

BOGOTÁ, THE METAPHOR FOR A MONSTER WITH EVER-INCREASING ENERGY CONSUMPTION

Cities are living, giant organisms that consume energy and many other materials. This information makes it possible to make decisions about their efficiency, however. A study of urban development and sustainability is currently under way and making use of relevant data analysis at the Faculty of Political Science, Government and International Relations of the Universidad del Rosario.

By Denise Danielle Bourne
Photos Alberto Sierra
Milagro Castro

Like rampaging, giant predators, cities tear past their frontiers, consuming more and more resources, producing tons of waste and releasing emissions into the atmosphere. So, is the growth of a city such as Bogotá actually sustainable? It consumes water from a sweeping natural region, fuel, electricity, construction materials and food, 65% of which has to be brought in from outside, with only 35% generated in the Cundinamarca region, less than 3 hours from the capital. "Bogotá is a big importer of foodstuffs while those of agrarian origin are quickly damaged," points out Professor William H. Alfonso Piña of the Universidad del Rosario's Faculty of Political Sciences, Government, and International Relations.

This academic teamed up with Clara Inés Pardo, professor at the School of Management and Business, an expert in energy efficiency who has worked on environmental questions in urban settings in both Germany and Colombia. Both set out to get beyond traditional urban studies methodology and carry out research with more empirical evidence, in other words with data.

This meant Alfonso and Pardo setting up baselines with available information to achieve deeper and more useful analysis on exploring new modelling methods. They are currently employing Data Envelopment Analysis (DEA), a traditional tool for measuring the relative efficiency of a set of productive units. This expert believes that cities are not islands; they form part a region, and for this reason the Faculty has spent nearly five years on research related to the search for options for efficient regionalization and productivity.

"How much do cities consume? How much do they consume in energy, fuel, construction materials, food and water? And how much waste and emissions do they create? With these questions we began to analyze studies of life cycles and material flow, and on the basis of some of the first results a first paper was published in an international journal," says Alfonso.

CITIES AND THEIR METABOLISM

They recognise, however, that it was not possible to calculate metabolism as such, in other words how much of this remains in Bogotá's urban ecosystem. "It is very difficult to measure the metabolism of cities' cycles. It is usually measured in terms of energy to see how much is consumed, with the productivity of a city then being determined; if consumption en-



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ergy is crossed with GDP, for example, on the basis of its imports and exports we can work out what was done with the energy and materials,” he claims.

There are certain ways to measure this city metabolism by using information on energy consumption. Nevertheless, the researcher adds, “if all you do is study energy assuming that there are associated indicators, inconsistencies can crop up, taking into account that some methodologies in the world assume that the more energy consumed, the more developed the city will be, and in our medium that could lead to error.”

In Bogotá, they decided to observe efficiency in industry and, within that, the manufacturing sector set up in the capital. “Clara had experience because she had already carried out an efficiency analysis in Germany, and this was behind our saying: why don’t we start with the Colombian city and then Latin American cities, later comparing these cities on a global scale?”, recalls Prof. Alfonso. Bogotá gave plenty of information, and there were other clusters that were standing out such as Barranquilla, which had innovation and competitiveness rankings higher than those of

Bogotá; Bucaramanga, Medellín, and the Coffee Belt also had information and showed interesting performance rates.

To calculate with the DEA analysis tool, it is necessary to run a program with the data, a process that can take several hours and even days. It is called ‘double envelopment’ because it is a results-optimization process that measures not only the

pure efficiency of the components but also relative efficiency on taking advantage of the possibility of grouping analysis units in frontier zones that the actual model creates.

Bogotá is an immense city. How can it be compared to Manizales, which is small? For Professor Alfonso it is clear that examining relative efficiency makes it far easier to compare cities of different sizes, hence these researchers are more interested in observing relative rather than pure efficiencies.

Information on relative efficiencies means comparisons can be carried out between different sectors, thus determining what cities or sectors are more efficient. Working with this assuredness, Alfonso and Pardo tested their analysis on 12 cities, even though some did not produce significant values. However, the study did come up with a very interesting

finding: Bogotá, Medellín, and Cali are the cities that use the most energy and which produce comparatively very little as a

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↑ William Alfonso Piña, professor in Urban Management and Development, remarks that cities are not islands but form part of a region, and for this reason the Faculty has spent five years researching options to boost efficient regionalization and productivity.

surplus to export. Conversely, when relative efficiencies were measured, the most efficient and sustainable cities turned out to be the smaller capitals, such as Manizales and others in the Coffee Belt.

“Manizales and other small cities had greater energy efficiency and are more productive on comparing them with big cities in which residential fabric takes priority. Bogotá, for example, has no industries and specializes in tertiary services, possessing a huge residential fabric that causes energy, water, and food consumption—among others—to rise, but without its exports being significant. The industries are placed outside,” explains the experts.

If the professor appears to be critical of the bigger cities, the evidence certainly bears him out: “Bogotá consumes a large quantity of energy, and compared to other cities using basic indicators, it is not so efficient because it produces less, while quality of life is limited, there isn’t good social coverage, and income is less, all in comparison with cities such as Manizales, which have higher indicators. In Bogotá we are devoted to services and business, and we do not have a real sector for producing things we can exchange and export. Our industry percentage has been falling and we went from having 15 percent

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industry to only 5 percent, and some estimates indicate that this percentage could be even smaller.”

The researcher affirms that Bogotá consumes much less energy per person, but this is almost exclusively for domestic use, such as watching television. The city’s residential fabric is extended every day, however, and this creates more energy consumption but not necessarily any production of goods.

The metaphor of the monster remains ripe for explaining that “Bogotá is a large predator that receives 6,000 tons of construction materials a day, a phenomenon that saw the Facatativá hills disappear because people want to keep using brick and stone, remodelling spaces hastily, hence more consumption of materials,” points out Professor Alfonso with concern.

While we know that sustainability in big cities is more difficult than in smaller ones, there remains a task for we citizens: to adjust our consumption voluntarily, rationalize our waste, and be more productive, as well as finding ways to get across the worth of such state-of-the-art research as this in understanding urban sustainability. ■