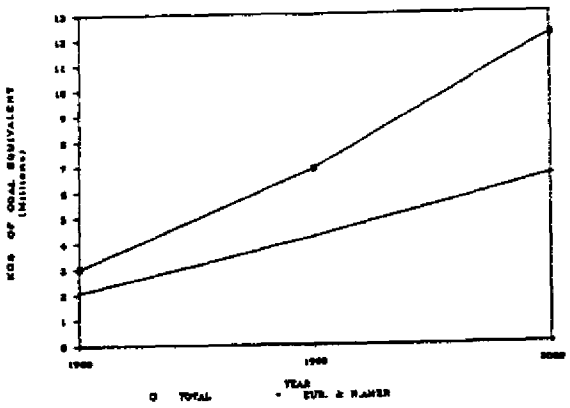

Figure 7. Total energy consumption: world and Europe and North America, 1960 to 2000

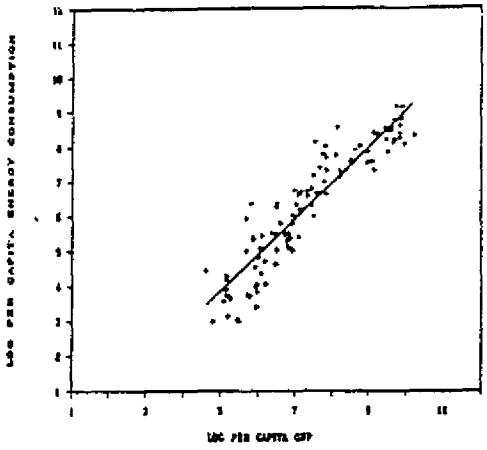

Figure 9. Logarithm of per capita energy consumption vs. logarithm of per capita GNP

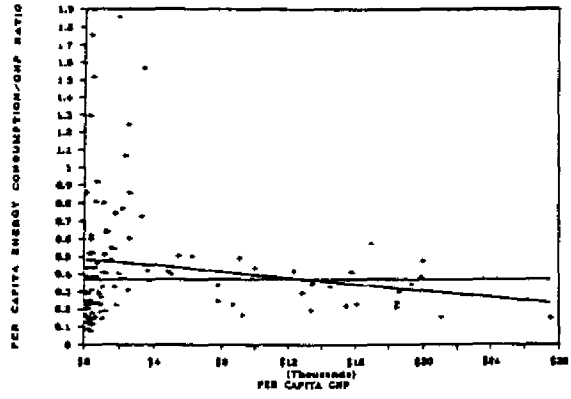

Figure 8. Per capita energy consumption as a ratio of GNP per capita: 101 countries, 1988

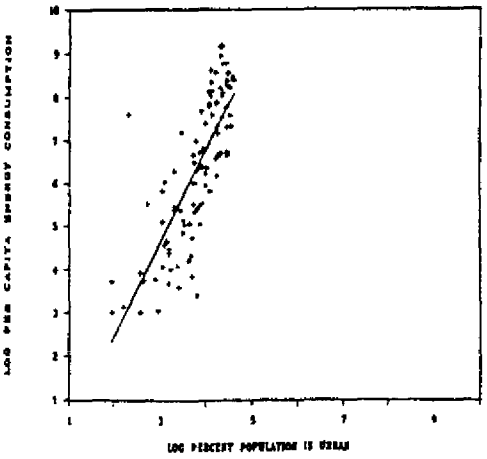

Figure 10. Logarithm of per capita energy consumption vs. logarithm of percent urban population

TABLE VIII. PER CAPITA ENERGY CONSUMPTION, KGS. OF OIL EQUIVALENT, 1988.

COUNTRY	PER CAP ENER CONS. KG/OIL EQ. 1988	RANK ENER. CONS. 1988	TOTAL POP. (mill.) 1988	PER CAPITA GNP 1988	RANK PC GNP 1988	PC ENERGY GNP RATIO
Canada	9,683	1	26 0	$16,960	9	0.57
Norway	9,516	2	4.2	$19,990	3	0.48
US	7,655	3	246.3	$19,840	4	0.39
Sweden	6,617	4	8.4	$19,300	5	0.34
UAE	6,481	5	1.5	$15,770	11	0.41
Finland	5,550	6	5.0	$18,590	6	0.30
Trinidad-Tobago	5,255	7	1.2	$3,350	31	1 57
Netherlands	5,235	8	14.8	$14,520	13	0 36
Australia	5,157	9	16.5	$12,340	18	0.42
Belgium	4,781	10	9.9	$14,490	14	0 33
Kuwait	4,637	11	2.0	$13,400	15	0.35
Singapore	4,464	12	2.6	$9,070	21	0.49
Germany, FR	4,421	13	61.3	$18,480	7	0.24
New Zealand	4,339	14	3.3	$10,000	19	0.43
Switzerland	4,193	15	6.6	$27,500	1	0.15
Denmark	3,902	16	5.1	$18,450	8	0.21
UK	3,756	17	57.1	$12,810	17	0.29
France	3,704	18	55 9	$16,090	10	0.23
Poland	3,453	19	37.9	$1,860	42	1.86
Austria	3,396	20	7.6	$15,470	12	0.22
Japan	3,306	21	122.6	$21,020	2	0.16
Saudi Arabia	3,098	22	14.0	$6,200	25	0.50
ngary	3,068	23	10.6	$2,460	36	1.25
bya	2,719	24	4 2	$5,420	26	0.50
reland	2,610	25	3.5	$7,750	23	0.34
Italy	2,608	26	57.4	$13,330	16	0.20
South Africa	2,439	27	34.0	$2,290	38	1.07
Venezuela	2,354	28	18.8	$3,250	32	0.72
Yugoslavia	2,159	29	23.6	$2,520	33	0.86
Oman	2,012	30	1.4	$5,000	27	0.40
Greece	1,986	31	10.0	$4,800	28	0.41
Israel	1,972	32	4 4	$8,650	22	0.23
Spain	1,902	33	39.0	$7,740	24	0.25
Panama	1,627	34	2.3	$2,120	40	0.77
Hong Kong	1,544	35	5.7	$9,220	20	0.17
Argentina	1,523	36	31.5	$2,520	34	0.60
Korea, Rep.	1,515	37	42.0	$3,600	30	0.42
Portugal	1,324	38	10.3	$3,650	29	0.36
Mexico	1,305	39	83.7	$1,760	44	0.74
Algeria	1,094	40	23.8	$2,360	37	0.46
Syria, AR	913	41	11.6	$1,680	46	0.54
Jamaica	855	42	2 4	$1,070	55	0.80
Chile	832	43	12.8	$1,510	47	0.55
Turkey	822	44	53.8	$1,280	50	0.64
Brazil	813	45	144.4	$2,160	39	0.38
Malaysia	784	46	16.9	$1,940	41	0.40
Uruguay	769	47	3.1	$2,470	35	0.31
Colombia	755	48	31.7	$1,180	53	0.64
Jordan	723	49	3 9	$1,500	48	0.48
Yemen, PDR	653	50	2.4	$430	75	1.52
Egypt, AR	607	51	50.2	$660	66	0.92

COUNTRY	PER CAP. ENER CONS. KG/OIL EQ. 1988	RANK ENER. CONS. 1988	TOTAL POP. (mill.) 1988	PER CAPITA GNP 1988	RANK PC GNP 1988	PC ENERGY GNP RATIO
China	580	52	1,088.4	$330	86	1.76
Ecuador	573	53	10.1	$1,120	54	0.51
Costa Rica	557	54	2.7	$1,690	45	0.33
Zimbabwe	527	55	9.3	$650	68	0.81
Tunisia	499	56	7.8	$1,230	51	0.41
Peru	478	57	20 7	$1,300	49	0.37
Botswana	415	58	1.2	$1,010	56	0.41
Mauritius	402	59	1.1	$1,800	43	0.22
Zambia	376	60	7.6	$290	89	1 30
Dominican Rep.	332	61	6.9	$720	65	0.46
Thailand	331	62	54.5	$1,000	58	0.33
Bolivia	249	63	6.9	$570	71	0.44
Congo, PR	245	64	2.1	$910	60	0.27
Philippines	244	65	59.9	$630	70	0.39
Papua N.Guinea	243	66	3.7	$810	64	0.30
Morocco	239	67	24.0	$830	63	0.29
Indonesia	229	68	174.8	$440	74	0.52
Paraguay	224	69	4.0	$1,180	52	0.19
El Salvador	215	70	5.0	$940	59	0.23
India	211	71	815.6	$340	85	0.62
Pakistan	210	72	106.3	$350	84	0.60
Honduras	203	73	4.8	$860	62	0.24
Guatemala	168	74	8.7	$900	61	0.19
Sri Lanka	162	75	16.6	$420	77	0 39
Senegal	155	76	7.0	$650	67	0.24
Cameroon	152	77	11.2	$1,010	57	0.15
Nigeria	150	78	110.1	$290	90	0.52
Ghana	125	79	1.4	$400	78	0.31
Mauritania	111	80	1.9	$480	72	0.23
Yemen, AR	102	81	8.5	$640	69	0.16
Kenya	94	82	22.4	$370	83	0.25
Mozambique	86	83	14.9	$100	101	0.86
Guinea	78	84	5.4	$430	76	0.18
Zaire	74	85	33.4	$170	96	0.44
Somalia	66	86	5.9	$170	98	0 39
Sudan	58	87	23.8	$480	73	0.12
Haiti	57	88	6.3	$380	80	0.15
Togo	54	89	3.4	$370	82	0.15
Bangladesh	50	90	108.9	$170	97	0.29
Benin	46	91	4.4	$390	79	0.12
Niger	43	92	7.3	$300	88	0.14
Malawi	42	93	8.0	$170	95	0.25
Rwanda	41	94	6.7	$320	87	0.13
Madagascar	39	95	10.9	$190	93	0.21
Tanzania	36	96	24.7	$160	99	0.23
Cent.Afr.Rep.	30	97	2.9	$380	81	0.08
Nepal	23	98	18.0	$180	94	0.13
Mali	21	99	8.0	$230	92	0.09
Ethiopia	20	100	47.4	$120	100	0.17
Burundi	20	101	5.1	$240	91	0.08

on the environment of increasing energy use will depend on the type of energy sources used and the extent of measures taken to ameliorate adverse effects. The relative cost of units of energy decreases as per capita incomes rise. When incomes are low, even cheap sources of energy are relatively high. Cheap energy sources emit greater levels of pollution than dearer ones. In early stages of urbanization, when rising per capita Gross National Product is still low, pollution of the land, water, and air environment from the use of energy tends to be great and can increase depending on the relative rates of increase in incomes, energy use, and concentration of population. At later stages of urbanization when incomes are higher, dearer and more efficient sources of energy that emit fewer pollutants are relatively cheaper and emission control devices more affordable.

Concentration

Urban populations use relatively little space. Of the 2,870 million people in 113 countries in 1960, 1,897 million were rural. Of the 7,515 million projected for 2020, 3,187 are expected to be rural. This 68 percent increase in rural population may cause rural densities in some regions to rise to levels that may have serious consequences on the environment. In most regions it will probably be easily absorbed. The 345 percent increase in urban population from 974 million in 1960 to 4,328 million in 2020 will result in enormously greater concentration of population and require a tremendous expansion of urban areas (United Nations 1987).

Urban densities, as measured by density gradients, have been declining since 1900 (Clark 1951). The highest center city densities in the world today are lower than they were a century ago. Urban agglomerations have been spreading and taking up more area. However, the space they require is still quite modest. In the United States, the urban population in 1970 was 73.5 percent of the total, and it increased very slightly to 73.7 percent by 1980 although it increased absolutely from 149.3 to 167.1 million over the decade. In 1970, the urban population occupied 1.5 percent of the land area of the country and this rose to 2.1 percent in 1980. During this period the urban population grew absolutely by 11.9 percent, urban densities decreased by 18.1 percent, and land in urban use rose 36.6 percent. However, the land occupied by the urban population remained still a very small fraction.

The enormous growth in urban population in the world projected for 2020 and the decreasing densities that can be expected to accompany it will require about 1 million additional square miles to be converted to urban use. While this is an area approximately the size of Australia, the total urban population will occupy less than 4 percent of the world land area. It will represent a tremendously greater relative concentration of population than has existed in modern history.

Environmental impact

The concentration of more than 4 billion people on less than 2 million square miles is a staggering prospect. The same area will, of course, contain most of the manufacturing production and other urban economic activities. Levels of production and consumption will be higher and per capita incomes greater. The area will also be that within which most of the increased quantity of energy is used. All of these effects will lead to greater per capita environmental effects.

The population and activities will require larger per capita quantities of water. They will generate vast amounts of waste water. Their activities will produce large amounts of solid wastes, including garbage. On-site disposal of liquid and solid wastes, an acceptable solution at low rural densities, results in intolerable levels of land, water, and air pollution with enormous concentrations of populations at even moderate urban densities.

The enormously expanded use of energy for production, transportation, space heating, lighting, cooking, sanitation, and personal hygiene will result in effluents that will vary according to the type of fuel used. Higher quality fuel and effluent control measures are functions of income, and as agglomerations

grow rapidly and their economic activities expand, improvements do not keep pace and extremely polluted urban environments result.

As incomes rise, larger expenditures are devoted to environmental management. It has been argued the demand for environmental quality is income elastic, which may be the case, but it is difficult to demonstrate because of measurement problems. However, there is a time lag factor, and urbanization takes place faster than incomes rise and facilities can be built. Environmental conditions in many of the huge agglomerations that will emerge over the next few decades can be expected to be very bad and represent a deterioration over present standards.

Social overhead capital

Human populations make extensive modifications to the natural environments they inhabit to support their existence and activities. These include modification of the landscape for the exploitation of natural resources through horticulture, animal husbandry, silviculture, the extraction of minerals, and the management of water. This will have resulted in the clearing of forests, the cultivation of fields, the creation of pasture, planting of timber lots, digging of mines and quarries, erecting elaborate agricultural terraces, creating ponds and channels, building fences and walls. In addition the population will have invested vast amounts of time, energy and resources in the building of structures which can be classified as of two types: those intended for human occupancy and those intended to be unoccupied. Occupied structures are primarily for protection from the elements and animal and human predators . . . . Buildings provide shelter for economic activities of various kinds, residentiary activities, social and cultural activities. Many of these structures have been elaborated with tremendous care and have symbolic significance beyond their immediate use as historic, artistic or cultural monuments. Unoccupied structures are extremely numerous in their varieties. They include wells, dams, docks, roads, causeways, bridges, tunnels, aqueducts, canals, and many other elements. The unoccupied structures usually represent by far the greatest percentage of all manmade structures in the region, and their initial cost and replacement value usually vastly exceeds that of occupied structures. The human population, in addition to structures, will also have accumulated over long periods of production a large number of artifacts. These include tools, implements, clothing and various sorts of textiles, furnishings, machinery and equipment, vehicles and ships. These artifacts are necessary, not merely in the conduct of economic activity but in the pursuit of everyday life (Bates 1982). Many of these artifacts will also be objects of beauty and have symbolic value historically, culturally or socially (Jones 1981, p. 241).

The built physical environment is the accumulation of social overhead capital over time. It is a function of the rate of investment and Gross National Product. It is durable and can last for extraordinarily long periods of time, and the accumulation at any point is modified by the rates of physical deterioration from natural causes, obsolescence, and destruction or demolition. The value of the accumulation of social overhead capital is expected to be some multiple of Gross National Product (Jones, Lewis, and Westendorff, forthcoming). That is to say:

$$BPE\ (t) = k\ GNP\ (t), \qquad (5)$$

where BPE (t) = replacement cost of the built physical environment at time t,

GNP (t) = gross national product at time t,

k = the ratio of social overhead capital to product.

Since investment in modifications of the environment and the construction of buildings and infrastructure is a function of Gross National Product which accumulates over time, when product is increasing rapidly the accumulated stock may be inadequate. That is to say, the multiple of its value to Gross National Product may be low. In other words, the value of k can change from one time to another. In periods of rapid urbanization and growth in

product, the value of k can decrease over previous levels, and the stock of social overhead capital may be inadequate. As a consequence, the quality of the environment can deteriorate. This may be observed in such things as: housing conditions characterized by homelessness, overcrowding, and poor quality; working conditions that are overcrowded, underventillated, unheated or overheated, grimy with dust and particulate matter; streets and roads heavily congested with traffic causing travel times to be extremely long; water supply and sewage disposal systems that are inadequate to serve populations resulting in unsanitary conditions; streets and open spaces littered with garbage and trash because of inadequate collection and disposal systems providing conditions for the increase of insect and rodent populations; and ambient air polluted with smoke, dust, dirt, and corrosive gases resulting from space heating, cooking, transportation and production activities.

We have numerous descriptions and chronicles of the extremely deleterious environmental conditions that accompanied the growth in urbanization and income in cities in Europe and North America in the nineteenth and early twentieth centuries (Fried 1968; Gavin 1971; Mayhew 1965; and Shattuck 1948). That investments in social overhead (non-productive) capital were inadequate in the Soviet Union and Eastern Europe after World War II is becoming painfully apparent. Similar conditions are likely to be the case as the enormous new agglomerations of the twenty-first century emerge.

Vulnerability to natural disasters

The vulnerability to natural disasters of the agglomerations that are emerging is a function of two variables: the hazardousness of their locations, i.e., the extent to which they are subjected to natural disasters; and the vulnerability of the elements at risk contained within them, i.e., the ability of the elements of the built physical environment of buildings, site improvements, and infrastructure in them to withstand the stresses imposed by natural hazards. On both counts the prognosis is not good.

With respect to the vulnerability of the built physical environment, during periods of rapid growth it is likely to be high. As shown previously, the accumulated value of social overhead capital is a function of Gross National Product. Investments which represent great relative sacrifices are likely to be made as economically as possible. This frequently results in selecting accessible sites that may be particularly hazardous. For example, in the earthquake that struck Campania Basilicata in 1980, the extent of destruction was not known for days because the regional roads which passed through each of the towns without alternate routes were impassable with rubble. The stricken region in the Baguio earthquake in the Philippines in 1990 was isolated for weeks because the transport facilities located along the less fertile land on the edges of the valleys were blocked with landslides. Scarce resources lead to inexpensive building methods which may result in vulnerable structures. In recent disasters, such as that in 1988 in Armenia, older buildings have performed much better than many newer ones built during the period of recent rapid growth. Mitigation measures may represent an additional cost that appears extravagant when risks are low given the alternative uses of scarce capital resources. In Jordan, which is relatively affluent, although it has a long and violent seismic history, there have been no seismic building codes to govern the enormous amount of construction over the past 40 years.

For many very good reasons, hazardous sites are frequently the ones with the greatest locational advantage for situating human activities, the populations associated with them, and the urban centers in which they are located.

The junctures between the great tectonic plates that form the surface of the earth frequently define the major topographical features of its surface. Examples are too numerous to list but include the west coast of South America, the coastline of California, the Mississippi Valley, the broad valley system of Danube-Sava-Drava Rivers, the west coast of

Italy, and the Adriatic coast of Yugoslavia. A very important characteristic of these topographical features is that they create conditions that are extremely advantageous for the location of human activities and consequently the populations associated with them. Great valley systems with broad streams for water and transport, fertile soils from millennia of deposits, flat land easy to work, build upon and move over; places where land and sea come together so accessible to other regions because sea transport is so much easier than overland, where mode of transport must change, where good harbors can be found; these are examples of important locational criteria.

The narrow bands where tectonic plates come together are, of course, prone to seismic activity. As a consequence we are confronted with the dilemma that much of the population and many of its most important activities are to be found in the very regions that are most seismically active. This is not a recent phenomenon but one that has characterized human settlement from earliest times. Not only are many of our largest urban agglomerations, most vital facilities, and most significant economic functions located in seismic regions, but also our oldest urban centers are too with the accretions of historic structures and collections of artifacts that served their needs and form our cultural heritage. Some of the earliest traces of the human race have been found in the Great Rift Valley in Central Africa, and the northern end of the Rift in the Middle East has been the home of some of our oldest historic cultures. The remaining towns and buildings of Spanish Colonial America down the coast of Ecuador and Peru, the Caribbean coast of Central America, and the islands of the Caribbean are in regions with long and often tragic seismic histories. Many more examples can be cited (Jones, Manson, Hotchkiss, and Savonis 1985).

Coastal regions are, of course, subject to sea surges, tsunamis, and the most devastating effects of hurricanes, typhoons, and cyclones. The proportion of the total population living within 50 miles of the coastal shoreline of the Atlantic Ocean and the Gulf of Mexico in the United States increased from 26 percent in 1950 to 28 percent in 1980. The population living in the seismically active area within 50 miles of the Pacific coast increased from 8 percent in 1950 to 12 percent in 1980. River valleys are the locus of riverine floods. Flash floods have their most devastating effects in narrow valleys. The junctures of plains with hills or mountains and narrow valley passages through hilly terrain are subject to land and rock slides.

The great agglomerations that are emerging are, to a large extent, places where people have settled for long periods of time. Eighteen of the 25 largest centers in 2000 have been major cities for at least 200 years; some have been major places for four or five centuries and more. The locational advantages these places have may still be important, but if they are only historical, the infrastructure they have accumulated over the ages provides them with a present inertial advantage over other sites. The locations are likely to be hazardous.

In an earlier section, projections were cited of the enormous increase expected in urban populations, the size of the largest agglomerations, and the extent to which populations will be concentrated on small percentages of the land surface. It is on primarily hazardous sites that these concentrations of populations will occur and many of the greatest agglomerations located. In other words, the world population will become increasingly at risk from natural hazards. The relation between population and the built physical environment has been shown. Except for agricultural and other extractive site improvements, energy production and interregional transmission, and land and water transport infrastructure, the bulk of it is in urban centers. The investment in social overhead capital achieved over years with varying sacrifice will be at greater risk in the future than it is now. Even much of that which is located in non-urban areas will be on coastal plains and in river valleys which are subject to hazards. Mitigation measures, such as more effective prediction, warning, and evacuation procedures, better siting of facilities, and sounder construction methods may improve the situation from what it might be without them. Loss of life, injuries,

and disease may be contained, but economic loss from damage and destruction and the secondary economic loss from lapse in productive activity are certain to increase tremendously. While buildings and infrastructure are likely to be less vulnerable because they are better constructed at higher levels of income, the exponential rate at which they will have accumulated will offset quality and total damage will be higher. A study which reviewed earthquakes in the United States after World War II, standardized for magnitude of event and showed that in constant dollar terms earthquakes were becoming more expensive over time. The ability to recover increases with income also, but it too is offset by the greater economic costs.

Conclusion

In two decades, most of the population of the world and most of its economic activities will be located in urban agglomerations for the first time in history. That urban population will be larger than the total population of the world in 1970. The structure of the world economy will have changed from rural agrarian to urban fabrication, trade and services. Incomes will have risen as labor productivity increased. Vastly greater quantities of energy will be consumed. The enormous concentration of people and the structures that will have to be built to accommodate them and their activities will create urban environments of unprecedented magnitude. Simply building these environments is an heroic task: making them habitable, healthy, safe, and invulnerable to natural hazards at acceptable levels seems beyond the accomplishable.

The clear implications are that the highest priority for all our efforts is to devote our attention, time, and resources to the shaping of the enormous urban environment that is emerging. Human and financial resources must be drastically reallocated from other tasks to cope with what will otherwise be overwhelming urban problems. Too much of our efforts to assist developing countries for too long have been focused on rural production and rural populations which are of ever diminishing relative magnitude and importance. Priorities must be revised.

The assistance we have given to build both rural and urban infrastructure and production facilities has too seldom required that necessary mitigation measures be taken to reduce their vulnerability to natural disasters. Not only is this poor investment strategy, it leads to increasing vulnerability. For example, the casualties resulting from the Baguio earthquake in the Philippines in July 1990 would have been lower if the new Hyatt Regency Hotel had never been built, particularly with so little construction supervision. Proper mitigation measures usually add a very small increment to the cost of new facilities, and with scarce capital resources to meet the enormous needs for new urban plant, we cannot afford not to take such measures.

In a similar fashion, assistance for building infrastructure and production facilities has too infrequently required necessary steps to ensure the environmental burden imposed by them will be as light as possible. As a consequence, recent development has been accompanied by alarmingly deteriorating environmental conditions, much of which could have been avoided with little effort. A notable case to the contrary is that of Sarajevo where 30 years of unheeding development had created a city with high levels of land, water, and air pollution which were reversed by a World Bank program between 1980 and 1984. In many instances, relatively simple and low cost measures can ensure that levels of emissions of all kinds will be lower than they would be without them. Unless we take these steps, we will use scarce funds to build vast intolerable urban areas.

What needs to be done to accommodate the burgeoning urban population of the next two decades is staggering to contemplate. Quite possibly we cannot do all that would be desirable to ensure levels of security and quality that we would like. However, we can at least avoid doings things wrong.

Bibliography

Bates, Frederick L., and Charles D. Killian. 1982. "The Use of a Cross-culturally Valid Level of Living Scale for Measuring the Social and Economic Effects of Earthquakes and other Disasters and for Measuring Progress in Recovery and Reconstruction as Illustrated by the Case of the Guatemalan Earthquake of 1976." In Barclay Jones and Miha Tomasevic, eds., *Social and Economic Aspects of Earthquakes*. Ithaca, New York: Program in Urban and Regional Studies, Cornell University, 479-498.

Clark, Colin. 1951. "Urban Population Density." *Journal of the Royal Statistical Society* CXIV:490-496.

Fried, Albert and Richard M. Elman, eds. 1968. *Charles Booth's London*. New York: Pantheon Books.

Fuchs, Victor A. 1981. "Economic Growth and the Rise of Service Employment." In Herbert Giersch, ed., *Towards an Explanation of Economic Growth*. Tubingen: J.C.B. Mohr.

Gavin, Hector. 1971. *Sanitary Ramblings: Being Sketches and Illustrations of Bethnal Green*. London: Cass Library of Victorian Times (No. 8), Frank Cass and Co.

International Labour Office (ILO). 1986. *Economically Active Population Estimates and Projections, 1950-2025*, vol. 1, 3rd edition, Geneva: International Labor Office.

Jones, Barclay G. 1981. "Planning for the Reconstruction of Earthquake Stricken Communities." In Ye Yaoxian and Henry J. Lagorio, eds., *Proceedings of the PRC-USA Joint Workshop on Earthquake Disaster Mitigation through Architecture, Urban Planning, and Engineering*. Beijing: Office of Earthquake Resistance, State Capital Construction Commission, 240-255.

Jones, Barclay G. 1984. "Productivity and the Spatial Implications of Structural Change: Empirical Evidence for Simon's Model." *Papers of the Regional Science Association* 54:1-11.

Jones, Barclay G. 1986. "Urban Support for Rural Development in Kenya." *Economic Geography* 62(3):201-214.

Jones, Barclay G., and Soloman Kone. "Relationships between Urbanization and per Capita Income: United States and Countries of the World, 1960-1980." Forthcoming.

Jones, Barclay G., with Blane D. Lewis. 1990. "The Four Basic Properties of Rank-Size Hierarchical Distributions: Their Characteristics and Interrelationships." *Papers of the Regional Science Association* 68:83-95.

Jones, Barclay G., Blane D. Lewis, and Jeffrey W. Cody. 1987. "Chinese Cities among the Largest World Agglomerations: An Historical Analysis." Paper presented at a conference on Planning for Human Settlements: China and the United States, Tongji University, Shanghai, China, June 29-July 1.

Jones, Barclay G., Blane D. Lewis, and David G. Westendorff. "The Economic Impact on the Built Physical Environment of Damage by Natural Disasters: A Model and Empirical Evidence." Forthcoming.

Jones, Barclay G., Donald M. Manson, Charles M. Hotchkiss, and Michael J. Savonis. 1985. *Search and Protect Procedures for Historic Structures and Artifacts in Seismic Regions*. Working Papers Series: Estimating Building Stocks for Earthquake Hazard Mitigation and Recover Planning. Ithaca, New York: Cornell Institute for Social and Economic Research, Program in Urban and Regional Studies, July.

Jones, Barclay G., and William F. Shepherd. 1986. "Economic Growth and Structural Change: Manufacturing in the United States." Paper presented at the Second Soviet-American Seminar on Regional Planning, Tallinn, Soviet Union, January 6-12.

Jones, Barclay G., and William F. Shepherd. 1987. "Cities of the Future: Implications of the Rise and Relative Decline of

Cities of the West." *Journal of Planning Education and Research* 6(3):162-166.

Jones, Barclay G., and Sulaiman S. Wasty. 1989. "On Various Thresholds in the Development Process." Paper presented at the International Seminar on Regional Development and Planning, Rabat, Morocco, May 10-12.

Jones, Barclay G., and Sulaiman S. Wasty. 1989. "The Impending Threat to Historic Cities." Paper presented at the International Symposium on Historic Cities and Modernization, Beijing, China, May 12-16.

Kuznets, Simon. 1946. *National Income: A Summary of Findings*. New York: National Bureau of Economic Research, Inc.

Mayhew, Henry. 1965. *Selections from London Labour and the London Poor*. Ed. by John L. Bradley. London: Oxford University Press.

Shattuck, Lemuel. 1850. Reprint. *Report of the Sanitary Commission of Massachusetts 1850*. Cambridge: Harvard University Press. 1948.

Simon, Herbert Alexander. 1947. "Effects of Increased Productivity upon the Ratio of Urban to Rural Population." *Econometrica* 15.

United Nations. 1987. *The Prospects of World Urbanization. Revised as of 1984-85.* (ST/ESA/SER.A/101) New York: United Nations.

United Nations. 1989. *The Prospects of World Urbanization, 1988.* (ST/ESA/SER.A/112) New York: United Nations.

Wasty, Sulaiman Shaukat. 1989. *Simon's Theory of Productivity and Structural Change as the Basis for a New Approach to Development: The Case of Pakistan*. Ithaca, N.Y.: Cornell University, Ph.D. dissertation.

Weber, Adna Ferrin. 1963. *The Growth of Cities in the Nineteenth Century: A Study in Statistics*. Ithaca, New York: Cornell University Press.

World Bank. 1982. *World Development Report, 1982*. Washington, D.C.: World Bank.

World Bank. 1990. *World Development Report, 1990*. Washington, D.C.: World Bank.

APPENDIX TABLE IA. THIRTY FIVE LARGEST AGGLOMERATIONS RANKED BY SIZE, 1000 A.D.-1500 A.D.

1000 Rank	Agglomeration: Country	Pop.	1100 Rank	Agglomeration: Country	Pop.	1200 Rank	Agglomeration: Country	Pop.
1	Cordova, Spain	0.450	1	Kaifeng, China	0.442	1	Hangchow, China	0.255
2	Constantinople, Byzantium	0.450	2	Constantinople, Byzantium	0 350	2	Fez, Morocco	0.250
3	Kaifeng, China	0.400	3	Sian, China	0 300	3	Cairo, Egypt	0.200
4	Sian, China	0.300	4	Cairo, Egypt	0.200	4	Constantinople, Byzantium	0.200
5	Kyoto, Japan	0.200	5	Kyoto, Japan	0 200	5	Canton, China	0.200
6	Cairo, Egypt	0.150	6	Marrakesh, Morocco	0.150	6	Pagan, Burma	0.180
7	Hasa, Qarmatians	0.150	7	Bagdad, Seljuks	0.150	7	Nanking, China	0.180
8	Hangchow, China	0.140	8	Hangchow, China	0.150	8	Kamakura, Japan	0.175
9	Angkor, Cambodia	0.130	9	Canton, China	0.140	9	Angkor, Cambodia	0.150
10	Bagdad, Persia	0.125	10	Kalyan, Chalukyas	0.125	10	Palermo, Sicily	0.150
11	Nishapur, Uighurs	0.125	11	Angkor, Cambodia	0.125	11	Marrakesh, Morocco	0.150
12	Chengtu, China	0.115	12	Anhilvada, Gujarat	0.125	12	Seville, Morocco	0.150
13	Khajuraho, Chandels	0.100	13	Fez, Morocco	0.125	13	Cuttack, Orissa	0.150
14	Anhilvada, Gujarat	0.100	14	Seville, Morocco	0.125	14	Peking, Kins	0.150
15	Bokhara, Uighurs	0.100	15	Tinnis, Egypt	0.125	15	Sian, Kins	0.150
16	Liaoyang, Khitans	0.100	16	Soochow, China	0 110	16	Kaifeng, Kins	0 150
17	Canton, China	0.100	17	Isfahan, Seljuks	0.110	17	Polonnaruwa, Ceylon	0.140
18	Rayy, Persia	0.100	18	Yangchow, China	0.107	18	Paris, France	0.110
19	Tanjore, Cholas	0.095	19	Kayseri, Seljukids	0.100	19	Bagdad, Seljuks	0.100
20	Songdo, Korea	0.095	20	Pagan, Burma	0.100	20	Tali, Nanchao	0.100
21	Isfahan, Persia	0.092	21	Liaoyang, Khitans	0.100	21	Konia, Sejukids	0.100
22	Seville, Spain	0.090	22	Nishapur, Seljuks	0.100	22	Damietta, Egypt	0.100
23	Chunar, Bengal	0.089	23	Chengtu, China	0.095	23	Yangchow, China	0.100
24	Soochow, China	0.087	24	Kanauj, North India	0 090	24	Kalinjar, Chandels	0.100
25	Ninghsia, Tangut	0.085	25	Palermo, Sicily	0.090	25	Chengtu, China	0.095
26	Loyang, China	0.085	26	Ninghsia, Kins	0.088	26	Ghazni, Persia	0.095
27	Yangchow, China	0.085	27	Gangaikondapuram	0.088	27	Damascus, Egypt	0.090
28	Tinnis, Egypt	0.083	28	Ghazni, Ghor	0.088	28	Soochow, China	0.090
29	Edessa, Egypt	0.082	29	Songdo, Korea	0.088	29	Ninghsia, Kins	0.085
30	Venhi,	0.082	30	Rayy, Khwarizm	0.085	30	Rabat, Morocco	0.085
31	Samarkand, Uighurs	0.080	31	Loyang, Kins	0.083	31	Kyoto, Japan	0.085
32	Peking, Khiyans	0.080	32	Tali, Nanchao	0.083	32	Songdo, Korea	0.085
33	Manyakheta,	0.078	33	Nadiya, Ghor	0.083	33	Alexandria, Egypt	0.085
34	Nanking, China	0.078	34	Peking, Kins	0.080	34	Nadiya, Ghor	0.085
35	Aleppo, Egypt	0.078	35	Lahore, Ghor	0.078	35	Nishapur, Khwarizm	0.080
	Total	4.779		Total	4 678		Total	4.650

1300 Rank	Agglomeration: Country	Pop.	1400 Rank	Agglomeration: Country	Pop.	1500 Rank	Agglomeration: Country	Pop.
1	Hangchow, China	0.432	1	Nanking, China	0.473	1	Peking, China	0.672
2	Peking, China	0.401	2	Cairo, Egypt	0.450	2	Vijayanagar, South India	0.500
3	Cairo, Egypt	0.400	3	Vijayanagar, South India	0.350	3	Cairo, Egypt	0.450
4	Canton, China	0.300	4	Hangchow, China	0.325	4	Hangchow, China	0.375
5	Nanking, China	0.300	5	Peking, China	0.320	5	Nanking, China	0.285
6	Paris, France	0.228	6	Canton, China	0.300	6	Canton, China	0.285
7	Fez, Maghreb	0.200	7	Paris, France	0.275	7	Tabriz, Persia	0.250
8	Kamakura, Japan	0.200	8	Tabriz, Persia	0.200	8	Paris, France	0.225
9	Soochow, China	0.180	9	Kyoto, Japan	0.200	9	Constantinople, Turkey	0.200
10	Sian, China	0.150	10	Soochow, China	0.175	10	Gaur, Bengal	0.200
11	Granada, Granada	0.150	11	Pandua, Bengal	0.150	11	Soochow, China	0.200
12	Constantinople, Byzantium	0.150	12	Fez, Morocco	0 150	12	Sian, China	0.150
13	Tabriz, Persia	0.150	13	Sian, China	0.150	13	Seoul, Korea	0.150
14	Angjor, Cambodia	0.125	14	Cambay, North India	0.125	14	Mandu, Malwa	0.150
15	Cuttack, Orissa	0.125	15	Milan, Milan	0.125	15	Ayutia, Siam	0.150
16	Venice, Venice	0.110	16	Bruges, France	0.125	16	Fez, Morocco	0.125
17	Chengtu, China	0.110	17	Venice, Venice	0.110	17	Adrianople, Turkey	0.125
18	Milan, Milan	0.100	18	Genoa, Genoa	0.100	18	Naples, Naples	0.125
19	Genoa, Genoa	0.100	19	Granada, Granada	0.100	19	Cambay, Gujarat	0.125
20	Delhi, North India	0.100	20	Samarkand, Timurids	0.100	20	Venice, Venice	0.115
21	Sarai, Golden Horde	0.100	21	Seoul, Korea	0.100	21	Chengtu, China	0.112
22	Gaur, North India	0.100	22	Siraz, Timurids	0.100	22	Milan, France	0 104
23	Chuanchow, China	0.100	23	Damascus, Egypt	0.100	23	Delhi, North India	0.100
24	Marrakesh, Maghreb	0.100	24	Prague, Germany	0 095	24	Kaifeng, China	0.095
25	Quilon, Travancore	0.100	25	Bursa, Turkey	0.093	25	Chitor, Mewar	0.090
26	Warangal,	0.100	26	Bagdad, Jelairids	0.090	26	Penukonda,	0 090
27	Kaifeng, China	0.095	27	Quilon,	0.090	27	Bruges, Spain	0.090
28	Yangchow, China	0.095	28	Chengtu, China	0.088	28	Gwalior, Gwalior	0 090
29	Damietta, Egypt	0.090	29	Chuanchow, China	0.087	29	Fuchow, China	0.083
30	Seville, Spain	0.090	30	Kaifeng, China	0 087	30	Wuchang, China	0.081
31	Dhar,	0.090	31	Caffa,	0 085	31	Bidar,	0.080
32	Songdo, Korea	0.080	32	Gaur, Bengal	0.083	32	Ahmedabad,	0.080
33	Tali, China	0.080	33	Gulbarga,	0.083	33	Tenochtitlan, Aztecs	0 080
34	Tunis, Maghreb	0.075	34	Fuchow, China	0.081	34	Lyon, France	0.080
35	Wuchang, China	0.073	35	Damietta, Egypt	0.080	35	Ghent, Spain	0.080
	Total	5.358		Total	5.845		Total	6.192

APPENDIX TABLE I3 THIRTY FIVE LARGEST AGGLOMERATIONS RANKED BY SIZE, 1600 A.D -2000 A D

1600 Rank	Agglomeration: Country	Pop.	1700 Rank	Agglomeration: Country	Pop.	1800 Rank	Agglomeration: Country	Pop.
1	Peking, China	0.706	1	Constantinople, Turkey	0 700	1	Peking, China	1.100
2	Constantinople, Turkey	0.700	2	Peking, China	0 650	2	London, Britain	0.861
3	Agra, Moguls	0.500	3	Isfanan, Persia	0.600	3	Canton, China	0.800
4	Cairo, Turkey	0.400	4	London, England	0.550	4	Constantinople, Turkey	0.570
5	Osaka, Japan	0.400	5	Paris, France	0.530	5	Paris, France	0.547
6	Canton, China	0.350	6	Yedo Japan	0.500	6	Hangchow, China	0.500
7	Yedo, Japan	0.350	7	Delhi, Moguls	0.500	7	Yedo, Japan	0.492
8	Kyoto, Japan	0.350	8	Ahmedabad, Moguls	0.380	8	Naples, Naples	0.430
9	Hangchow, China	0.350	9	Osaka, Japan	0.370	9	Soochow, China	0.392
10	Lahore, Moguls	0.350	10	Kyoto, Japan	0.350	10	Osaka, Japan	0.380
11	Nanking, China	0.317	11	Cairo, Turkey	0.350	11	Kyoto, Japan	0.377
12	Naples, Spain	0.275	12	Canton, China	0.300	12	Lucknow, India	0.300
13	Paris, France	0.250	13	Nanking, China	0.300	13	Cairo, Egypt	0.263
14	Ahmedabad, Moguls	0.225	14	Hangchow, China	0.292	14	Moscow, Russia	0.238
15	Bijapur, Bijapur	0.200	15	Soochow, China	0.245	15	Lisbon, Portugal	0.237
16	London, England	0.187	16	Naples, Spain	0.207	16	Patna, India	0.235
17	Soochow, China	0.175	17	Mexnes, Morocco	0 200	17	Vienna, Austria	0.231
18	Adrianople, Turkey	0.160	18	Dacca, Moguls	0.200	18	Sian, China	0 224
19	Venice, Venice	0.151	19	Surat, Moguls	0.200	19	Nanking, China	0.220
20	Sian, China	0.150	20	Hyderabad, Moguls	0.200	20	St. Petersburg, Russia	0.220
21	Qazvin, Persia	0.150	21	Lisbon, Portugal	0.188	21	Amsterdam, Holland	0.201
22	Potosi, Spain	0.148	22	Amsterdam, Holland	0.172	22	Ningpo, China	0.200
23	Seville, Spain	0.144	23	Patna, Moguls	0.170	23	Calcutta, India	0.200
24	Chengtu, China	0.130	24	Seoul, Korea	0.170	24	Hyderbad, Hyderbad	0.200
25	Marrakesh, Morocco	0.125	25	Sian, China	0.167	25	Seoul, Korea	0.190
26	Arakan, Arakan	0.125	26	Ayutia, Siam	0.150	26	Wuchang, China	0 185
27	Isfahan, Persia	0.125	27	Tabriz, Persia	0.150	27	Murshidabad	0.185
28	Milan, Milan	0.119	28	Wuchang, China	0.150	28	Mukden, China	0.182
29	Lisbon, Portugal	0.110	29	Srinagar, Moguls	0.150	29	Benares, India	0 179
30	Granada, Spain	0.110	30	Rome, Papal States	0.149	30	Amapura, Thailand	0.175
31	Rome, Papal States	0.109	31	Venice, Venice	0.143	31	Fatshan, China	0.175
32	Palermo, Spain	0.105	32	Mukden, China	0.140	32	Bombay, India	0.175
33	Prague, Bohemia	0.100	33	Smyrna, Turkey	0.135	33	Berlin, Germany	0.172
34	Ayutia, Siam	0.100	34	Moscow, Russia	0.130	34	Madrid, Spain	0.169
35	Fez, Morocco	0.100	35	Milan, Milan	0.124	35	Dublin, Ireland	0.165
	Total	8.346			9.912		Total	11.370

1900 Rank	Agglomeration: Country	Pop.	Rank	1950 Agglomeration/Country	Pop.	2000 Rank	Agglomeration: Country	Pop.
1	London, Britain	6.480	1	NYC/NE New Jersey, USA	12.400	1	Mexico City, Mexico	26.300
2	New York, USA	4.242	2	London, UK	10.400	2	Sao Paulo, Brazil	24.000
3	Paris, France	3.330	3	Shanghai, China	10 300	3	Tokyo/Yokohama, Japan	17.100
4	Berlin, Germany	2 424	4	Rhein-Ruhr, FDR	6 900	4	Calcutta, India	16.600
5	Chicago, USA	1.717	5	Tokyo/Yokohama, Japan	6.700	5	Greater Bombay, India	16.000
6	Vienna, Austria	1.662	6	Beijing, China	6 700	6	NYC/NE New Jersey, USA	15.500
7	Tokyo, Japan	1.497	7	Paris, France	5.500	7	Seoul, Republic of Korea	13.500
8	St. Petersburg, Russia	1.439	8	Tianjin, China	5.400	8	Shanghai, China	13.500
9	Philadelphia, USA	1.418	9	Buenos Aires, Argentina	5 300	9	Rio de Janeiro, Brazil	13.300
10	Manchester, Britain	1.255	10	Chicago/NW Illinois, USA	5.000	10	Delhi, India	13.300
11	Birmingham, Britain	1.248	11	Moscow, USSR	4 800	11	Buenos Aires, Argentina	13.200
12	Moscow, Russia	1.120	12	Calcutta, India	4 400	12	Cairo/Giza/Imbaba, Egypt	13.200
13	Peking, China	1.100	13	Los Angeles, USA	4 100	13	Jakarta, Indonesia	12.800
14	Calcutta, India	1.085	14	Osaka/Kobe, Japan	3.800	14	Baghdad, Iraq	12.800
15	Boston, USA	1.075	15	Milan, Italy	3.600	15	Teheran, Iran	12.700
16	Glasgow, Scotland	1.072	16	Rio de Janeiro, Brazil	3.500	16	Karachi, Pakistan	12.200
17	Liverpool, Britain	0.940	17	Mexico City, Mexico	3.100	17	Istanbul, Turkey	11.900
18	Osaka, Japan	0.931	18	Philadelphia, USA	3.000	18	Los Angeles, USA	11.200
19	Constantinople, Turkey	0.900	19	Greater Bombay, India	2.900	19	Dacca, Bangladesh	11.200
20	Hamburg, Germany	0.895	20	Detroit, USA	2.800	20	Manila, Philippines	11.100
21	Shanghai, China	0.837	21	Sao Paulo, Brazil	2.800	21	Beijing, China	10.800
22	Buenos Aires, Argentina	0 806	22	Naples, Italy	2.800	22	Moscow, USSR	10.100
23	Budapest, Austria	0.792	23	Leningrad, USSR	2.600	23	Bangkok/Thonburi, Thailand	9 500
24	Bombay, India	0.780	24	Manchester, UK	2.500	24	Tianjin, China	9.200
25	Ruhr, Germany	0.766	25	Birmingham, UK	2.500	25	Paris, France	9.200
26	Rio de Janeiro, Brazil	0.750	26	Cairo/Giza/Imbaba, Egypt	2.500	26	Lima-Callo, Peru	9.100
27	Warsaw, Poland	0.724	27	Boston, USA	2.300	27	London, UK	9.100
28	Tientsin, China	0.700	28	Shenyang, China	2.200	28	Kinshasha, Zaire	8.900
29	Canton, China	0 670	29	West Berlin, FDR	2.200	29	Rhein-Ruhr, FDR	8 600
30	Newcastle, Britain	0.615	30	San Francisco/Oakland, USA	2.000	30	Lagos, Nigeria	8.300
31	St. Louis, USA	0.614	31	Leeds/Bradford, UK	1.900	31	Madras, India	8 200
32	Pittsburg, USA	0.604	32	Glasgow, UK	1.900	32	Bangalore, India	8.0[illegible]
33	Cairo, Egypt	0.595	33	Jakarta, Indonesia	1.800	33	Osaka/Kobe, Japan	7.7[illegible]
34	Naples, Italy	0.563	34	Hamburg FDR	1.800	34	Milan, Italy	7 50[illegible]
35	Brussels, Belgium	0.561	35	Wien, Austria	1.800	35	Chicago/NW Illinois, USA	7.200
	Total	46.207		Total	144.200		Total	422.800

1600 1700 1800

APPENDIX TABLE II URBAN AGGLOMERATIONS WITH POPULATION OF TWO MILLION OR MORE IN 1985, RANKED BY SIZE, 1950 AND 2000

RANK 1950	AGGLOMERATION	COUNTRY	1950
1	NEW YORK	U.S.A	12.34
2	Shanghai	CHINA	10.26
3	LONDON	U K	10 25
4	Tokyo-Yokohama	JAPAN	6 74
5	Beijing	CHINA	6.54
6	PARIS	FRANCE	5.44
7	Tianjin	CHINA	5 36
8	Buenos Aires	ARGENTINA	5 13
9	CHICAGO	U S.A.	4.94
10	MOSCOW	USSR	4.84
11	Calcutta	INDIA	4.45
12	LOS ANGELES	U.S.A	4.05
13	Osaka/Kobe	JAPAN	3.83
14	MILAN	ITALY	3.63
15	Rio de Janeiro	BRAZIL	3.45
16	PHILADELPHIA	U.S.A.	2.94
17	Greater Bombay	INDIA	2.90
18	Mexico City	MEXICO	2.88
19	DETROIT	U S A.	2.77
20	Sao Paulo	BRAZIL	2.75
21	NAPLES	ITALY	2.75
22	LENINGRAD	USSR	2.62
23	MANCHESTER	U.K.	2.51
24	BIRMINGHAM	U.K.	2.50
25	Cairo/Giza	EGYPT	2.41
26	BOSTON	U S A.	2.24
27	Shenyang	CHINA	2.22
28	WEST BERLIN	GERMANY	2.15
29	SAN FRANCISCO	U.S.A.	2.03
30	LEEDS-BRADFORD	U.K.	1.91
31	HAMBURG	GERMANY	1.79
32	Hong Kong	HONG KONG	1.75
33	Jakarta	INDONESIA	1.73
34	Sydney	AUSTRALIA	1.70
35	KATOWICE	POLAND	1.69
36	BUDAPEST	HUNGARY	1.62
37	ROMA	ITALY	1.57
38	BARCELONA	SPAIN	1.56
39	MADRID	SPAIN	1 55
40	Melbourne	AUSTRALIA	1.54
41	Chongoing	CHINA	1.54
42	Manila/Quezon	PHILIPPINES	1.54
43	Guangzhou	CHINA	1.43
44	Madras	INDIA	1.40
45	Delhi	INDIA	1.39
46	Bangkok	THAILAND	1.36
47	ATHINAI	GREECE	1.35
48	MONTREAL	CANADA	1.34
49	Santiago	CHILE	1.33
50	WASHINGTON D.C	U.S.A.	1.30
51	Wuhan	CHINA	1.25
52	BUCURESTI	ROMANIA	1.18
53	Hyderabad	INDIA	1.12
54	TORONTO	CANADA	1.07
55	Alexandria	EGYPT	1.04
56	Teheran	IRAN	1.04
57	Karachi	PAKISTAN	1.03
58	Seoul	R.O.K.	1.02
59	Lima-Callo	PERU	1.01
60	ISTANBUL	TURKEY	0 97
61	MUNCHEN	GERMANY	0.96
62	Nagoya	JAPAN	0 96
63	Pusan	R.O K.	0 95
64	Singapore	SINGAPORE	0.95
65	Kitakyushu	JAPAN	0.94
66	Xian	CHINA	0.94
67	Harbin	CHINA	0.93
68	Nanjing	CHINA	0 89
69	TORINO	ITALY	0.88
70	Ho Chi Minh Ville	VIET NAM	0.87

RANK 2000	AGGLOMERATION	COUNTRY	2000
1	Mexico City	MEXICO	24 44
2	Sao Paulo	BRAZIL	23.60
3	Tokyo/Yokohama	JAPAN	21 32
4	NEW YORK	U.S.A.	16 10
5	Calcutta	INDIA	15 94
6	Greater Bombay	INDIA	15.43
7	Shanghai	CHINA	14.69
8	Teheran	IRAN	13.73
9	Jakarta	INDONESIA	13.23
10	Buenos Aires	ARGENTINA	13.05
11	Rio de Janeiro	BRAZIL	13.00
12	Seoul	R.O.K.	12 97
13	Delhi	INDIA	12.77
14	Lagos	NIGERIA	12.45
15	Cairo/Giza	EGYPT	11.77
16	Karachi	PAKISTAN	11.57
17	Manila/Quezon	PHILIPPINES	11.48
18	Beijing	CHINA	11.47
19	Dacca	BANGLADESH	11.26
20	Osaka/Kobe	JAPAN	11.18
21	LOS ANGELES	U.S.A	10 91
22	LONDON	U.K	10.79
23	Bangkok	THAILAND	10 26
24	MOSCOW	USSR	10.11
25	Tianjin	CHINA	9.96
26	Lima-Callo	PERU	8.78
27	PARIS	FRANCE	8.76
28	MILAN	ITALY	8.74
29	Madras	INDIA	7.85
30	Bangalore	INDIA	7.67
31	Baghdad	IRAQ	7.66
32	CHICAGO	U.S A.	6.98
33	Bogota	COLOMBIA	6.94
34	Hong Kong	HONG KONG	6.09
35	Lahore	PAKISTAN	5.93
36	LENINGRAD	USSR	5.84
37	Pusan	R.O.K.	5 82
38	Santiago	CHILE	5 58
39	Shenyang	CHINA	5.50
40	MADRID	SPAIN	5.42
41	Medan	INDONESIA	5 36
42	ANKARA	TURKEY	5.19
43	Alger	ALGERIA	5.16
44	Ahmedabad	INDIA	5.09
45	Belo Horizonte	BRAZIL	5.01
46	Hyderabad	INDIA	4.94
47	Caracas	VENEZUELA	4.79
48	Casablanca	MOROCCO	4.63
49	Guangzhou	CHINA	4.49
50	Wuhan	CHINA	4 47
51	NAPLES	ITALY	4.46
52	Yangon	MYANMAR	4.45
53	Ho Chi Minh Ville	VIET NAM	4.42
54	Kinshasa	ZAIRE	4.35
55	PHILADELPHIA	U.S.A.	4.33
56	Alexandria	EGYPT	4 29
57	Sydney	AUSTRALIA	4 08
58	Chengdu	CHINA	3 98
59	Porto Alegre	BRAZIL	3 94
60	DETROIT	U.S.A.	3.92
61	Guadalajara	MEXICO	3.89
62	KATOWICE	POLAND	3.88
63	ROMA	ITALY	3.82
64	Taibei	CHINA	3.78
65	Zibo	CHINA	3.76
66	Monterrey	MEXICO	3.75
67	Surabaja	INDONESIA	3.67
68	HOUSTON	U S A.	3.62
69	TORONTO	CANADA	3.61
70	Recife	BRAZIL	3 57

APPENDIX TABLE II URBAN AGGLOMERATIONS WITH POPULATION OF TWO MILLION OR MORE IN 1985, RANKED BY SIZE, 1950 AND 2000.

RANK 1950	AGGLOMERATION	COUNTRY	1950
71	Ahmedabad	INDIA	0.85
72	DALLAS	U S.A.	0.86
73	Lahore	PAKISTAN	0.83
74	Recife	BRAZIL	0.82
75	Bangalore	INDIA	0.76
76	KIEV	USSR	0.74
77	Casablanca	MOROCCO	0.71
78	HOUSTON	U.S.A.	0.71
79	Chengdu	CHINA	0.70
80	Caracas	VENEZUELA	0 68
81	Bogota	COLOMBIA	0.68
82	Yangon	MYANMAR	0.67
83	Porto Alegre	BRAZIL	0.67
84	TASHKENT	USSR	0.61
85	Surabaja	INDONESIA	0.61
86	Poona	INDIA	0.59
87	Liupanshui	CHINA	0 59
88	Taiber	CHINA	0.59
89	Baghdad	IRAQ	0.58
90	Zibo	CHINA	0.48
91	Belo Horizonte	BRAZIL	0.47
92	Salvador	BRAZIL	0.45
93	Alger	ALGERIA	0.44
94	Dacca	BANGLADESH	0.42
95	Guadalajara	MEXICO	0.40
96	Monterrey	MEXICO	0.36
97	Medan	INDONESIA	0.35
98	Lagos	NIGERIA	0.29
99	ANKARA	TURKEY	0.28
100	Kinshasa	ZAIRE	0.17

RANK 2000	AGGLOMERATION	COUNTRY	2000
71	Harbin	CHINA	3.56
72	Poona	INDIA	3.56
73	SAN FRANCISCO	U S.A.	3.53
74	Chongoing	CHINA	3.42
75	KIEV	USSR	3.39
76	Salvador	BRAZIL	3.39
77	BARCELONA	SPAIN	3.38
78	ISTANBUL	TURKEY	3.27
79	Melbourne	AUSTRALIA	3.27
80	WASHINGTON D.C.	U.S.A.	3.19
81	ATHINAI	GREECE	3.15
82	DALLAS	U.S.A.	3.11
83	BIRMINGHAM	U.K.	3.10
84	Xian	CHINA	3.08
85	Liupanshui	CHINA	3.00
86	Singapore	SINGAPORE	2.95
87	MONTREAL	CANADA	2.93
88	NANJING	CHINA	2.83
89	BOSTON	U.S.A.	2.81
90	TORINO	ITALY	2.77
91	TASHKENT	USSR	2.70
92	MANCHESTER	U.K.	2.60
93	BUCURESTI	ROMANIA	2.55
94	Kitakyushu	JAPAN	2.39
95	MUNCHEN	GERMANY	2.33
96	HAMBURG	GERMANY	2.24
97	BUDAPEST	HUNGARY	2.15
98	LEEDS-BRADFORD	U.K.	2.14
99	Nagoya	JAPAN	2.11
100	WEST BERLIN	GERMANY	2.08

Source: United Nations. PROSPECTS OF WORLD URBANIZATION. New York: 1969.