. We know that we have to provide good alternatives through public transport. But new and effective manners of public transport are hardly even discussed, let alone implemented.

Every city in the world can improve the quality of its mobility in three years. That's the normal term of a mayor. I'm sure of this, from my experience of working on cities for 40 years. It's not a naive position: it is possible. All I am doing in many cities of the world as a consultant is giving the testimony that this is possible to do.

Many places are trying to solve the problem of mobility through costly systems, which take a lot of time to do and need subsidy. In New York City, they have been talking about building the Second Avenue subway line for 50 years. If they start next year, it will take 20 years—that means 70 years from the original idea to completion. [Construction on the line began a quarter century ago, but the four completed tunnel sections were sealed when work halted.]

The Second Avenue line is supposed to cost \$3.8 billion. But it would not even transport more people than the light-rail line in Curitiba, Brazil, right in front of my house, which we built in less than two years!

I am sure that the future of urban transportation is in surface mass transit—in a surface system that has the same performance as a subway. You can give a surface system the same performance as an underground system, but you can construct it much faster to serve more passengers with higher quality. I call tell you, because I did it. Now, over 80 cities are implementing systems like the ones that I implemented in Curitiba.

Five Commandments of Sustainability

1. Use your car less.

Use it less in your routine itinerary when you can take public transit. Of course, you must have a good alternative transit system in the first place to do that. Every city in the world must offer that alternative. If not, we are really in trouble.

2. Either live closer to your work or bring your work closer to home.

It will be impossible to continue our current mode of living—of living in one place and working on the other side of the city, or having leisure on one side. We cannot waste energy, including our own energy or time, always going back and forth.

3. Separate your garbage.

Simple.

4. Understand that sustainability is the integration of saving and wasting, where you save at the top, and waste less on the bottom.

The more you save, the less you waste.

5. Have multiple uses for all urban facilities.

We cannot afford to have downtown districts empty for 16 hours a day or a big arena used just ten times a year. An arena could be a farmers market in the morning, or serve university uses, or be used at night for big events.

The key concept of urban mobility is that different types of transportation should never compete in the same space. And that is a good concept of mobility: trying to make what you have better.

What about sustainability?

Let's go to sustainability. If you and I want to help create a more sustainable world, what is possible for every person to do? There are five commandments of sustainability.

One, use your car less. I'm not saying don't use it. Just use it less in your routine itinerary when you can take public transit. Of course, you must have a good alternative transit system in the first place to do that. Every city in the world must offer that alternative. If not, we are really in trouble.

Two, either live closer to your work or bring your work closer to home. It will be impossible to continue our current mode of living—of living in one place and working on the other side of the city, or having leisure on

one side. Cities must integrate functions. We cannot waste energy, including our own energy or time, always going back and forth.

Fortunately, today, the generators of jobs, the industries or services, are diminishing in scale. The major industries—food, services, and so forth—can be closer to your home. And they are no longer noisy or dirty. That's a good asset for our cities now and in the future.

Third commandment, separate your garbage. Simple.

Fourth, we have to understand that sustainability is the integration of saving and wasting, where you save at the top, and waste less on the bottom. So, the more you save, the less you waste. If your waste is zero, your sustainability goes to the infinitum.

Fifth and finally, an important issue: have multiple uses for all urban facilities. We cannot afford to have downtown districts empty for 16 hours a day or a big arena used just ten times a year. An arena could be a farmers market in the morning, or serve university

uses, or be used at night for big events. It's incredible that they are used just ten times a year. Multiple uses make the city more compact.

What about the third major environmental problem that you identified: diversity?

A city is more human when it mixes urban functions—living, working, and leisure—when it mixes ages and income. The more you mix uses, ages, functions, and incomes, the more diverse it is—the more human.

We must have diversity not only in ages and incomes, but also in religions and backgrounds. If you have a contact with your neighbor, you are not an enemy, you coexist—it is a healthy coexistence.

I like better the expression of the former president of Portugal, Mario Suarez: we have to globalize solidarity. The city is the best refuge of solidarity. That means, if a country, every government, doesn't have a general view about their cities and a general view about people, my feeling is—history shows us every time—when we try to work on the economy separated from the human settlements, we have disaster. When we are speaking about Latin America, it's a severe problem of detachment.

What course should political and community leaders take to boost sustainability? Or, for you, are these issues directly tied to all politics, not just environmental issues?

How can we be closer to people? We must propose a high quality of life—meaning a goal above mere economic ones. Many times, I was watching or listening to debates between candidates for president in many countries, and the big discussions were about numbers—for example, I propose more millions of jobs than you.

My own feeling is, never did I see a discussion of the whole scenario for a whole country or a state. I was in Lima, Peru, once, and I saw written on the wall, "Enough Public Works, We Want Promises." It was a joke, of course.

In most countries, there's a lack of creativity and innovation. But do you know what the main problem is? People seek complex solutions when simple ones often work better. What are the secrets of my city? I would say commitment to simplicity—that is, not being afraid to be simple, because a city is not as complex as people tell us. There are a lot of “complexity sellers” around the world. We should beat them with slippers.

The second approach is not wanting to have all the answers. Why are people so ambitious to have all the answers? If you want to have all the answers, you will never start. So, if you want to have innovation, it's 50 percent of the process—the start. Why? Give the people a chance to correct you. That's the main issue: listening and not losing your creativity.

Where does Latin America excel in comparison to other nations or regions in solving sustainability and growth problems? What lessons or best practices does Latin America offer other nations?

I can give you a quick answer. The lack of resources helps Latin America to be more effective, more creative. You are more creative when you have less. That is, if you want to be more creative, take out a zero from your budget, if you want to be really creative, cut two zeros.

We cannot cut programs that are tackling serious problems, however. I could never cut our education and health care programs when I was mayor. I tried to make a creative solution on sustainability with the money that was left.

Where does Latin America fall behind other nations in solving sustainability and growth problems?

For our needs, we have to find quicker answers. We are very fast-growing countries. We don't have enough time. We have to understand that it must be fast; it has to start. Other nations, without this growth problem, can have more time.



“What are the secrets of my city? I would say commitment to simplicity—that is, not being afraid to be simple, because a city is not as complex as people tell us. There are a lot of ‘complexity sellers’ around the world. We should beat them with slippers.”

What about of lack of enforcement of environmental laws in some Latin American countries?

I give you an example about separation of garbage. It's not about taxing people or passing regulations. Rather, it's convincing people. They have to understand the result of their attitude. If you can explain, if people are convinced, they will help you. It's not taxing or forcing by law. If you force too much, they will always try to find a way to evade the law.

You have worked as an urban planner in China. What do you think of its industrialization and rapid urbanization? Is it good, is it bad, or a mixture of good and bad?

I know China, but not well enough. China is a very complex situation. If you look at Shanghai, it is more like a *Flash Gordon* landscape. In other issues, they are mostly like *Blade Runner* landscapes. You can go from *Flash Gordon* to *Blade Runner* very easily.

If China wants to commit to a more sustainable policy, it will commit. They have this will; it's an incredible country. That's my hope, that they want to commit more to a more sustainable world. They can do it faster, but there are still big, big problems there. I have a lot of hope that they can. If they have a big commitment, they have this kind of will to make it.

Do people worldwide need to change their attitudes or their values about what's desirable and what's not if we are going to successfully tackle the truly daunting sustainability challenges?

Every country, including China, is trying to build the tallest building in the world. The *Guinness Book of Records* names a tallest

building in the world. We should change that rating to the most sustainable city.

I am obsessed about one idea: teaching children about their cities, trying to make them understand their own cities. At Curitiba, we started with the separation of garbage. We taught children in our schools for six months. They went home, and they taught their parents. That was an incredible experience.

What we need is a Museum of Sustainability in many cities—in fact, not a museum, but a place where we have sustainable games, where we teach the five commandments of sustainability how many carbon emissions from your house, or to your parents' job. You will have a more sustainable world with that kind of education.

Can the many nations that suffer from widespread poverty, warfare, and serious disease improve their environmental and growth problems? Is sustainability a luxury that some nations cannot afford?

You are right. That's a good question. Sustainability is not a luxury, it's a need. In fact, the more poverty we have, the more we need sustainability. The bigger respect, because sustainability has to do with the solidarity, [is having] solidarity not only with your own generation, but also with the next generations.

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