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# Global Metropolis: The Role of Cities and Metropolitan Areas in the Global Economy

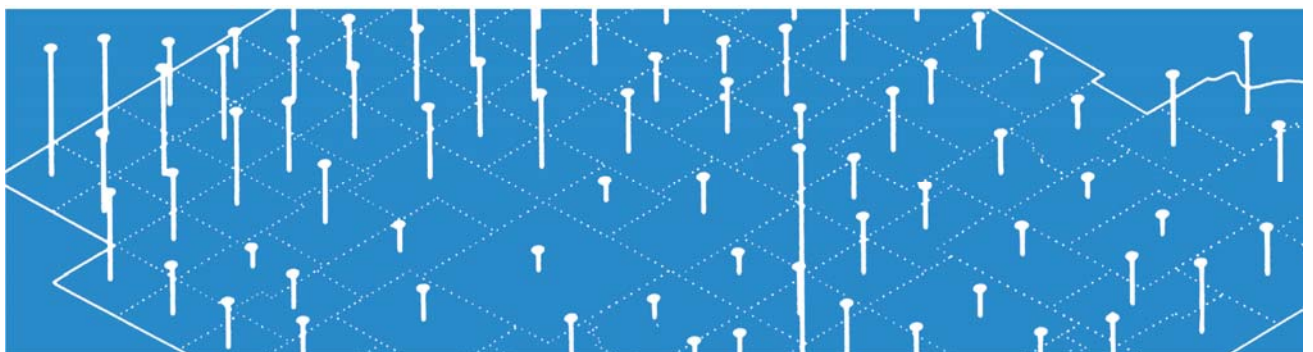## Working Paper Series:
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# Global Metropolis:

# The Role of Cities and Metropolitan Areas in the Global Economy

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## Introduction

The past year marked a turning point in world history. It was the year the world became urban. The share of the world's population living in urban areas increased from just 3 percent in 1800 to 14 percent in 1900. By 1950, it had reached 30 percent. Today, this number stands at more than half. In the advanced countries, three-quarters of people live in urban areas (UNFPA, 2007). Noting this momentous shift, The Economist put it this way: "Whether you think the human story begins in a garden in Mesopotamia known as Eden, or more prosaically on the savannahs of present-day east Africa, it is clear that Homo sapiens did not start life as an urban creature. Man's habitat at the outset was dominated by the need to find food, and hunting and foraging were rural pursuits." But today the story concludes, "Wisely or not, Homo sapiens has become Homo urbanus". According to the United Nations, more than two-thirds of the world's population (4.4 billion people) will be urbanites by the year 2030 (UNFPA, 2007).

While this general process and pattern of urbanization is well known, we know a great deal less about the global level of economic activity produced by cities and metropolitan areas. The simple reason for this is that we lack the required statistical information. While we have a plethora of data and information on economic output by country, there is a noticeable absence of systematic and comparable data on cities and metropolitan areas. There is one group or agency that collects the necessary data.

The past several years have seen numerous, very useful and important attempts, to develop data and to better understand the economic role of cities and metropolitan areas in the global economy. Researchers like Saskia Sassen, Peter Taylor, Robert Lang and others have developed new and innovative ways to track and benchmark global cities and their surrounding metropolitan areas (Sassen, 1991, 2006, 2008; Taylor, 2003, 2005; Lang and Dhavale, 2005). Mercer Consulting publishes annual reports on the cost and quality of life in a sample of global cities (Mercer Consuling, 2007). MasterCard recently

produced a major report, drawing from the work of leading  scholars on economic activity in global cities (Worldwide Centers of Commerce Index).  A landmark study by the Chinese Academy of Social Sciences, (Pengfei and Kresl, 2008 compiled data from a wide range of sources to produce detailed rankings of urban competitiveness for 500 cities worldwide.

Our research seeks to provide new insight in to the economic role of cities and metropolitan areas in the world economy.  It summarizes new data, derived from satellite images of the world at night, to provide systematic estimates of the economic activity generated by cities and metropolitan areas worldwide.

We begin with a short summary of our methodology for using the satellite images to develop economic estimates. We provide a detailed accounting of the role of metropolitan areas in the global economy overall, before turning to a more detailed looked at their role in the world's major economic areas – North American, Europe, Asia, the newly industrializing countries and the developing world.  The last section summarizes the overall, very significant contribution of cities and metropolitan areas to the global economy.

## Data and Methods

We use a novel method to develop systematic data on global cities and metropolitan areas.  We calculate economic activity for these locations based on satellite images of the entire globe.  We define a metropolitan area as a core city and its surrounding hinterland as contiguously (or very nearly contiguously) lighted areas, as seen from space at night. Lang and Dhavale (2005) and the Regional Planning Association (2006) have used much more complex methods, including measures of commuting patterns, etc.  We find that while these factors are critically important for understanding the functioning of a metropolitan area, contiguous development is a good enough proxy for economic

integration that it can meaningfully be used in this context.  While our method does not account for many of the cultural and political factors as well as network connectivity that inform and shape metropolitan regions, its strength lies in the application of a systematic criteria for identifying  the economic activity of cities and regions across the globe.

We begin with light emission data for the year 2000 (Doll, Muller, & Elvidge, 2000). The base data are from the Earth Observation Program of NOAA's National Geophysical Data Center.  This data provides a measure of light intensity for each 30 arc second cell between -65° and 65° latitude.  These cells cover approximately 1km² at the equator and become somewhat smaller at higher and lower latitudes.[1]

We then set a light threshold that captures the essence of the U.S. metro areas. After we determine the threshold that gives the best approximation of the established U.S. metropolitan areas, we apply this same threshold to the nighttime lights dataset for the rest of the world.  We close small gaps, merging light areas that are separated by less than 2 kilometers.

We calibrate the model by using detailed published data for Gross Regional Product (GRP) for 363 U.S. metropolitan areas prepared for the US Conference of Mayors (USCOM) (Global Insight, 2006).  This calibration also yields an objective measure of the precision of this process – we are able to reproduce the GRP estimates

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[1] While the data capture low light levels that are consistent with low-density suburban and electrified semi-rural areas, the measured emission level saturates far from the most economically intense center of a major city due to the design of the sensors and the processing algorithms used by NGDC.  The fall-off in brightness gradient as this threshold is approached is quite steep and occurs in the inner suburbs of large American cities.  While this presents a challenge in producing estimates, it is not insurmountable.  This data limitation is in some ways liberating because we suspect that the relationship between light emissions and economic activity breaks down as higher levels of urbanization expand vertically rather than horizontally.  We would thus be forced to estimate central cities differently from their surroundings in any case. To deal with the problem of saturation of urban cores, we break the process of estimating economic activity from light emissions into two stages:  we estimate activity levels for low light areas, including urban peripheries, as a direct function of light level.  We separately estimate urban cores as a function of both area and shape.

with a standard error of 34 percent. In evaluating this number, it should be noted that the USCOM estimate also contains measurement error.

We deal with the problem of translating physical economic activity into standard units by renormalizing the total for each nation to agree with that nation's 2000 Gross Domestic Product (GDP) in 2000 U.S. dollars at current market exchange rates (World Bank, 2006). We thus use the light-derived estimates to establish the relative importance of pixels within nations while maintaining consistency with published estimates at the national level.

In cases where we have high quality metropolitan region estimates for areas with well-defined borders, we renormalize those areas in line with the published estimates for GRP as per above. When such sub-regional adjustments are made, we again renormalize the national total to coincide with World Development Indicators national estimates (GDP).

The result of this process is an estimate of economic activity for every 30 arc second grid cell (less than one square kilometer) in the world. We refer to this indicator as Light-based Regional Product or LRP. While it is expressed in the same nominal dollars as GDP and GRP and designed to aggregate up to published estimates of GDP, it is different enough in terms of both its derivation and its conceptual design that is best identified with its own name.

## Key Findings

We now turn to key findings of the research. Table 1 shows the top 20 regions worldwide in economic activity (or LRP). Appendix 1 provides a more detailed listing of the top 100 economic regions worldwide.

The world's largest metropolitan area in terms of economic activity is Greater Tokyo which produces nearly $2 trillion dollars in economic output (see Table 2). It is followed by Greater New York, Osaka-Kyoto-Kobe, Los Angeles, Nagoya, Chicago, London, Greater Antwerp, Greater Bonn and Washington DC.

The economic activity produced by these regions is substantially greater than their population size. The top ten, which house just 2.6 percent of the world's population, account for more than 20 (21.2%) percent of global economic activity. The twenty largest in economic terms, home to 4.4 percent of the world's people, produce nearly 30 percent (28%) of global economic activity. And the world's fifty largest economic regions, home to 7 percent of global population, account for almost 40 percent (38.5%) of global economic activity.

## Table 1: World's Largest Metropolitan Regions by LRP (billions)

|    | Region | LRP (billions) |
|----|--------|----------------|
| 1  | Tokyo-Kawasaki-Yokohama | $1,997.5 |
| 2  | New York-Philadelphia-Newark | 1,181.9 |
| 3  | Kyoto-Osaka-Kobe | 617.9 |
| 4  | Los Angeles | 561.7 |
| 5  | Nagoya | 558.4 |
| 6  | Chicago-Milwaukee | 405.7 |
| 7  | London | 378.1 |
| 8  | Antwerpen-Gent-Bruxelles-Lille-Liege | 336.2 |
| 9  | Bonn-Dortmund-Duisburg-Koln | 315.2 |
| 10 | Washington D.C.-Baltimore | 297.3 |
| 11 | Paris | 280.9 |
| 12 | Boston | 275.2 |
| 13 | Seoul-Inch`on | 238.9 |
| 14 | San Jose | 235.1 |
| 15 | Leeds-Sheffield-Birmingham | 222.2 |
| 16 | Dallas | 212.7 |
| 17 | Guangzhou-Hong Kong-Kowloon | 200.5 |
| 18 | Amsterdam-Rotterdam-The Hague | 187.5 |
| 19 | Milano | 181.9 |
| 20 | Houston | 170.3 |

We now turn to the leading economic regions by major continent – North America, Europe and Asia.

## North America

Table 2 lists the ten largest economic regions in North America. New York tops the list followed by Los Angeles, Chicago, Washington DC, Boston, San Jose, Dallas, Houston, Detroit and Atlanta – all U.S. regions.  These regions generate 11.7 percent of global economic activity while housing 1.3 percent of world population. Toronto-Buffalo ranks 11th in North America with $ 161.8 billion in LRP and Mexico City ranks 14th in North America with nearly $140 billion in economic activity. It is interesting to note that Mexico City generates nearly a quarter (24 percent) of Mexico's total economic activity.

### Table 2: North America's Largest Economic Regions

|    | Region | LRP (billions) |
|----|--------|----------------|
| 1  | New York-Philadelphia-Newark | $1,181.9 |
| 2  | Los Angeles | 561.7 |
| 3  | Chicago-Milwaukee | 405.7 |
| 4  | Washington D.C.-Baltimore | 297.3 |
| 5  | Boston | 275.2 |
| 6  | San Jose | 235.1 |
| 7  | Dallas | 212.7 |
| 8  | Houston | 170.3 |
| 9  | Detroit | 168.3 |
| 10 | Atlanta | 164.5 |

## Europe

Table 3 lists the ten largest economic regions in Europe. London is the largest economic region, followed by Greater Antwerp, Greater Bon, Paris, Leeds-Sheffield-Birmingham, Amsterdam-Rotterdam, Milan, Manchester-Liverpool, Berlin and Frankfurt. The regions which host 1.3 percent of world population produce approximately 7.1 percent of world economic activity.

## Table 3: Europe's Largest Economic Regions

| | Region | LRP (billions) |
|---|---|---|
| 1 | London | $378.1 |
| 2 | Antwerpen-Gent-Bruxelles-Lille-Liege | 336.2 |
| 3 | Bonn-Dortmund-Duisburg-Koln | 315.2 |
| 4 | Paris | 280.9 |
| 5 | Leeds-Sheffield-Birmingham | 222.2 |
| 6 | Amsterdam-Rotterdam-The Hague | 187.5 |
| 7 | Milano | 181.9 |
| 8 | Manchester-Liverpool | 134.3 |
| 9 | Berlin | 96.0 |
| 10 | Frankfurt am Main | 93.0 |

## Asia

Table 4 lists Asia's ten largest economic regions. Tokyo is Asia – and the world's – largest with nearly $2 trillion in LRP. Kyoto-Osaka-Kobe, Nagoya, Seoul, Fukuoka, Singapore, Sapporo, Bangkok and Fukuyama complete the top ten. The regions account for 12.8 percent of world economic activity, while housing 2.3 percent of world population.

## Table 4: Asia's Ten Largest Economic Regions

| | Region | LRP (billions) |
|---|---|---|
| 1 | Tokyo-Kawasaki-Yokohama | $1,997.5 |
| 2 | Kyoto-Osaka-Kobe | 617.9 |
| 3 | Nagoya | 558.4 |
| 4 | Seoul | 238.9 |
| 5 | Guangzhou-Hong Kong-Kowloon | 200.5 |
| 6 | Fukuoka-Kita Kyushu | 105.8 |
| 7 | Singapore | 91.9 |
| 8 | Sapporo | 79.4 |
| 9 | Bangkok | 75.4 |
| 10 | Fukuyama | 53.1 |

## The BRICS

A Goldman Sachs [2005] report identified the so-called BRICs nations – that is Brazil, Russia, India and China as large, rapidly growing and increasingly significant global economic actors. Table 5 shows the top 10 metro areas in the BRICS nations.   The

largest is Hong Kong followed by Sao Paolo., Beijing, Shanghai, Rio de Janeiro, New

Delhi, Tianjin, Belo Hroizonte, Calcutta and Porto Alegre.

## Table 5: BRICS - Ten Largest Economic Regions

|    | Region | LRP (billions) |
|----|--------|----------------|
| 1  | Guangzhou-Hong Kong-Kowloon | $200.5 |
| 2  | Sao Paulo | 114.3 |
| 3  | Beijing | 46.9 |
| 4  | Shanghai | 45.8 |
| 5  | Rio de Janeiro | 42.1 |
| 6  | New Delhi-Delhi | 31.6 |
| 7  | Tianjin | 17.3 |
| 8  | Belo Horizonte | 16.5 |
| 9  | Calcutta | 14.9 |
| 10 | Porto Alegre | 14.5 |

## Emerging Economies

Table 6 lists the ten largest metros for the emerging economies - Argentina, Egypt,

Malaysia, Mexico, Poland, South Africa, Thailand, and Turkey. The largest is Buenos

Aires, followed by Mexico City, San Diego, Jerusalem-Tel Aviv, Bangkok, Pretoria-

Johannesburg, Jakarta, Cairo, Kuala Lumpur, and El Paso.

## Table 6: Ten Largest Economic Regions in the Emerging Economies

|    | Region | LRP (billions) |
|----|--------|----------------|
| 1  | Buenos Aires | $143.2 |
| 2  | Mexico City | 139.4 |
| 3  | San Diego | 110.3 |
| 4  | Jerusalem-Tel Aviv-Yafo | 104.6 |
| 5  | Bangkok | 75.4 |
| 6  | Pretoria-Johannesburg | 62.9 |
| 7  | Jakarta | 45.9 |
| 8  | Cairo-El-Giza | 44.3 |
| 9  | Kuala Lumpur | 39.5 |
| 10 | El Paso | 27.5 |

## Global Economic Role of Metropolitan Regions

Table 7 shows the share of economic activity generated by metropolitan areas of various sizes.

## Table 7: Economic Activity by Major Region

| Region | Population cutoff (millions) | | | |
| | 10.0 | 5.0 | 1.0 | 0.5 |
|---|---|---|---|---|
| **North America** | $2,288.7 | $3,451.5 | $5,972.0 | $6,704.9 |
| | (20.69%) | (31.21%) | (54.00%) | (60.62%) |
| **Europe** | $1,310.4 | $2,118.1 | $3,609.3 | $4,183.8 |
| | (15.01%) | (24.26%) | (41.49%) | (47.93%) |
| **BRICs** | $322.3 | $369.1 | $785.4 | $954.9 |
| | (13.43%) | (15.38%) | (32.73%) | (39.80%) |
| **Asia*** | $3,613.1 | $3,658.0 | $4,154.5 | $4,421.0 |
| | (65.44%) | (66.26%) | (75.25%) | (80.07%) |
| **Emerging Economies **** | $417.0 | $609.8 | $1,023.2 | $1,602.9 |
| | 24.94% | (36.47%) | (61.20%) | (95.87%) |
| **All Nations** | $7,962.8 | $10,615.1 | $16,259.1 | $18,205.1 |
| | (25.49%) | (34.13%) | (52.27%) | (58.5%) |

\* Hong Kong, Japan, Macao, South Korea, Singapore
\*\* Argentina, Egypt, Malaysia, Mexico, Poland, South Africa, Thailand, Turkey

- The 681 metropolitan areas with more than 500,000 people, which house roughly a quarter (24 percent) of world population, account for nearly 60 percent (58.50%) of total worldwide economic activity.  Such metros account for more than 80 percent of economic activity in Asia, roughly 60 percent of economic activity in North America,  approximately 95 percent in the Emerging Economies, 40 percent in the BRICs and nearly half (47.93%) percent on economic activity in Europe.

- The 347 metropolitan areas worldwide with more than a million people, which house 20.38 percent of world population, account for more than half (52.27 percent) of worldwide economic activity.  These metros command roughly three-quarters (75.25 percent) of economic activity in Asia, half (54 percent) in North

America, roughly 60 percent in the Emerging Economies, 40 (41.49) percent in Europe and one third (32.73 percent) in the BRICs.

- The 61 metros with more than 5 million people which house roughly 10 percent of world population account for a third of all global economic activity. These metros account for two-thirds of economic activity in Asia, roughly a third (31.21 percent) in North America, a quarter (24.26 percent in Europe), approximately 36 percent in the Emerging Economies and 15 percent in the BRICs.

- The 29 metros with more than 10 million people, which house roughly 8 percent of global population, account for a quarter of global economic activity. These metros account for two-thirds of economic activity in Asia, a fifth (20.69 percent) in North America, 15 percent in Europe, a quarter (24.94 percent) in the Emerging Economies and 13 percent in the BRICs.

- Overall, some 60 percent of worldwide activity is generated by metro areas with more than 500,000 people. Asia leads the way in global economic urbanization, followed by North America, the Emerging Economies and Europe.

**Table 8: Share of Global Economic Activity Produced by the Largest Economic Regions**

| Top Metro Regions | Total LRP (billions) | Economic Share |
|---|---|---|
| 10 | $6.649.75 | 21.18% |
| 20 | $8,854.81 | 28.02% |
| 100 | $14,458.68 | 46.05% |

- Finally, just the ten largest economic regions produce more than a fifth of total economic output. The top twenty produce nearly 30 percent (28%), and the top 100 economic regions produce almost half (46 percent) of global economic activity (Table 8).

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## Appendix

**Top 100 metros by LRP (billions)**

| Rank | Region | LRP ($billions) |
|---|---|---|
| 1 | Tokyo-Kawasaki-Yokohama | 1,997.5 |
| 2 | New York-Philadelphia-Newark | 1,181.9 |
| 3 | Kyoto-Osaka-Kobe | 617.9 |
| 4 | Los Angeles | 561.7 |
| 5 | Nagoya | 558.4 |
| 6 | Chicago-Milwaukee | 405.7 |
| 7 | London | 378.1 |
| 8 | Antwerpen-Gent-Bruxelles-Lille-Liege | 336.2 |
| 9 | Bonn-Dortmund-Duisburg-Koln | 315.2 |
| 10 | Washington D.C.-Baltimore | 297.3 |
| 11 | Paris | 280.9 |
| 12 | Boston | 275.2 |
| 13 | Seoul-Inch`on | 238.6 |
| 14 | San Jose | 235.1 |
| 15 | Leeds-Sheffield-Birmingham | 222.2 |
| 16 | Dallas | 212.7 |
| 17 | Guangzhou-Hong Kong-Kowloon | 200.5 |
| 18 | Amsterdam-Rotterdam-The Hague | 187.5 |
| 19 | Milano | 181.9 |
| 20 | Houston | 170.3 |
| 21 | Detroit | 168.3 |
| 22 | Atlanta | 164.5 |
| 23 | Toronto-Buffalo | 161.8 |
| 24 | Tampa | 146.3 |
| 25 | Buenos Aires | 143.2 |
| 26 | Miami | 142.7 |
| 27 | Mexico City | 139.4 |
| 28 | Manchester-Liverpool | 134.6 |
| 29 | Seattle | 123.1 |
| 30 | Sao Paulo | 114.4 |
| 31 | San Diego | 110.3 |
| 32 | Minneapolis | 107.4 |
| 33 | Phoenix | 106.7 |
| 34 | Fukuoka-Kita Kyushu | 105.8 |
| 35 | Jerusalem-Tel Aviv-Yafo | 104.6 |
| 36 | Denver | 99.7 |
| 37 | Cleveland | 99.1 |
| 38 | Berlin | 96.1 |
| 39 | Frankfurt am Main | 93.0 |
| 40 | Singapore | 91.9 |
| 41 | Sydney | 83.4 |
| 42 | Cincinnati | 82.8 |
| 43 | Madrid | 81.8 |
| 44 | Sapporo | 79.4 |
| 45 | Venice | 79.3 |
| 46 | St. Louis | 77.7 |
| 47 | Glasgow | 76.2 |
| 48 | Bangkok | 75.4 |
| 49 | Melbourne | 72.7 |
| 50 | Barcelona | 69.2 |

| | | |
|---|---|---|
| 51 | Napoli | 68.9 |
| 52 | Roma | 67.1 |
| 53 | Montreal | 66.9 |
| 54 | Pittsburgh | 64.4 |
| 55 | Pretoria-Johannesburg | 62.9 |
| 56 | Newcastle | 62.7 |
| 57 | Hamburg | 60.1 |
| 58 | Zurich | 59.8 |
| 59 | Portland | 58.7 |
| 60 | Charlotte | 56.1 |
| 61 | Kansas City | 55.2 |
| 62 | Stuttgart | 55.1 |
| 63 | Sacramento | 53.4 |
| 64 | Fukuyama | 53.1 |
| 65 | Lyon | 52.1 |
| 66 | Athens | 50.8 |
| 67 | Vienna | 49.6 |
| 68 | San Antonio | 49.6 |
| 69 | Indianapolis | 48.5 |
| 70 | Salt Lake City | 47.9 |
| 71 | Manila-Quezon City | 47.1 |
| 72 | Marseille | 47.0 |
| 73 | Beijing | 46.9 |
| 74 | Abu Zaby | 46.4 |
| 75 | Jakarta | 45.9 |
| 76 | Shanghai | 45.8 |
| 77 | Pusan | 45.0 |
| 78 | Las Vegas | 44.8 |
| 79 | Cairo-El-Giza | 44.3 |
| 80 | Columbus | 44.2 |
| 81 | Mannheim - Heidelberg | 43.5 |
| 82 | Rio de Janeiro | 42.1 |
| 83 | Munchen | 40.8 |
| 84 | T`ai-chung | 40.8 |
| 85 | Brisbane | 40.6 |
| 86 | Perth-Fremantle | 40.5 |
| 87 | Austin | 40.0 |
| 88 | Kuala Lumpur | 39.5 |
| 89 | San Juan | 38.9 |
| 90 | Richmond | 38.9 |
| 91 | Kobenhavn | 38.8 |
| 92 | Taipei-Chingmei | 38.2 |
| 93 | Raleigh-Durham | 37.0 |
| 94 | Santiago | 37.0 |
| 95 | Greensboro-Winston-Salem | 36.8 |
| 96 | Norfolk | 36.5 |
| 97 | Nashville | 36.3 |
| 98 | Oslo | 36.3 |
| 99 | Kao-Hsiung-T`ai-nan | 36.0 |
| 100 | Memphis | 35.1 |

**Top 100 metros by population (millions)**

| Rank | Region | Population (millions) |
|---|---|---|
| 1 | Guangzhou-Hong Kong-Kowloon | 37.19 |
| 2 | Cairo-El-Giza | 37.15 |
| 3 | Tokyo-Kawasaki-Yokohama | 36.52 |
| 4 | New York-Philadelphia-Newark | 29.63 |
| 5 | Seoul-Inch`on | 22.01 |
| 6 | Sao Paulo | 21.74 |
| 7 | Mexico City | 19.60 |
| 8 | New Delhi-Delhi | 17.59 |
| 9 | Kyoto-Osaka-Kobe | 17.48 |
| 10 | Bombay | 17.33 |
| 11 | Jakarta | 16.27 |
| 12 | Manila-Quezon City | 16.01 |
| 13 | Los Angeles | 15.86 |
| 14 | Shanghai | 13.97 |
| 15 | Antwerpen-Gent-Bruxelles-Lille-Liege | 13.76 |
| 16 | Buenos Aires | 13.58 |
| 17 | Druzba-Moskva | 13.46 |
| 18 | Calcutta | 13.10 |
| 19 | London | 12.58 |
| 20 | Karachi | 11.70 |
| 21 | Tehran | 11.19 |
| 22 | Upper Nile | 11.02 |
| 23 | Nagoya | 10.78 |
| 24 | Chicago-Milwaukee | 10.67 |
| 25 | Paris | 10.57 |
| 26 | Bonn-Dortmund-Duisburg-Koln | 10.44 |
| 27 | Beijing | 10.33 |
| 28 | Rio de Janeiro | 10.08 |
| 29 | Bangkok | 10.02 |
| 30 | Taipei-Chingmei | 9.54 |
| 31 | Istanbul | 9.44 |
| 32 | Leeds-Sheffield-Birmingham | 9.39 |
| 33 | Dhaka | 8.63 |
| 34 | Pretoria-Johannesburg | 8.51 |
| 35 | Lima | 8.00 |
| 36 | Milano | 7.71 |
| 37 | Jerusalem-Tel Aviv-Yafo | 7.63 |
| 38 | Amsterdam-Rotterdam-The Hague | 7.62 |
| 39 | Toronto-Buffalo | 7.25 |
| 40 | Bogota | 7.10 |
| 41 | Madras | 7.04 |
| 42 | Lahore | 7.01 |
| 43 | Brazzaville | 6.99 |
| 44 | Washington D.C.-Baltimore | 6.84 |
| 45 | Boston | 6.59 |
| 46 | Lagos | 6.54 |
| 47 | Hyderabad | 6.35 |
| 48 | Baghdad | 6.26 |
| 49 | Manchester-Liverpool | 5.96 |
| 50 | Bangalore | 5.84 |
| 51 | Santiago | 5.80 |
| 52 | San Jose | 5.59 |
| 53 | Pusan | 5.32 |

| 54 | Ho Chi Minh City | 5.30 |
| 55 | Madrid | 5.29 |
| 56 | Ar Riyad | 5.25 |
| 57 | Dallas | 5.24 |
| 58 | Miami | 5.23 |
| 59 | Tianjin | 5.13 |
| 60 | T`ai-chung | 5.09 |
| 61 | Kao-Hsiung-T`ai-nan | 5.07 |
| 62 | Tampa | 4.93 |
| 63 | Ahmadabad | 4.86 |
| 64 | Kuala Lumpur | 4.78 |
| 65 | Napoli | 4.74 |
| 66 | Surabaja | 4.74 |
| 67 | Barcelona | 4.73 |
| 68 | Houston | 4.66 |
| 69 | Fukuoka-Kita Kyushu | 4.64 |
| 70 | Saint Petersburg | 4.60 |
| 71 | Khartoum-Omdurman | 4.55 |
| 72 | Wuhan | 4.50 |
| 73 | Detroit | 4.46 |
| 74 | Pune | 4.46 |
| 75 | Chengdu | 4.39 |
| 76 | Shenyang | 4.31 |
| 77 | Atlanta | 4.23 |
| 78 | Singapore | 4.23 |
| 79 | Belo Horizonte | 4.16 |
| 80 | Montreal | 4.13 |
| 81 | Xian | 4.03 |
| 82 | San Diego | 3.99 |
| 83 | Alexandria | 3.95 |
| 84 | Guadalajara | 3.92 |
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## Author Bios

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