

<http://www.nae.edu/Publications/TheBridge/Archives/V29-4UrbanizationEngineering/MegacitiesandtheDevelopingWorld.aspx>

Megacities and the Developing World

[George Bugliarello](#)

[The Bridge, Volume 29, Number 4 - Winter 1999](#)

The large urban agglomerates we call megacities are increasingly a developing world phenomenon that will affect the future prosperity and stability of the entire world.

The concentration of the world's population in urban areas is growing at an enormously rapid rate, and within that phenomenon, projections call for even more rapid growth of megacities, currently defined by the United Nations (UN) as cities of over 10 million people.¹ From 1975 to 2015, the number of megacities will have grown from five -- three of them in the developing world -- to 26 -- all but four in the developing world (UN, 1998).

The definition of what is a megacity is clearly arbitrary, as the population concentration that differentiates megacities from other urban areas changes with time and context. In the ancient world, Rome, with its over 1 million inhabitants, was a megacity, and today, London or Chicago could be considered megacities, even if they fall below the 10 million UN threshold.

Although there are numerous examples in the developed world, megacities are primarily a phenomenon of the developing world. If one considers population projections for the 11 largest urban agglomerates in 2015 (Figure 1), in 15 years most of the largest cities of the world will be in the developing world, a significant change from the largest city populations in 1980 and 1994. Although Tokyo will remain the largest city in the world, New York, at second place in 1980 and 1994, is projected to be at the bottom of the list by 2015, while Mumbai will have climbed from sixth to second place, and Jakarta from last to fifth place. Both Tokyo and New York are experiencing relatively modest population increases, and a number of other large cities in the developed world are experiencing population declines. In contrast, the populations of developing world megacities are typically growing from one to five percent per year, although these rates are expected to abate somewhat in the next 15 years (UN, 1998). However, if all the megacities of the world -- developed and developing alike -- have one factor in common, it is the great diversity in many of their salient indices, from cost of living to mobility, that often reflects differing approaches to public policies (Parker, 1995).

Despite the fact that megacities are increasingly a phenomenon of the developing world, there are three major reasons why the developed world needs to pay attention to them. First, *what happens in the megacities of the developing world affects the rest of the world*. The combination of high population density, poverty, and limited resources makes the developing world megacity an environment which favors the incubation of disease, from cholera to tuberculosis to sexually transmitted

infections, that in an age of rapid communication can almost instantaneously be propagated to the rest of the world. Vulnerability to terrorism, natural hazards, ecological disasters, war conditions, and food scarcity are also exacerbated in the megacities of the developing world. As recent episodes have shown, attacks against embassies, businesses, and travelers directly affect the developed world, particularly the United States.

Megacities, both in the developed and the developing world, are places where social unrest often originates, as demonstrated currently in Jakarta, and historically in Paris and St. Petersburg, the megacities of their time that sparked the French and Russian Revolutions. Such unrest affects the rest of the world, as do other phenomena of megacities, including the rate at which their residents emigrate to other areas, and the competitive challenge presented by their cheap labor forces. Last but not least, the ecological impacts of sprawling megacities extend to other regions of the world, as seen with the air pollution generated by millions of households burning soft coal, or with the disposal of waste, a universal problem epitomized by the odyssey of New York City's waste-laden barges.

The second major reason to pay attention to megacities is that *they are key instruments of social and economic development*. In a world concerned with the growth of the global population, megacities are strong indicators of both present and future conditions: they have become instruments for dramatic birthrate reductions in comparison to other regions of the countries in which they are situated; they are instruments to promote human genome diversity because they attract diverse populations; they are the site of cultural and educational institutions that promote social development; they often set the tone for a nation's social values; and they are powerful instruments of economic concentration (for example, today Karachi generates 20 percent of Pakistan's gross domestic product and provides 50 percent of government revenues).

A third reason to pay attention to megacities is that *they offer new market opportunities to both the developing and developed world alike*, as discussed further below.

Megacity Dynamics

To understand the role of the megacities in our world today, we need to understand their dynamics. A megacity is a complex organism and its development is largely a spontaneous process. It is not an entity that can

be totally designed, as has been learned from a number of planning failures, exemplified by Brasilia, or, in New York and several other U.S. cities, by the so-called projects for low-income tenants. However, if it cannot be totally designed, the megacity can be guided in its evolution through realistic planning.

The first question, in terms of dynamics, is: Why do megacities attract? Why do such large populations flow to them and want to live in them? In the developing world, megacities attract those who are seeking a better life -- a higher standard of living, better jobs, fewer hardships, and better education.

The second question is: Why, if they have such force of attraction, do megacities have what appears to be a formidable set of increasingly intractable problems? The problems of megacities include:

- Explosive population growth.
- Alarming increases in poverty that contradict the reasons why a megacity attracts (World Bank, 1991). A concentration of the poor and jobless occurs both in the developing world and, on a smaller scale, in the developed world, as evidenced by the number of unemployed in New York City.
- Massive infrastructure deficits in the delivery of telecommunications services, the availability of transportation, and the presence of congestion. For example, traffic congestion in Bangkok is so bad that the average commute now takes three hours (World Resources Institute, 1996).
- Pressures on land and housing. China concentrates 5.7 persons per room, as compared to 0.5 persons in the United States.
- Environmental concerns, such as contaminated water, air pollution, unchecked weed growth due to the destruction of original vegetation, and overdrawn aquifers. For instance, Mexico City's aquifer is being overdrawn and is sinking by about 1 meter per year (World Resources Institute, 1996).
- Disease, high death rates, drug-resistant strains of infection, and lethal environmental conditions. For example, 12.6 percent of the deaths in Jakarta are related to air pollution causes (World Resources Institute, 1996).
- Economic dependence on federal or state governments that constrains the independence of megacity administrations.
- Capital scarcity, the factor that shapes the economy of the megacity and aggravates its other problems, from infrastructure to environmental deterioration.

These problems are increasingly intractable because megacities are experiencing very rapid growth with which they cannot cope. Coincident with rapid growth, these problems are occurring in environments where the populations, having flocked to the megacities in hopes of a better life, have ever higher expectations which are generally greater than the ability of a megacity to respond to them.

Megacity problems are exacerbated by what are usually serious deficits in the realm of knowledge. These are deficits in the generation of knowledge, such as the research necessary to address the problems of the megacity, and in the dissemination of knowledge, e.g., in the educational systems. Equally serious are deficits in the utilization of knowledge by the relatively poor and uneducated populations of the megacities. Since megacities are larger than many a nation, they need to address these crucial deficits in knowledge with the same seriousness with which nations address them, through research, education, and other instruments for the generation, diffusion, and utilization of knowledge.

Of all the challenges confronting the megacities, one of the most difficult and urgent for their stability, and for that of the rest of the world, is employment. Today there are 1.5 billion jobless people in the world. One billion more jobs will have to be provided in the next 25 years, a substantial portion of them in the megacities. This will be an enormous challenge, as it calls for a drastic transformation of the work picture in the megacities of the developing world. Today those megacities are characterized by substantial unemployment, low productivity among those who are employed, a large service sector, a small manufacturing sector, and a large and generally inefficient government sector. There is also a large informal sector of employment in family enterprises and small enterprises, from peddlers to small retail stores, which is quite different from the formal sector of large companies and the government.

The employment difficulties are compounded by limited job mobility, inadequate transportation to jobs for poorer citizens, and the lack of legal protection for workers, particularly in the informal sector. This lack of jobs, coupled with the lack of housing and the conditions of life at the margins of the megacity, physically speaking in the barrios and favelas, and figuratively speaking in the lack of sufficient attention to needs, has led to the growth of a fundamentalism, the roots of which are mainly economic rather than religious.

To understand the dynamics of the megacities is also to understand their dilemmas. Dilemmas confront all large cities, but they are much more dramatic in the megacities of the developing world. The first set of dilemmas could be called "mayor's dilemmas" -- how to balance growth and stability and how to avoid vicious circles in development. Balancing growth and stability entails questions of equity versus efficiency, efficiency versus jobs, and equity versus global competition. A megacity exists in a global market which, if the city is to get its share, constrains the ability to continue to offer

economically inefficient jobs to the population -- the very jobs that are needed to maintain internal stability.

Development Challenges

A vicious circle in the development of a megacity is that of attraction, growth, and disattraction, as exemplified by Bangalore, a city that offers a good base for growth in terms of a favorable climate, a skilled population, and a good transportation system (Niath, 1996). That base has led to a strong migration into Bangalore, which, in turn, has led to high real estate costs, the creation of slums, health care problems, environmental problems, and shortages of water and energy. This is not exclusively a problem of a developing world megacity. It is often encountered, in different ways, in developed world environments such as the Research Triangle Park in North Carolina. It is, however, far more serious in the developing world, if the hopes that major urban conglomerates be key instruments of social and economic development, rather than of despair, are not to be dashed.

The mayor's dilemmas are often exacerbated by an excessive dependence of the megacity -- typical in the developing world -- on central federal or state governments (World Bank, 1995). How to lessen that dependence is a challenge both for the megacity and for the nation in which it is embedded. A fundamental rethinking of the city-nation relationship is required, if the nation is to draw the maximum benefit from the megacity and the megacity is to attempt to solve successfully its key problems.

Another facet of this problem is the national dilemma of the balance of focus between a megacity and the rest of the country; that is, the extent to which megacities should receive the lion's share of attention, as often happens to the detriment of other urban areas and the rest of the country. A corollary question is how to slow down the growth of megacities in order to give them the breathing space necessary to provide adequate jobs and infrastructure to their existing populations. Part of the national dilemma is how to find alternatives to megacities by creating or strengthening smaller cities that would offer most of the advantages of a megacity but fewer problems, or by finding other ways of anchoring to the countryside the population that would like to migrate to the megacities. Many experiments to deflect growth from the megacities have failed, however, so the growth continues irrepressibly with serious social consequences -- alienated populations that can find neither jobs nor adequate shelter. A recent example that does not seem to have worked as intended is the attempt by Turkey to create a number of new universities away from the major cities like Istanbul, Ankara, and Izmir, as instruments for catalyzing growth and anchoring population there (Organisation for Economic Co-operation and Development [OECD], 1995).

Keys to Solutions

The solutions to the problems and dilemmas of developing world megacities are complex. However,

some approaches are essential, such as adopting "efficiency" policies, focusing on appropriate education, developing credit and capital, encouraging community participation, and focusing on technology.

Policies aimed at using more efficiently the resources of the megacities and at developing more efficient systems include the obvious fiscal discipline; the necessity to create financial reforms and to facilitate self-help activities and the work of entrepreneurs; the removal of institutional barriers such as those to home ownership; and the development of more efficient public-private interfaces. They also include the implementation of municipal service subsidies only for persons in need, instead of for services as a whole (usually a recipe for infrastructure deterioration); the deregulation, within limits that do not destroy social stability, of a highly regimented labor market; and essential cross-sectoral integrations, such as those of jobs and transportation and of land use and housing.

The importance of education, as well as of developing adequate credit and capital, is self-evident. The importance of intelligently designed community participation in decisions about the level, quality, and cost of services cannot be sufficiently stressed. Participatory planning does not mean that the community as a whole plans, but that it gets heard and involved in the planning process. This is a powerful, if often inadequately used, mechanism for avoiding costly solutions or solutions that fail to satisfy the needs of the population, for making the role of the megacity government more efficient, and, above all, for enabling the users of the megacity infrastructure, from transportation to schools to housing, to acquire a sense of ownership.

In solving the problems of the megacities, technology is key to providing more choices, to making available better tools to address the challenges, and to generating new markets and thus new opportunities for economic development and employment (Bugliarello, 1994; OECD, 1992). In order to carry out this role, a set of issues needs to be addressed in a different context from that of the developed world. One such issue is the adoption of appropriate standards that provide for the sufficient safety and protection of the users and consumers, but that do not unduly inhibit economic development by forcing the adoption of approaches that are too costly. A second set of policy issues includes the extent to which new technologies are needed, as opposed to technologies that may be already in existence elsewhere but are locally new. That is, existing technologies can be provided in new packages to better respond to the needs of megacities, and locally produced technologies can be used instead of imported ones.

Policies are also needed to preserve the coexistence of new and older technologies (for instance, motorized transportation, bicycles, and animal transportation); to develop joint efforts with other cities to solve common problems that are beyond the capabilities of a single megacity; and to determine the appropriate balances between what can be done at a household level and what can be built at the city level (for instance, the extent to

which housing can be built with self-help, rather than with large city intervention, or the extent to which energy can be generated, or waste can be processed at the household level, rather than through city networks). Policies must also decide on the balances between soft and hard solutions, for example, the extent to which human labor can be used instead of machines, or whether traffic instrumentation and controls can lessen the need for road construction. Other needed balances are between local and regional focus, such as suburban versus central city development, as well as between the needs of the residents and those of commuters, which often represent a substantial element of the daily population of the megacity (in Cairo, for example, there are 2 million commuters versus 11 million inhabitants [Rodenbeck, 1999]). Finally, policies need to establish an appropriate balance between free market activities and interventions, a balance difficult to attain because of its impacts on social stability.

An important aspect of the quest for a proper balance between efficiency and stability is the issue of subsidies. Experience in developing countries shows that subsidization of an entire service often leads to its deterioration when it overburdens a city budget and the city cannot maintain the service at an adequate level. Thus, both efficiency and sound technological development demand that users should pay for the services they receive, and only those users who cannot pay should be subsidized.

In terms of technological needs, developing world megacities demand a philosophy for standards and specifications that is different from that of the developed world. In developing world megacities, standards and specifications should favor low-cost technologies that require little maintenance and are easy to repair, instead of more advanced, high-performance technologies. Too often, imports from the developed world fall rapidly into disrepair because they tend to require high maintenance and may be hard to repair. There is little point, for instance, to require air conditioning in transit vehicles if after a while the inability to adequately maintain it leads the passengers to open or even break the windows of the vehicles. "Good enough" technologies are called for, that is, technological solutions that are adequate for the needs of the megacities, but not so refined as to entail high engineering, construction, or operational costs.

A Different Equation

Technologies must also account for a different labor-machine equation than would be found in a highly developed economy. For instance, the sorting of material from urban waste is a significant and traditional source of employment in the poorer cities; it should be replaced by machines only when alternate and more favorable job opportunities are created. Until that occurs, mechanizing the process may be technically elegant and aesthetically pleasing, but could be socially destabilizing, even if it goes against the grain of a developed world engineering and social view. In brief, differences in social and physical environments and customs make it imperative to focus in appropriate ways on the social and environmental acceptability of a technology. Lastly, the

export potential of a given technology introduced or developed in a megacity has to be considered; if there is a potential market for the technology, it could enhance the economic viability of the megacity.

Examples of needed technologies range from simpler vehicles with high local content to local energy transformers, cheap people-movers, and flexible multimodal systems for transportation, water supply, and waste removal. In each of these cases, the trunk systems -- whether streetcars, gas pipelines, water mains, or sewers -- need to be extended by flexible systems that provide services to those poorer segments of the population that are often concentrated at the margin of the megacity, as in the barrios or favelas. Those margins tend to expand more rapidly than the ability of the city to expand its trunk infrastructure -- particularly water supply and sewage systems, as well as expressways and rail systems -- to reach the periphery. In due time, some poor regions of a megacity improve economically and the trunk systems can be extended to them; but new marginal areas will arise that again will require flexible systems.

Given the importance of self-help initiatives, megacities need materials, supplies, methods, and organization to enable their citizens to help themselves. Finally, "per use" systems are needed to make it possible to charge those who are capable of paying for the use of expressways, water systems, and other services, while subsidies are provided only for those who cannot afford to pay the full rate.

Technologies and products to respond to the needs of the developing world megacities represent major market opportunities for both the megacities themselves and for the rest of the world. Those markets can be satisfied by products from inside the megacities or by products coming from anywhere else. However, for products coming from more advanced industrial economies, the market represented by developing world megacities cannot be viewed just as an extension of domestic markets, as seems often to be the case today. A megacity is a new kind of market that has new requirements, but also, given its large size, offers substantial opportunities to whomever, in either the developing or the developed world, recognizes it and has the skills and patience to pursue it. The market opportunities can be enhanced by aggregating the markets of several megacities, and by devising new appropriate technologies.

Global Market Strategies

Strategies that the developing world megacities need to consider in order to encourage these opportunities include creating effective interfaces between public and private sectors, providing incubators for new or locally new appropriate technologies, and developing joint efforts with other megacities to create a consolidated market, starting with a program of research and development to support the technology needs they have in common (World's Scientific Academies, 1996). An idea of the size and growth of the megacities market is conveyed by the size of the population of the 11 largest

agglomerates in Figure 1, which is projected to go from 162 million in 1994 to 240 million in 2016 -- an increase of 80 million people in just those 11 cities.

An important element of a global market strategy for a megacity is the development of educational thrusts oriented toward that market. Computer education is already making many developing world megacities into sources of software for the developed world. Low labor costs give developing world megacities an advantage when it comes to people-intensive services such as tourism, maintenance, or even, possibly, some aspects of health care. There is no reason, for instance, why megacities could not become places for doing the labor-intensive tasks required to maintain technologies of the developed world, or for providing low-cost, personnel-intensive health care assistance for certain chronic diseases.

In conclusion, the large urban agglomerates we call megacities are increasingly a developing world phenomenon that will affect the future prosperity and stability of the entire world. It is important for both the developing world and the developed world to understand megacities' dynamics, their immense problems and needs, and the economic and market development opportunities they may offer. The evolution of megacities in the developing world will shape patterns of national and global economies, will continue to affect the settlement of vast populations, and will influence the social and political dynamics of the world. Although the megacities are not different in many respects from other urban concentrations, they play a key role on the global stage by virtue of their very size. The megacities of the developing world, confronted by nearly intractable problems, have a pervasive and crucial need for policies and socio-technological and socio-economic approaches that must be devised in a different context than that of the developed world -- a context with different settings, different needs, different challenges, and different opportunities.

References

Bugliarello, G. 1994. Technology and the city. Pp. 131-146 in *Mega-city Growth and the Future*, R. J. Fuchs, E. Brennan, J. Chamie, F. Lo, J. I. Uitto, eds. Tokyo: United Nations University Press.

Niath, I. 1996. Urbanization in India-challenges and some solutions. Paper presented at Inter-Academy Forum Meeting, United Nations Habitat II Conference, Istanbul, June.

Organisation for Economic Co-operation and Development (OECD). 1992. *Cities and New Technologies*. Paris: OECD.

OECD. 1995. *Reviews of National Science and Technology Policy-Turkey*. Paris: OECD.

Parker, J. 1995. A survey of cities: Turn up the lights-many-splendoured things. *The Economist* 336(7925).

Rodenbeck, M. 1999. *Cairo, the City Victorious*. New York: Knopf.

United Nations. 1998. Trends in urbanization and the components of urban growth. In *Proceedings of the Symposium on Internal Migration and Urbanization in Developing Countries*, 22-24 January 1996. New York: United Nations Population Fund.

World Bank. 1991. *Urban Policy and Economic Development: An Agenda for the 1990s*. Washington, D.C.: World Bank.

World Bank. 1995. *Better Urban Services: Finding the Right Incentives*. Washington, D.C.: World Bank.

World Resources Institute. 1996. *World Resources, 1996-97*. New York: Oxford University Press.

World's Scientific Academies. 1996. Science and technology and the future of cities. Statement to United Nations Habitat II Conference, Istanbul, June 1. Online: <http://science.org.au/policy/statemen/habitat2.htm>.

Notes

1. The literature on megacity issues is very large. The United Nations, The World Bank, and the Organisation for Economic Co-operation and Development are among the major sources of information on the subject. This paper has also drawn from an unpublished National Research Council study of megacities, for which I chaired the Synthesis Committee and Judith Bale was the project director.

About the Author

George Bugliarello is chancellor, Polytechnic University, and interim editor-in-chief of *The Bridge*. This article is a revised version of his presentation given 5 October 1999 at the NAE Annual Meeting Technical Symposium.

Related Articles

More articles on [Engineering, the Economy, and Society](#)