Megaopolis: Resource Conserver or Resource Waster

Joseph J. Spengler

MEGALOPOLIS: RESOURCE CONSERVER
OR RESOURCE WASTER?

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Efficiency in the use of resources, natural and others, varies with the distribution of population. This Article is concerned with one aspect of the effect of current trends in population distribution upon resource use, namely, the megalopolitanization of our population, a process symbolized by the title, *One Tenth of a Nation*[1] of a recent study of the New York Metropolitan Region. The purpose of the Article is to indicate issues in need of careful analysis rather than to present much new data; it is intended primarily as a *mise en scène*, a poser of questions in an area wherein a plethora of "data" has swamped concern with eudaemonic principles.

I
CURRENT TRENDS

In 1960, 63 per cent of the population of the United States lived in standard metropolitan statistical areas; of this fraction, 51.4 per cent lived in central cities and 36.8 per cent in urban centers situated within these areas. Of the nation's population, 69.9 per cent were urban, of whom but one-fifth lived outside these areas. Of the nation's population, 9.8 per cent lived in places of 1,000,000 or more, 16 per cent in places of 500,000 or more, 22 per cent in places of 250,000 or more, and 28.5 per cent in places of 100,000 or more. The not quite comparable figures in 1910 were 45.7 per cent urban, and 9.2, 12.5, 16.8, and 22.1 per cent, respectively, living in places of 1,000,000 or more, 500,000 or more, 250,000 or more, and 100,000 or more.

In the 1950's it was predicted that 73 per cent of the nation's population would be urban by 1980, with 67 per cent living in standard metropolitan statistical areas.[2] By 1985, it is anticipated, the New York Standard Metropolitan Statistical Area could num-

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1. Lichtenberg, One Tenth of a Nation (1960); see also Gottman, Megalopolis (1961); Hawley, The Changing Shape of Metropolitan America (1955); Davis, The World's Metropolitan Areas (1959).

2. Hauser, Population Perspectives 98 (1961); see also Bogue, The Population of the United States 784 (1959).

ber about 14 million inhabitants, while the number of such areas including a million or more inhabitants will approximate forty-nine,[3] and nearly one-half the nation's population inhabitants will live in the fifty-two largest such areas.[4] Associated with this tendency toward increasing concentration of population in space, together with reduction of population density within metropolitan areas, is the emergence of belts of population, or "strip cities" which consist of a string of cities, together with intervening areas of much lower but still rising average density of population. Presently, the belts are found mainly East of the Mississippi River, in both the more crowded northern portion and the less crowded southern portion; several lie in the Pacific Coast region, mainly in California, and several are in Texas, but only three are in the area (exclusive of Texas) lying between the Mississippi River and the Pacific Coast region.[5]

It is hard to estimate to what extent these trends are predetermined and non-modifiable. There is considerable patterning in the distribution of population among cities as well as within particular cities.[6] Furthermore, there is evidence that the distribution of population among cities may be the result of a stochastic process, allowing the larger urban centers to keep pace with, or even outstrip, the smaller. The socio-economic mechanisms underlying such a supposedly predetermined pattern, assuming it to exist, has not yet been discovered. Neither does this pattern correspond closely to the pattern that emerges if city size is governed mainly by the functions which cities of specific size perform in a hierarchy of cities

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3. Lowery, Metropolitan Populations to 1985: Trial Projections 18-20 (Rand Corp. Memo. No. RM-4125 RC, Sept. 1964).

4. *Id.* at 25.

5. See U.S. News & World Report, Sept. 18, 1961, p. 73; see also Hauser, *op. cit. supra* note 2, at 117. Within the belt running along the Northeastern seaboard from Virginia to New Hampshire, about one-half of the included area remains wooded, one-third is used in farming, and about fifteen per cent is "devoted to special use (chiefly buildings and roads)." Gottman, *op. cit, supra* note 1, at 234, 384.

6. *E.g.,* Berry & Garrison, *Alternate Explanations of Urban Rank-Size Relationships,* 48 Annals Ass'n Am. Geographers 83 (1958); Isard, Methods of Regional Analysis: An Introduction to Regional Science, ch. 11 (1960); Isard, Location and Space Economy, ch. 3 (1956); Losch, Economics of Location, ch 24 (1954); Philbrick, *Principles of Areal Functional Organization in Regional Human Geography,* 33 Econ. Geog. 299 (1957); Duncan & Duncan, *The Measurement of Intra-City Locational and Residential Patterns,* 2 J. Regional Sci. 37 (1960); Duncan, *Population Distribution and Community Structure,* 22 Cold Spring Harbor Symposia in Quan. Biol. 357 (1957); Vining, *A Description of Certain Spatial Aspects of an Economic System,* 3 Economic Development & Cultural Change 147 (1955). See also authorities cited in note 7 *infra.*

ordered about central places; nor are our largest metropolitan centers prone to be centrally located.[7]

It is possible that not much is to be learned from the principles governing growth and form in the organic world and made applicable to the world of city and population distribution.[8] It is worth noting, however, that while "each main group of animals has its mean and characteristic size," this size may vary with the kind of environment in which animals choose to live. Thus, the whale or the hippopotamus finds support for its great burden in waters while it could not, as do birds, find comparable support in an aerial environment.[9] The historical development of urban as well as overall population-distribution patterns is in keeping with Thompson's observations concerning the size of organisims. The proportion of the population available for concentration in urban centers depends mainly upon productivity per worker in agriculture;[10] it falls within a range of five to ninety per cent. The distribution of population within and among cities, the product of both centrifugal and centripetal forces, is governed, in a rational economy, primarily by transportation conditions and by economies and diseconomies of scale and agglomeration, and secondarily by the size and character of the state in which the population lives and by the tastes and values of

7. On the stochastic process, see Simon, Models of Man, ch. 9 (1957); and for comments on this and alternative explanations, see Duncan, *Population Distribution and Community Structure, supra* note 6, at 365. Good transportation and transfer relations, formerly largely dependent on ready access to coastal or river channels, have determined the location of large cities up to now. Of 19 metropolitan areas with large central cities of 500,000 or more inhabitants, 12 are on sea or lake coasts, and of 75 middle-size central cities of 100,000 to 500,000 inhabitants, 40 are so situated. See Schnore & Varley, *Some Concomitants of Metropolitan Size*, 20 Am. Sociology Rev. 410 (1955). On the distribution of cities by size, see also Stewart & Warntz, *The Physics of Population Distribution*, 1 J. Regional Science 99 (1958); Stewart, *Demographic Gravitation, Evidence and Application*, 11 Sociometry 31 (1948); Stewart, *Empirical Mathematical Rules Concerning the Distribution and Equilibrium of Population*, 37 Geographical Rev. 461 (1947); Zipf, Human Behavior and the Principal of Least Effort, ch. 9 (1949); Duncan, *The Measurement of Population Distribution*, 11 Population Studies 27 (1957).

8. Losch doubts, however, "that the fundamental principles of zoological, botanical and economic location theory differ very greatly. Natural events reach their goals by the shortest route." Losch, *op. cit. supra* note 6, at 184, n. 119.

9. Thompson, On Growth and Form 42 (1961); see also Hirsch, Urban Life and Form (1963).

10. This statement needs to be qualified by a country's disposition to export or import agricultural produce.

this population.[11] As these conditions have changed, the pattern of population distribution has changed. It is questionable, therefore, whether the distribution of population among cities is so completely subject to stochastic processes as sometimes implied.

Political philosophers have always emphasized that a city's size, together with its location and internal order, should correspond to an ideal. This is found in Chinese, Indian, Greek, Roman, medieval, and later literature as well as in the writings of Utopians.[12] In more recent time, this emphasis is expressed in the concept of a city of optimum size. What constitutes an optimum size depends, of course, upon the criteria of optimality chosen and upon the manner in which diverse criteria are reduced to terms of a common denominator of optimality.[13] Colin Clark's analysis of urban economic functions led him to conclude that "a region can give its inhabitants an adequate range of commercial services when the population of its principal city is somewhere in the neighborhood of 100,000 to 200,-000."[14] For other services, a smaller population generally suffices,

11. On changes in the character of cities over time, as economic, technological, political, and economical conditions have changed, see Mumford, The City in History; Its Origins, Its Transformations, and Its Prospects (1962); Mols, Introduction á la Démographie Historique des Villes d'Europe du XIV° au XVIII° Siécle (3 vols. 1953-56); Russell, *Late Ancient and Medieval Population*, 48 Transactions Am. Philosophical Society 2 (1948); Russell, *The Metropolitan City Region of the Middle Ages*, 2 J. Regional Science 55 (1960); Sjoberg, The Preindustrial City (1960); Lynch, *The Form of Cities*, Scientific Am., April, 1954, p. 54; Kraeling & Adams, City Invincible (1960); Comhaire & Cahnman, How Cities Grew (1959); Gilmore, Transportation and the Growth of Cities (1953).

12. *E.g.*, Kane, History of Dharmasastra (3 vols. 1930-46); Wycherly, How the Greeks Built Cities (2d ed. 1962); Hackett, Man, Society and Environment (1950); Negley & Patrick, The Quest of Utopia (1952); Braunfels, Mitteralterliche Stadtbaukunft in der Toskana (1959); Rosenau, The Ideal City in Its Architectual Evolution (1959); Saarinen, The City, Its Growth, Its Decay, Its Future (1943); Meyerson, *Utopian Traditions and the Planning of Cities*, 90 Daedalus 180 (1961).

13. See Duncan, *Optimum Size of Cities*, in Spengler & Duncan, Demographic Analysis 372 (1956); Ogburn & Duncan, *City Size as a Sociological Variable*, in Burgess & Bogue, Contributions to Urban Sociology 129 (1964); Lillibridge, *Urban Size: An Assessment*, 28 Land Econ. 341 (1952). Ludlow reports some evidence that cities of 100-150 thousand population appear to "be the most economical." Ludlow, *Urban Densities and Their Costs: An Exploration into The Economics of Population Densities and Urban Patterns*, in Woodbury, Future of Cities and Urban Redevelopment: Problems and Practices 153, 162 (1953). Stress consequent upon the increasing social interaction associated with increasing population density may also set limits to optimum size. See Calhoun, *Social Welfare as a Variable in Population Dynamics*, 22 Cold Spring Harbor Symposia in Quantitative Biology 339 (1957).

14. Clark, *The Economic Functions of a City in Relation to Its Size*, 13 Econometrica 97, 112 (1945).

while for the development of manufacturing a city of 200,000 to 500,000 is required. The requirements of traffic and parking and the avoidance of traffic congestion when nearly every family possesses a car set a limit of about 200,000 to city size.[15] Relative smallness, no more than relative largeness, determines the quality of a city; rather it affects its *potential* for quality.[16]

No attempt will be made to define an optimum size city. While it may be defined as that size at which any further increment in size will augment a city's disadvantages more than its advantages, there remains the task of defining and measuring advantages and disadvantages as well as the companion task of aggregating advantages and disadvantages for a heterogeneous population and translating each aggregate into per capita terms. The writer's concern is with two questions somewhat related to that of optimum size. How does increase in city size affect the per capita availability of "resources"? How does increase in city size affect the administration of these "resources"?

II

RESOURCES AND THEIR ADMINISTRATION

In this Article three kinds of resources will be distinguished: (1) man-made inputs, mainly capital and labor; (2) natural resources, and above all, suitably situated space; (3) time, the most nonstorable of all resources. Two kinds of maladministration of resources are distinguished, that arising from avoidable unproductive use, and that traceable to imbalance between marginal social costs and marginal social benefits.

Economic output is a result of the action of man and man-directed organisms upon blocks of the inorganic stuff by which man is surrounded. Most of this stuff consists in man-made equipment, the bulk of which is largely composed of labor inputs. Within the con-

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15. *Id.* at 112. See also Clark, *The Distribution of Labour Between Industries and Between Locations*, 26 Land Econ. 136 (1950).

> The best pattern of population location for Australia appears to consist of regions with some 250,000 population, comprising up to thirty or forty rural, and sixty or seventy urban neighborhoods of 2,500 each ... [and separated by two or three miles] of hills or other natural features.

Id. at 144. On critical city size for business services, see Duncan, Metropolis and Region 60, 77-81 (1960).

16. See Thorndike, 144 Smaller Cities (1940); Thorndike, Your City (1939).

text of the present discussion, man-made equipment and labor may be disregarded, since its supply is not highly subject to limitation as are space and time.

However, it will be touched upon again when discussing resource administration.

Turning to natural resources, or more accurately, to the services flowing from these resources, it is possible to distinguish those whose stock is virtually fixed or depletable, and those described as renewable. Also distinguishable are those which are scarce (demand for them at zero price exceeding their supply at this price) from those which remain non-scarce and free (demand for them at zero price not exceeding their supply at this price) even though they may become scarce in the future as demand rises.[17] Insofar as natural resources, whether scarce or non-scarce, enter into production, their supply may limit output, whether defined narrowly as economic output or more broadly as the output of all that which men esteem, whether it bears a price or not. This limitational effect is conditioned, of course, on the demand side by men's tastes and income-structure, and on the supply side by their technology and investment which together enlarge the variety as well as the relative amount of man's natural environment that he can bend economically to his purposes.

Of all the services of the components of man's natural resources or environment with which this Article is concerned, that of suitably situated surface, or living space, is the most important. Not only is the per capita availability of living space greatly affected by the manner in which population is distributed among and within cities. The quality of this space may also be affected by the impact of population distribution upon the exposure of space to pollution and to the cleansing capacity of the media, mainly air and water, which surround suitably situated surfaces and which must be counted upon to remove foreign matter from living space and thus sustain its livability; for the threat of pollution tends to increase with population concentration and density.[18] Availability of living space itself contributes to a variety of needs, recreation, production, comforts

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17. On the importance of the distinction between "goods" and "non-goods" for the interpretation of economic change, see Abramovitz, *Welfare Interpretation of Secular Trends*, in The Allocation of Economic Resources, Essays in Honor of Bernard Francis Haley 4-6 (1959).

18. *E.g.*, Haagen-Smit, *The Control of Air Pollution*, 210 Scientific Am., Jan. 1964, p. 25. There is an extensive and growing literature on air and water pollution, some of it relating to population density and degree of pollution.

and convenience, mobility, privacy, sense of noncongestion and spaciousness, and so on.[19] The demand for living space, therefore, tends to rise at the individual level as his income rises[20] and at the community level as overall average income rises. This tendency is reflected in the Western world in the disposition both of higher-income receivers to move, especially toward the suburbs and, on the whole, to stay there even in later stages of the family cycle.[21] Furthermore, population density in cities tends to decline as average income rises. Increasing relative numbers can afford the higher transportation and other costs of the greater amount of space that spreading out makes available and desirable, given the less attractive alternative of living in the central city, especially when the age of the dwellings to be found there is relatively great and indicative of obsoleteness.[22] The impact of this tendency to spread out and thereby dilute population density as incomes and earnings improve is restricted, of course, by various intra-urban and extra-urban barriers to expansion. Because of the demand of the well-to-do for

19. *E.g.*, Wingo, Cities and Space 57-63, 231-49 (1963); Woodbury, *Economic Implications of Urban Growth*, 129 Science 1585, 1587 (1959). The economizing of space is dealt with by Isard in Location and Space Economy (1956), and by Alonso in Location and Land Use, ch. 1 (1964).

20. The choice is, as Hoover and Vernon observe respecting the New York region, between "spacious living" and "easy access" to Manhattan, with the latter still a "major factor" because of the many jobs in Manhattan. See Hoover & Vernon, Anatomy of a Metropolis, ch. 6 (1959). On the measurement of space and time consumption, and so forth, see Kain, *A Contribution to the Urban Transportation Debate: An Econometric Model of Urban Residential and Travel Behavior*, 46 Rev. Economics & Statistics 55 (1964).

21. *E.g.*, 45 Statistical Bull. of Metropolitan Life Insurance Company 1-3 (June 1964); Taeuber & Taeuber, *White Migration and Socio-Economic Differences Between Cities and Surburbs*, 29 Am. J. Sociology 718 (1964); Goldstein, *Some Economic Consequences of Suburbanization in the Copenhagen Metropolitan Area*, 68 Am. J. Sociology 551 (1963); Schnore, *Municipal Annexations and the Growth of Metropolitan Suburbs*, 1950-60, 67 Am. J. Sociology 406 (1962); and 28 Am. Sociological Rev. 76 (1963). Schnore's studies reveal that it is in the older and larger areas much more than in the smaller ones that persons of relatively high socio-economic status move to the suburbs where space is more plentiful. Suburbanization is also a function of the impact of city growth upon internal density when the central city is quite densely populated already. See Duncan, *Patterns of City Growth*, 67 Am. J. Sociology 418 (1962). On the family cycle which may affect the locational preferences of families, see Glick, American Families, chs. 4-5 (1957); Alonso, *The Historic and the Structural Theories of Urban Form: Their Implications for Urban Renewal*, 40 Land Econ. 227 (1964).

22. *E.g.*, Hoover & Vernon, *op. cit. supra* note 20, at ch. 8; Ogburn & Duncan, *supra* note 13, at 132; Clark, *Urban Population Densities*, ser. A, 114, pt. 4, J. Royal Statistical Soc'y 490 (1951); Clark, *Urban Population Densities*, 36(4) Bull. International Statistical Institute 60 (1958); Berry, *Urban Population Densities: Structure and Change*, 53 Geographical Rev. 389 (1963).

land (irrespective of the growth of city populations) and of the poorer elements for accessibility, the tendency of the rich to locate in space-rich peripheral areas is effective even when there is little city growth.[23]

Time is of coordinate importance with space. While discretionary time may be somewhat variously defined,[24] in this Article it shall be defined residually as that which is left each day after full allowance has been made for the length of the work day, the amount of time required for the journey to and from work, and the minimum amount absorbed by sleeping and the performance of necessary household functions.[25] The amount of discretionary time available has risen with the decline in the length of the work week from about fifty to sixty hours around 1900 to about thirty-five to forty hours today. It has increased also with the diminution in the amount of the time required to perform household functions made possible by improvements in distribution and in facilities utilizable within or by households. Prolongation of life, together with increasing retirement in the early sixties, has greatly increased the discretionary time of older persons.[26] With the current acceleration of mechanization and automation and the resulting increase in output per manhour, together with the disposition to consume much of the released time in the form of voluntary (as distinguished from forced) leisure, further important increments are being added to the amount of discretionary time now available. Indeed, it is to be expected that within the next twenty-five years the average work year will be reduced to about forty weeks of thirty-five to forty hours per week, or 1,400 to 1,600 hours per year. Under this arrangement, work and sleeping (at seven hours daily) absorb less than one-half (3,915 to 4,155) of the 8,760 hours annually available to a worker. His discretionary time will be considerably less than 4,600 hours per year because no allowance has been made for the journey to work and the performance of necessary household

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23. Alonso, *op. cit. supra* note 19, at 106, 139.

24. See Moore, Man, Time, and Society 18 *passim* (1963); see also De Grazia, Of Time, Work, and Leisure, ch. 3 (1962), and Larrabee & Meyersohn, Mass Leisure, pt. 3 (1958).

25. Just as spending tends to rise with income, so does the amount of time spent *ceteris paribus* on necessary household functions and sleeping tend to rise with the amount of discretionary time available.

26. While life expectancy at age sixty in 1960 was a little higher than in 1900—15.8 years instead of 14.4 years—73,502 of 100,000 male babies were reaching age sixty instead of 46,452 as in 1900. See Wolfbein, Changing Patterns of Working Life 9 (U.S. Dep't of Labor 1963).

functions. It is to be expected, however, that workers will not look with favor upon arrangements that result in what amounts to taxes upon time that would otherwise be discretionary.

We are moving into an age of leisure as well as of opulence. Indeed, the advent of affluence removes the economic limit to man's capacity to purchase and use leisure and thus activates what was largely a latent demand fifty to sixty years ago. Between 1950 and 2000, it is estimated that, while the total time at the disposal of the population will increase about 119 per cent, nondiscretionary time required in essential functions will rise only about 105 per cent; meanwhile, discretionary time available largely for leisure will increase about 155 per cent.[27] The composition of leisure time will change also, partly because a more optimal temporal distribution of work time and leisure time will be achieved and partly because some uses of leisure time will greatly expand (for example, outdoor recreation may absorb ten per cent of all leisure in 2000 instead of three and one-half per cent as at present, thus increasing aggregate outdoor recreation by about 600 per cent).[28]

Increase in the amount of discretionary time at the disposal of individuals increases their demand for space, because availability of space is essential to the enjoyment of many forms of leisure made possible by the availability of discretionary time and heightened incomes. In short, time and space are both superior as well as complementary goods, and increase in either elevates the demand for the other. Furthermore, with the increasing attention being given to leisure as a component of income properly defined,[29] and with increasing emphasis in both the private and the public sector upon the stimulation and the satisfaction of leisure-oriented demands for goods and services, the structure of tastes will be

27. Holman, *National Time Budget for the Year 2000*, 46 Sociology & Social Research 17, 19 (1961).

28. Clawson, *How Much Leisure, Now and in the Future*, in Charlesworth, Leisure in America: Blessing or Curse 13-19 (American Academy of Political Science Monograph No. 4, 1957) and Clawson, Statistics on Outdoor Recreation (1958). See also Clawson, Land for the Future, ch. 3 (1960). Twenty-seven reports have been brought out under the auspices of the United States Outdoor Recreation Resources Review Commission (1962). For a rational defense of the practice of reserving urban land for park use, see Weisbrod, *Collective Consumption Services of Individual-Consumption Goods*, 78 Q.J. Econ. 471 (1964).

29. Leisure apparently was first included in national income about a century ago by Walras. Its non-inclusion may have been because the value of leisure in countries marked (as were most in 1850) by overpopulation and considerable unemployment is zero. See Georgescu-Roegen, *Economic Theory and Agrarian Economics*, 12 Oxford Economic Papers 1, 29-32 (1960).

altered in ways augmentative of the value individuals find in leisure. The value of space will rise in sympathy.

Turning now to the administration of resources, natural and others, one finds their contribution to income limited in two ways. First, the allocation of resources among users may be suboptimal, a result likely if adequate play is not given to the price system. This may result because competition is quite imperfect, or because the price system functions less effectively in the public than in the private sector, especially when the public sector, together with its decision-making agencies, has become quite large.[30] This tendency may be accentuated inasmuch as governmental expenditures tend to rise with the availability of revenue which in turn grows faster than income whenever the revenue system is elastic.[31] Even under favorable circumstances, however, it is considered unlikely that there will emerge a system of prices which will sustain an optimal pattern of locations within urban or similar areas.[32]

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30. This was noted in 1836 by Malthus in his Principles of Political Economy (1936). He observes that, whereas private entrepreneurs hire no more personnel and pay them no more "than necessary," the

> same presumption cannot be justly entertained in regard to the business of government: and as the results of the labour of its servants are not brought to the market, nor are their salaries distributed with the same rigid attention to the exchangeable value of their services, no just criterion is afforded for determining this value.

Id. at 47. Morgenstern writes:

> The treatment of *government services* involves another characteristic difficulty. National income is a monetary magnitude; for the private sector, the pricing mechanism is a suitable mechanism by which to value the final amount of goods and services. For the government sector, the pricing mechanism often offers no clue about the *value* of final output.

Morgenstern, On the Accuracy of Economic Observations 247 (2d ed. 1963). (Emphasis the author's.) See also Abramovitz, *supra* note 17, at 5, 12. The effects noted increase as cities grow in size, with the result that the interdependence of metropolitan denizens rises and the public sector consequently expands at the expense of the private; for then external or other-regarding effects (economies, diseconomies, social wants) tend to outstrip population and less efficient political allocation tends to replace more efficient market-dominated allocation. See Baumol, *Interaction of Public and Private Decisions,* in Schaller, Public Expenditure Decisions in the Urban Community 1-18 (1963); see also *id.* at 138, 148-54. On the sources of error in large-scale decision-making units, see Morgan, *The Theory of Error in Centrally-Directed Economic Systems,* 78 Q.J. Econ. 395 (1964). See also on "the efficiency of the small," Kohr, The Breakdown of Nations 160-69 (1957).

31. *E.g.,* Lewis, *The Federal Sector in National Income Models* together with Pechman's comments, in Conference on Research in Income and Wealth, Models of Income Determination 242-46, 252, 269-74 (1964). See note 59 *infra.*

32. See Koopmans & Beckmann, *Assignment Problems and the Location of Economic Activities,* 25 Econometrica 64-71 (1957).

Suboptimal use of resources results when marginal social benefits and marginal social costs do not coincide. Aside from difficulties connoted by the term "second best," or otherwise involved in satisfactorily coping with supposed disparities between marginal social costs and benefits, these disparities become of concern only under certain circumstances. When productive agents are flexible and easily reallocable, disparities are readily correctable. When, however, productive agents are relatively inflexible and fixed in character, disparities may not prove easily correctable. In the latter situation, planning is desirable, whereas in the former planning can contribute little. Inflexibility and fixity are apt to characterize urban structures, and probably those of larger cities in greater measure than those of smaller cities. There exists striking evidence of the impact of such inflexibility in the form imposed in the past by the mode of development and building found in older cities and making for the greater compactness of their older parts.

In modern societies, especially in their urban sectors, a considerable amount of what is treated or reported as income may be little if anything other than cost masquerading as income. Cost can masquerade as income because economists, still under the influence of the so-called "utility" theory, too completely reject the view implicit in the classical distinction between "productive" and "unproductive" labor. Factors of production can be used (1) in ways that add to the stream of final goods and services, or income, or aggregate welfare,[33] (2) in ways that affect these streams little or not at all, and (3) when employed to produce what may or may not be definable as "intermediate" goods, in ways that may increase the capacity of individuals and the economy to produce income. If income is conceived of in welfare terms, (2) should be valued at zero and (3) should be assigned a value in keeping with its actual contribution to the standard of living. Yet much of (2) and (3), a great portion of which consists of "government services", is valued at factor cost (the income received for the services allegedly rendered).[34] Consequently, national income is given an inflated value.

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33. These stream concepts are not interchangeable, particularly in a metropolitan economy in which, because of the high degree of communication, the satisfaction which each person derives from his own consumption depends much more significantly upon the consumption choices of others than it would in a rural or a small town economy. See Abramovitz, *supra* note 17, at 10-15; Deutsch, *On Social Communication and the Metropolis*, 90 Daedalus 99, 102 (1961), on the increasing opportunity cost of individual choice as the range of relevant choices widens.

34. Morgenstern, *op. cit. supra* note 30, at 245-48 *passim*.

The degree of this inflation tends to be greatest in modern societies, moving upward as a society becomes more developed and urban.

Kohr has dealt persuasively with this issue.

> Once our life becomes too crowded and complex, a seemingly geometrically rising proportion of our output and consumption increase must be diverted from pleasurable enjoyment to the necessary but sterile task of helping us untangle the difficulties that have come to us as a result of our social, technical, and economic overdevelopment.[35]

The more a society "gains in density, the more seems to go into meeting the problems caused by its increasing density."[36] Kohr identifies three categories of commodities "which swell the figures of national income without ever adding to the material welfare of those producing it": the "power commodities" underlying military strength; "progress commodities" such as unwanted license plates, parking space, and the like; and

> density commodities, which have become necessary as a result of population and production increases but are no more capable of adding to an individual's happiness than bombs. From a standard-of-living point of view, these are of infinitely greater significance than power commodities since, unlike the latter, they swell not only the figures of our national production but also of our national consumption . . . giving the illusion of increasing welfare while actually reflecting increasing misery.[37]

What has just been said bears upon the significance of urban income data. Median income rises with size of urban area; it was about one-seventh higher in urban areas of a million or more inhabitants than in areas of 50 to 250 thousand.[38] Even if one abstracted from possible differences in living costs, it would remain of interest to know to what extent correction for components (2) and (3) would reduce the income differentials reported. Even when only regional and related influences affecting median income are taken into account, these size-connected urban income differences are greatly reduced.[39]

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35. Kohr, *Toward a New Measurement of Living Standards*, 15 American J. Economic Sociology 93 (1955).

36. *Id.* at 95.

37. *Id.* at 96 *passim*; see also Kohr, The Breakdown of Nations 146-47 (1957).

38. Schnore, *Some Correlates of Urban Size: A Replication*, 69 Am. J. Sociology 185, 191 (1963).

39. See Mansfield, *City Size and Income 1949*, in Hanna, Regional Income 271-317 (1957).

III

URBAN SIZE RESOURCE USE

While increase in city size is often praised as a means of economizing on space, it also tends to reduce the standard of life in so far as this standard depends on availability of living space. Moreover, it will exercise this negative influence increasingly as the space component of the subjective standard of living increases, and in ways largely uncompensated by the increasing availability of substitutes. Not even the erection of tall, vertical structures can help much, because they are greatly subject to decreasing productivity and because their construction usually is accompanied by increase in population density and by reduction in available surface space per capita. Increase in city size serves to reduce living space per capita in three ways: (1) it reduces the amount of living space available within the relevant urban boundaries; (2) it reduces access to varieties of general living space situated, at least potentially, in the vicinity of the boundaries of the urban unit; and (3) it intensifies the rate of use of transport and other facilities and thus gives rise to congestion, a particular manifestation of lack of space.

The average number of persons per square mile, by size of incorporated city, rose in 1950 from 1,695 in places of 2,500-5,000 population through 3,575 in places of 25,000-50,000 population and 6,015 in places of 100,000-250,000 population to 14,015 in places of 1,000,000 population or more. On the average, doubling of city size, added 1,000 persons to the density of population per square mile.[40] This type of relationship existed in earlier decades and still does, though average density in urbanized areas of all sizes declined in 1950 to 1960.[41] The intra-urban pattern of population distribution is affected by a city's age, its role in an

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40. Clawson, Land for the Future, *op. cit. supra* note 28, at 85-87 *passim*; Ogburn & Duncan, *supra* note 13, at 132-33; Schnore & Varley, *supra* note 7, at 410. In 1940, according to Stewart & Warntz, *The Physics of Population Distribution, supra* note 7, multiplying population size by a factor of ten was accompanied by only a 5.6 multiplication of area size.

41. Clawson, Land for the Future, *op. cit. supra* note 28, at 96; Schnore, *Some Correlates of Urban Size: A Replication*, 69 Am. J. Sociology 185, 188-89. This reduction in density is often due to the adding of tracts of below average density to existing areas. See *id.* at 188; Schnore, *Metropolitan Annexations and the Growth of Metropolitan Suburbs, 1950-60*, 67 Am. J. Sociology 406 (1962).

urban area, when its structure and transport were built, and so on.[42]
Here, however, the main point is that intra-urban space per capita
tends to fall with size of city, thus manifesting one of the costs
of intensive urbanization. Moreover, density sometimes exceeds
Ludlow's estimated *maximum allowable* for purely residential
land use, together with provision for transportation and all other
services, a maximum ranging from 8,950 persons per square mile
for detached houses to 22,400 persons per square mile for thir-
teen-story apartments.[43] If one allows 0.25 acres for dwelling
space, along with 0.4-0.5 acres for all other services, one has a
density of about 3,400-4,000 persons per square mile.[44]

If the non-urban landed area surrounding a city is conceived as
the source of periodic enjoyment, as extra-urban supplements to
per capita enjoyment of intra-urban living space, or land in urban
use, then *ceteris paribus* the larger the urban unit and its popula-
tion, the smaller is the per capita amount of surrounding land of
a given degree of accessibility.[45] Postulate square or circular cities
with radiuses of one-half and one, respectively, and identical
population density. Then, if accessibility to space surrounding a
city is inversely proportional to the distance from its center to
the center of a given relative amount of surrounding territory, ac-
cessibility will be four times as difficult in the instance of the
larger city as in that of the smaller one.

Congestion of population is a concomitant of a low space-popula-
tion ratio. It is mainly the result of high residential density and of

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42. See Winsborough, *supra* note 22 and his bibliography. Residential and indus-
trial employment density has declined more than commercial employment density. See
Niedercorn & Hearle, *Recent Land-Use Trends in Forty-Eight Large American Cities*,
40 Land Econ. 107, 100 (1964).

43. See table (based on Ludlow) in Clawson, Land for the Future, *op. cit. supra*
note 28, at 64, *passim*.

44. Land in residential use in cities constitutes around 0.4 or slightly less of devel-
oped land in *all* uses. *Id.* at 78; Niedercorn & Hearle, *supra* note 42, at 106. One study
suggests that adding one person to an urban population adds about one-tenth of an
acre to the land in urban use. *Id.* at 110. Bogue estimates that adding one person to the
urban population entails the addition of 0.172 to 0.264 acres to the amount already in
urban use. See Clawson, Land for the Future, *op. cit. supra* note 28, at 107.

45. *Ceteris paribus* may not hold, of course. If population is more concentrated, and
hence confined in a smaller inner area, a given degree of accessibility is attainable at
reduced cost in distance, but at the expense of the cost of greater density at the center.
As Kingsley Davis observes, however, "a high density over a little space can be
tolerated, because escape seems easy. But a high density over a great amount of space
seems oppressive." See Davis, *Urbanization in India: Past and Future*, in Turner, In-
dias' Urban Future 3-27 (1962).

a high job density in the more central portions of urban areas. It tends to rise with size of the urban community and of the metropolitan area within which the area of high job density is located.[46] It has been greatly accentuated, however, by the advent of the private automobile and the consequent suboptimalization of the use of diverse transport facilities to move the population, especially during peak-load hours.[47] The capacity of cities to provide that for which they are primarily established, "multiplicity of choice and intensive city trading,"[48] is thus significantly diminished. Restoration of mass transport is therefore considered essential.[49] While analysis of the social physics of traffic flow can help solve traffic problems,[50] careful planning of the construction and use of the arteries serving urban communities is essential, together with selective marginal costing and differential taxing of the use of traffic channels in such ways as to eliminate the current spread between the social cost of their use and the social benefit resulting.[51]

46. "To keep the degree of traffic congestion constant, road traffic capacity must rise far more than in proportion with the rate of increase of population, and sheer problems of geography and land availability practically preclude such a possibility." Baumol, *supra* note 30, at 7-8. D. L. Foley found, on the basis of a study of five large cities, that the ratio of the daytime population to the resident population was 23.84 in the neighborhood of the city center, 7.41 in a distance zone of a half-mile farther away from the center, and much lower in zones still farther from the center. Foley, *Urban Daytime Population: A Field for Demographic-Ecological Analysis*, 32 Social Forces 323 (1954). On the hourly distribution of the trips to work associated with this ratio, see Wingo, Transportation and Urban Land 30-36 (1961). See also on daytime population, Lapin, Structuring the Journey to Work 104-07 (1964).

47. As Jane Jacobs points out, however, we can "blame automobiles for too much," since the "project image and the other anti-city ideals of conventional planning" would produce a somewhat similar result even with other modes of transportation. Jacobs, The Death and Life of Great American Cities, ch. 18 (1961); see also Bello, *The City and the Car* in Fortune's The Exploding Metropolis, ch. 2 (1957).

48. Jacobs, *op. cit. supra* note 47, at 340. "It is the multiplicity of different localities and of persons, and the wide choice of potential quick contacts among them, that makes the metropolis what it is." Deutsch, *supra* note 33, at 100.

49. "The day is bound to come when whole regions of a country will be so densely populated that some kind of mass transport, if it didn't then exist, would have to be invented." Burck, *How to Unchoke Our Cities*, Fortune, May, 1961, pp. 119, 264. See also Hazard, *Are We Committing Urban Suicide?*, 42 Harv. Bus. Rev. 152 (1964); *Hearings on S. 6 and S. 917 Before a Subcommittee of the Senate Committee on Banking and Currency*, 88th Cong., 1st Sess. 67-70 *passim* (1963) [hereinafter cited as *Hearings*].

50. *E.g.*, Herman & Gardels, *Vehicular Traffic Flow*, 209 Scientific Am., Dec. 1963, p. 28, 35; Baumol, *supra* note 30.

51. An extensive literature on the use of taxation and pricing to alleviate congestion is coming into being. *E.g.*, Johnson, *On the Economics of Road Congestion*, 32 Econometrica 137 (1964); Walters, *The Theory and Measurement of Private and Social Cost of Highway Congestion*, 29 Econometrica 676 (1961); Hewitt, *The Cal-*

Recent advances in electronic computers and data-gathering devices now make possible selective marginal cost pricing which was formerly a purely academic exercise.[52] It is not likely, however, that, even given optimization of the use of alternative modes of transport, correct pricing and efficient planning can do more than ease congestion in cities beyond a certain size so long as their residential and employment patterns remain as today.

While the length of the journey to work, together with the amount of time absorbed thereby, is affected by many circumstances, it is conditioned by size of city. It thus absorbs a considerable amount of time that would otherwise be discretionary.[53] In recent years the average length of the work trip has increased somewhat in cities of small and medium size, but not enough to alter the generally inverse relation between city size and length of work trip.[54] Although the average length of the journey to work in the large cities may not have increased greatly, study would probably show that the time required has increased wherever congestion has increased more than effective congestion-offsetting measures. The extent to which workers are compensated for the time spent traveling to and from work varies with the situation in which workers find themselves.[55]

Turning from resources to the administration of their use, two questions must be asked. (1) Does the misallocation of resources tend to increase with city size? (2) Does the tendency to use

culation of Congestion Taxes on Roads, 31 Economica 72 (1964) ; Kain, *supra* note 20; Neutze, *Pricing Road Use*, 40 Economic Record 175 (1964) ; Vickrey, *General and Specific Financing of Urban Services*, in Schaller, *op. cit. supra* note 30, at 62.

52. Johnson, *supra* note 51, at 149.

53. In a sense, time is substituted for space. With Clark, let us write $y = Ae - bx$ where x is distance in miles from the assumed center of a city, y is density of resident population, A represents hypothetical peak density, and b indicates how rapidly density falls off with distance. Since b depends largely on the nature and cost of intra-urban transport, it remained high in the nineteenth century until modern transport and reduced relative transport costs brought about diminution in its value in the West though not in the non-West. See Clark, *Urban Population Densities*, ser. A, 114, pt. 4, J. Royal Statistical Soc'y 490-91 (1951) ; Duncan, *Population Distribution and Community Structure*, *supra* note 6, at 357-59; Berry, *supra* note 22, at 389-405. In cities of the past, space was sacrificed for time while in modern Western cities, time is sacrificed for space. In smaller cities, however, one is able to obtain more of both time and space.

54. Lapin, Structuring the Journey to Work 39-48 (1964) ; Ogburn & Duncan, *supra* note 13, at 134-36; Goldstein & Mayer, *Migration and the Journey to Work*, 42 Social Forces 472 (1964) ; Hoover & Vernon, *op. cit. supra* note 20, at 138-45, 280-87; De Grazia, Of Time, Work and Leisure (1962).

55. Wingo, postulating that the individual worker usually can choose freely among combinations of income and leisure, infers that he is able to shift to the employer the time-costs of the journey to work. Wingo, *op. cit. supra* note 46, at 56-60.

resources unproductively increase with city size? Within the compass of the present Article, quantitative answers to these questions cannot be supplied. However, a plausible affirmative answer can be established.

Misallocation in the public sector tends to increase with city size because those who make the decisions to raise and spend revenue, whether directly from the affected citizenry or through the medium of a share in expanding state or federal revenues, become farther removed from the restraining and individual-welfare-seeking influence of the affected electorate and more subject to the pressures of special-interest groups and profit-seeking individuals and cliques. The decision locus becomes increasingly separated from the tax locus or revenue source.[56] There results the condition found in New York:

> New York's failure can be traced to many sources: the apathy and venality of politicians, the cold unconcern of builders, the remoteness and indifference of business and financial leaders.[57]
>
> *   *   *   *
>
> The serious-minded voters have given up all hope of having responsive, efficient government. . . . The ordinary New York office worker, convinced of the futility of individual protest against his environment, lacking access to the institutional economic power that could bring improvement, is alienated from the city by force of circumstances.[58]

These conditions are likely to be accentuated, should a remote federal government increasingly assume responsibility for urban costs.[59]

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56. Hauser states that the spread of metropolitan population has tended "to divorce economic responsibility associated with place of work in the central city from political and civic responsibility associated with place of residence in the suburb." Hauser, *op. cit. supra* note 2, at 142.

57. Whalen, *A City Destroying Itself*, Fortune, Sept. 1964, p. 115.

58. *Id.* at 242, 244. See also Freedgood, *New Strength in City Hall* in Fortune's The Exploding Metropolis, ch. 3 (1957); Banfield, *The Political Implications of Metropolitan Growth*, 90 Daedalus 61 (1961); Jacobs, *op. cit. supra* note 47, ch. 21.

59. *E.g.*,

City after city is perverting the basic intention [of the 1956 Federal Highway Act] by trying to get Federal highway money as financial aid in urban renewal. Furthermore, the national program often brings inter-urban traffic into the hearts of cities, necessitating street widening which may cost 5-35 times as much as a first-class, controlled-access, four-lane divided highway in the country.

Higbee, The Squeeze 218 (1960); see also *Hearings, supra* note 49, at 113-58 *passim*, dealing with opposition to federal aid. See also note 30 *supra*.

Unproductive use of resources is associated with urbanization and tends to increase with city size. As city size increases, it probably becomes easier to give expression to Parkinson's Law—to employ people in positions in which they make no contribution or very little contribution to real output. Furthermore, the problems and difficulties associated with urban life probably are much greater in very large urban centers than in smaller urban centers. Kuznets has estimated that about half the expenditure of the American urban population on services (including urban rents) is a function of urbanization and an offset to new costs occasioned thereby; hence he has estimated the real net practical value of these expenditures at half their nominal value.[60] Kohr finds what he calls "density commodities" (which, along with "power" and "progress" commodities "seem to be part not of the *standard* but of the *cost* of life") rise with increasing city size and urban density.[61]

IV

CONCLUSION

While this Article has not sought to determine optimal city size, or even to review the relevant literature, it has indicated certain major disadvantages which become more intense as city size increases. Furthermore, one may inquire whether technological and economic trends are making, as are changes in tastes, for greater urban population concentrations and city size, or for smaller ones. This is not a question, of course, to which as yet affirmative or even clear-cut answers are available, though at least three indications seem to be emerging.

First, optimum plant size appears to be decreasing somewhat and may continue to decrease as a result of automation.[62] Second,

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60. Kuznets, Economic Change 186 (1953); Usher, *The Transport Bias in Comparisons of National Income*, 30 Economica 140 (1963).

61. Kohr, *supra* note 35, at 98; and see also *id*. at 103 on the relative increase in these expenditures. Kohr cites Shultz & Harriss, American Public Finance 31, 34 (5th ed. 1949) in support of his argument that per capita expenditures upon remedial governmental functions (designed to ward off the social disadvantages of urban growth) increase with city size. See also Ludlow, *supra* note 13, at 163-67.

62. See Blair, *Does Large-Scale Enterprise Lower Costs?*, 38 Am. Economic Rev. 121, 166 (Supp. 1948); Moos, *The Scope of Automation,* 67 Economic J. 28-30 (1957); Billing, *The Industrial Pattern and New Zealand's Future,* 67 Economic J. 67-70 (1957); Jewkes, *The Size of Factory,* 62 Economic J. 237 (1952). Wingo, *op. cit. supra* note 19, at 170-71; Nelson, Concentration in the Manufacturing Industries of the United States 2 (1963).

improvements in systems of communication and in managerial practice probably are reducing the economies associated with the location of several plants in the same community, or of some plants near what in the past were complementary plants. Third, the relative importance of manufacturing is declining and that of services is rising,[63] with the result that a larger fraction of the labor force is more free to locate at will than has been true in the past when concentration of manufacturing made for concentration of non-manufacturing population.

Should the trends discussed really materialize, and should smaller plants replace larger ones as the latter become depreciated and obsolete, some dispersal to smaller cities may result, together with increased location there of newly invested capital and of persons newly entering the labor force. If so, some of the resource costs discussed in this Article will diminish. Discretionary time will increase, density costs will fall off, and governmental mismanagement will pass under more severe control by public opinion.

Prevention of disadvantage-producing urban growth entails apprehension of its causes and their removal. While the causes vary, associated with them is the prospective profit derivable from investment in urban expansion. Among them are forces which, when numerous, may produce a lognormal distribution of city sizes, or when few and powerful, may produce still greater concentration in very large places.[64]

In some respects city growth resembles coral-reef growth; it is not subject to a powerful decision-maker, nor is its growth guided by a dominant plan other than that supplied by an imperfectly working price system supplemented by minor regulations.[65] The growth process resembles somewhat a Markov chain process in that what takes place in a given time period tends to fix the range of choices available in the next time period, thus suggesting the

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63. U.S. Dep't of Labor, Manpower Report of the President and a Report on Manpower Requirements, Resources, Utilization and Training 95, 100 (1963).

64. Berry, *City Size and Economic Development,* 9 Economic Development and Cultural Change 573 (1961).

65. Regarding how the price system affects land conversion and the selection of mode of urban transportation, see Muth, *Economic Change and Rural-Urban Land Conversion,* 29 Econometrica 1 (1961); Moses & Williamson, *Value of Time, Choice of Mode, and Subsidy Issue in Urban Transportation,* 71 J. Pol. Econ. 247 (1963); Beesley, *The Value of Time Spent in Traveling: Some New Evidence,* 32 Economica 174 (1965).

presence of cumulative causation.[66] Most urban growth-affecting decisions are made by individual decision-makers essentially isolated from other decision-makers and concerned only with making private benefit exceed private costs whether or not public benefit also exceeds public cost. Most strategic and powerful of these decision-makers are business concerns. Those who would subject urban growth to more rational direction than it presently receives might partially accomplish this purpose by imposing sufficient taxes upon business undertakings to insure their continuing self-renewal and by imposing city-supporting taxes at progressively higher rates when cities exceed a stipulated size.

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66. Harvey & Clark, *The Nature and Economics of Urban Sprawl*, 41 Land Econ. 1 (1965).