Saturation: A Problem Evaded in Planning Land Use

The environmental consequences of sustained population growth have yet to be recognized by planners.

George Macinko

The 22 June 1964 issue of *U.S. News and World Report* includes, in its feature presentation "What the Future Holds for America" (*1*), a series of interviews with 16 members of President Johnson's "idea team" formed under the coordination of Eric F. Goldman, professor of history at Princeton University. In response to a question on what national issues demand attention, one of the interviewees, John K. Galbraith, states (*2*):

> I'm disturbed by the way our cities are sprawling into the countryside, the way in which we're using up vacant land . . . I think it will be only a short time before people turn from asking political leaders, "How prosperous have you become in the last five years?" to asking, "What have you done to conserve the charm of our countryside and our cities?" . . . I don't think there is any problem that people are more concerned about than the preservation of the charm and beauty of our cities and our countryside. If this were just a personal view of mine, it wouldn't be worth talking about. But I've been around the country in the past six months, and there is nothing from San Francisco to Long Island that evokes a bigger response. It isn't just a concern of middle class or well-to-do people. It's a feeling that extends through the whole range of American society.

That Galbraith's assessment of the prevailing national mood is reasonably correct is attested to by a number of recent developments which, collectively, provide evidence of a growing awareness of and concern for the use of the American landscape. These developments include the establishment of a Bureau of Outdoor Recreation; the passage of the wilderness and the land-and-water conservation bills; the creation of a vast number of state and local planning organizations; the founding of urban or regional planning departments at an increasing number of universities; and most recently, the President's pronouncements on the "Great Society," with their decided emphasis on the need to conserve and restore the beauty and fitness of the American environment.

The conservation activities of the Brandywine Valley Association typify some problems encountered by those concerned with land planning (*3*). Although the Association has been remarkably successful in its 19-year effort to advance a comprehensive conservation program in the 330 square miles (860 km^2) comprising the Brandywine watershed of southeastern Pennsylvania and northern Delaware, it did not originally anticipate its most serious problem, that of continuing suburban sprawl, which threatens to negate the positive results achieved through the program.

A comparison of earlier scenes from the Brandywine Valley, epitomized by Figs. 1 and 2, with scenes that characterize the last decade (Figs. 3–6) reveals the dynamic nature of this area. From the changes typified in these pictures it soon became clear that, without a vigorous program of land-use planning, conservation activities would go for naught, for land set aside in one year for conservation (*4*) would be subject to industrial and residential build-up during succeeding years. Faced by this prospect, the Association turned to planners for help.

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Professional Planning

My purpose here is to examine the foundations of the land-planning movement on which the Association and others concerned with the evolution of the American environment pin their hopes for the future. I shall emphasize the basic objectives, operating assumptions, and underlying philosophy of regional land planning, and hope to raise some questions that generally go unprobed in discussions of this subject. I propose to demonstrate that though planners set goals which are accorded almost universal agreement, the methods by which they try to attain these goals will not work, and accordingly I suggest an alternative which may promise more success.

The primary goal of planning appears to be the promotion and maintenance of an environment which will allow for "optimum human living." Planners generally believe this goal is most likely to be realized in an environment in which provision is made for solitude, for public open space, and for the esthetic pleasures provided by a landscape which embodies some aspects of a "natural" or at least a semi-rural flavor. Much of the impetus of the planning movement throughout the nation, as in the Brandywine Valley, arises from an aversion to a completely built-up landscape.

Perhaps the most important operating assumption of contemporary planning is that the conditions necessary for "optimum human living" can be attained by means of various technical planning measures. This belief is typified by a statement made recently by the managing editor of *Architectural Forum* to the effect that the "foolish" idea that every family should have its own house on its own plot of land is the basis of our present land chaos, and by his advocacy of cluster housing and variable density zoning as the solution to this chaos (*5*). These and related measures are all based on the assumption that increasing demands for space can be met by exercising ingenuity in the allocation of space.

One of the most pervasive of contemporary philosophical beliefs is that progress, which one might presume to be judged in terms of human welfare, is intimately and inexorably linked with growth—growth both in numbers of people and in their institutions, especially industry. Planners did not originate

this belief, but their planning philosophy reveals its widespread acceptance. Briefly, this philosophy maintains that growth is good, for progress depends on it; or at least that growth is inevitable. Progress in this context is defined in strongly economic terms (*6*). It is reasoned that economic considerations are the key to human welfare and that economic advance depends primarily on a steadily increasing demand for the fruits of production. Achievement and maintenance of this increasing demand are thought to depend largely on increasing the number of consumers. Growth in population is therefore held to be a condition of progress (*7*).

In analyzing these objectives, assumptions, and philosophy, I will make use of a specific example which I believe to be typical of the present state of thinking in the land planning movement. In so doing I intend to demonstrate that the assumptions and philosophy that guide current planning efforts are inappropriate to the goals professed.

The Planning Process

In November 1963, the Greater Wilmington Development Council, Inc., sponsored a forum at which the future use of land in Delaware was forecast. The forecast, "Delaware's Tomorrow? —1982 Impact Visualized" (*8*), was prepared by the Delaware Chapter of the American Institute of Architects and dealt with that portion of Delaware north of the Chesapeake and Delaware canal.

The forecast was based on the facts that there were at the time some 75,000 acres of open land in northern Delaware and that this land was being used for residential and industrial purposes at the rate of 4000 acres annually. From this the architects concluded that the continuation of present trends, with their accent on the single, detached dwelling on a uniform plot of land, would result in the disappearance of open land by 1982. This was viewed as undesirable, and the architects proposed that Delaware adopt more flexible zoning regulations which would provide for cluster housing and variable-density zoning.

Only a continuation of present trends and policies would make the architects' forecast come true. The disappearance of open land could be prevented by a change in trend or policy. Evidently the architects regarded their proposal as the change in policy which would allow deflection of the forecast. In a very limited sense they were correct, for, given the projected level of demand, under their program some open land would remain in 1982. However, even if the architects' proposal had been adopted in its entirety, some open land would have been used up between 1963 and 1982. Suppose we arbitrarily allow that the rate of consumption of open space after adoption of the proposal would have been reduced by 50 percent. In 1982 there would then be about 37,500 acres of open land. But what about 1983 and thereafter? Presumably the demand for land will continue beyond 1982. If development is inevitable (*9*), then even the most intelligently guided development will eventually lead to the destruction of open space just as surely as would random development in a shorter period of time.

The operating assumption that a continuing demand for space can be met by ingenuity in allocation of space is untenable for a limited space subject to a continuing demand. Such space allocation is a delaying or rearguard action that slows down the ultimate confrontation. It does not "solve the problem," and may in the long run have adverse effects. By appearing to be a solution, it temporarily hides one of the most pressing reasons for public concern—the fact that open land is in danger of becoming exceedingly short in supply.

The analysis above is not intended to deny the usefulness of recent land-planning proposals but, instead, to delimit more closely their capabilities and limitations. Measures such as cluster housing can provide certain real advantages in the economics of street and utility layout and in the arrangement of buildings to fit the physical characteristics of their sites, to name but a few. But to hold that, in the absence of some measure of population control, cluster housing creates "permanent open space" (*10*) is to practice self-delusion. Consider, for example, what happens to a county-wide area when all its land is under cluster development. How do you keep land between clusters open unless you stop all further growth? And if you are willing and able to limit growth, then land planning takes on an entirely different character and many new opportunities present themselves.

Because land planning as currently practiced appears to have serious weaknesses which would prevent the attainment of its announced goals, I have questioned a number of people associated with planning at either the academic or the practical level, not only in Delaware, but also in Michigan, Idaho, California, Maryland, and Pennsylvania. The general purpose of my questions was to determine how planners proposed to handle the problem of using a finite amount of space without seriously considering the implications of sustained population growth. More specifically, I wished to determine how planners proposed to handle open-space requirements after their present plans were fully realized. That is, what are the prospects for land use after 1982?

The replies I have received to these questions have shown a remarkable degree of uniformity, and they make it difficult to give planners credit for having fully thought out the implications of their position. A question of the type "Why can't you keep 75,000 acres of land open?" is greeted with incredulity. After considerable ambiguity the most common standby is that "one can't stop progress." But if progress will not defer to the need for 75,000 acres of open land, what miracle can be expected to restrain progress when but 37,500 acres remain open? Or 18,750? The question "If you do not plan to keep 75,000 acres open, then what amount of open space is planned for?" is generally replied to in this fashion: "Planning is not a document or a blueprint of the future, but is, instead, a process." One is left to wonder how provisions for open space will be met by this "process" which presumes an indefinite continuation of growth with its concomitant space requirements. If the situation which we will have in 1982 with no planning is undesirable, it will be no less undesirable at some later date under the sanction of planning.

Several things appear moderately clear at this time. It seems that planning requires a plan and that if the preservation of open land is regarded as a valuable objective, then in this particular the plan must be relatively inflexible—one cannot, in a finite area, plan both to preserve open space and to use it up. Inflexibility in this con-

text need not be interpreted to mean that a given segment of open land can never be used for some other purpose, but, instead, signifies that if the goal is to have a determinate amount of open land in the planned area, then any use of the original open land must be compensated for from within the planned area. Failure to compensate for used land must, of course, lead to the loss of open land (*11*).

Furthermore, though planners are ostensibly committed to the preservation of a wide array of environmental features, the mandate for preservation suffers in actual practice. Leopold (*12*) points out that planners pay more attention to encouraging development than to protecting the valuable attributes of the environment which will be destroyed or diminished in the process of development. When pushed on this issue, planners contend that preservation of land must ultimately bow to the inevitability of ever-continuing growth. Proponents of this view of growth ignore the ecological doctrine which sets limits on all forms of organic growth. A fundamental tenet of ecology is that any species has the biotic potential to occupy any given finite space, and that under favorable conditions the species in question will increase until the population density is such that growth must cease (*13*). In a recent report on the growth of world population, the Committee on Science and Public Policy of the National Academy of Sciences also emphasizes limits on growth: "There can be no doubt concerning the long term prognosis: Either the birth rate of the world must come down or the death rate must go back up" (*14*). An even more recent Academy report indicates that the United States is not exempted from these limiting conditions: " . . . continued growth of the United States population would first become intolerable and then physically impossible" (*15*).

Thus it appears that never-ending growth is not only not inevitable, but in fact is impossible, for the mathematics of biology and space set constraints if man does not choose to do so. This insight finds no cognizance in planning theory, which looks upon the suggestion that growth may have limits as being too political or too farfetched for frank discussion. It is my belief that, when faced with the space situation that a long-term perspective on growth discloses, planners all too readily subscribe to the popular supposition that the ecological law of space saturation under favorable conditions is inapplicable to man. However, the fantastic growth of world population over the past half-century (*16*) indicates that this law does have relevance to man, and, in fact, is more relevant to man than to any other species, for man has developed and is in the process of developing powers that will enable him to extend conditions favorable to his increase throughout the entire planet.

Fremlin (*17*), in a chilling essay, reminds us that progress in technology (allowing for vast increases in human numbers) does not negate the fact that population growth has limits, but, instead, merely emphasizes that mankind faces the collective choice of determining at what population density it wishes to call a halt—or, in the absence of deliberate choice, of having limiting conditions imposed on it. It is thus seen that the law will be inapplicable to man *only if* man chooses to make it so by exercising his power of foreseeing the consequences of his actions and by then taking appropriate measures to avert those consequences he deems undesirable.

But if one accepts the conclusion that growth does have limits, then it is important to attempt to determine what takes place as these limits are approached. While one can debate the extent to which rapid population growth in the United States—our population is increasing at least twice as fast as is the population of any other major industrial country of the Western world (*18*)—contributes to social, economic, and political problems, the effect of our rapid population growth on land utilization is far less debatable. It is quite clear that growth forces planners to follow a policy of accommodation.

Saying that planning must be flexible, they must alter plans to accommodate more industrial and residential growth than was planned for. That the alterations in planning which are required to accommodate growth invariably cause reductions in the space originally reserved for public functions, playgrounds, parks, and nature areas in order to make way for parking lots, expressways, and residential and industrial sites is dismissed as unfortunate but beyond human control. The further indulgence of this presumably never-ending spiral of growth can be expected to result in the progressive deterioration of many environmental features which are now judged desirable.

Reconstruction of Land Planning

My criticism of the way planning is now being done should not be construed as an attack on the very idea of planning, for the future will require more rather than less planning. Furthermore it would be a serious mistake to hold that planners are more responsible for increased densities of population, or that they have any more control over development, than the real estate agent, the highway engineer, and many other public and private agencies. Nor can the planner be expected to modify social, economic, and political conditions through a "Master Plan."

What I am here concerned with is to point out what the planner can reasonably be expected to contribute to the solution of a major problem and then to suggest a means by which this contribution might be effected.

Reconstruction of land planning must begin with recognition that any land-use policy that completely evades the issue of population control can be no more than a temporary luxury which can lead only to an increasingly painful reckoning in the not-too-distant future. The problems posed by population growth will not disappear if they are ignored; their solution in a democratic society must come by way of common consent, and this will require time and understanding; therefore the sooner these problems are confronted honestly and directly, the more likely it is that measures designed to alleviate problem situations will be successful. In the area of land planning such a confrontation would, it is hoped, reveal the true nature of the land problem by showing that the chaotic land situation cannot be attributed solely to sprawl resulting from development of large, single-family lots, but, instead, would show that the amount of available open land at any time depends on both (i) the size of the individual bites taken from a stock fund and (ii) the number of biters.

Planners have worked exclusively on

measures designed to affect rates of usage of open space without giving any serious thought to reversing trends, while at the same time they have given the public the impression that trends are being taken care of. However, I have yet to encounter a plan which makes explicit the fact that only by reversing the trend of ever-continuing use of land for construction purposes can future open space be assured. Instead, the public is enjoined to make more efficient use of the land, with no apparent recognition that use, if continued, uses up. Demographers hold as a truism the statement that in a finite space any rate of human increase, no matter how small, if maintained, will lead to saturation conditions (*19*). Planners of land use should realize that, similarly, any rate of open land usage must, if maintained, lead to saturation conditions—that is, no more open land. This is merely to paraphrase the ecologists, who insist it is not the rate that is of ultimate importance but the trend.

Figs. 1 to 6 above provide a graphic illustration of the landscape changes that have increasingly characterized the Brandywine Valley during the past decade. Figs. 1 and 2 (top) portray scenes that evoke thoughts of the historic nature of the Brandywine—a land of rolling hills, old stone barns, covered bridges, dairy cattle, and gracious living in a rural setting. Figs. 3 and 4 (center) are illustrative of the recent boom in real estate activities that have resulted in the proliferation of small (Fig. 5, bottom left) and large (Fig. 6, bottom right) subdivisions throughout the valley and its environs. Such developments have been chiefly responsible for the great interest in land planning evidenced during the recent years. [Courtesy Brandywine Valley Association]

Other Alternatives

Because planners have thus far failed to face the logical implications of their position, the public has not had laid before it the widest range of possible planning alternatives. The choices actually presented to the public today are severely circumscribed. Most often, choice is limited to one of two alternatives: one depicting future environmental conditions (for example in 1982) in the absence of planning, the other presenting conditions that might be realized at that future date if planning is implemented. In either instance the forces of growth are accepted uncritically, the main distinction being between growth taking place in a completely unregulated fashion, and growth taking place with its areal aspects subjected to some degree of regulation. Nowhere can one find a plan which portrays the type of environment that could be developed if growth were deliberately curbed or restrained. This is surprising, for planners freely admit that growth presents them with their most vexing problems, many of which definitely lead to a decline in the quality of the human habitat. For example, the population of the greater Wilmington area is expected to grow from the present 213,000 to 583,000 by 1980 (*20*). Almost everyone involved in planning for this area agrees that a much more desirable environment could be achieved for 1980 if the population was less than the 583,000 projected. In other words, by almost any index chosen—education, housing, transportation, recreation, water, or wildlife—the habitat designed for 300,000 or fewer apparently would be superior to that which must accommodate nearly double that number. But, despite this private admission, the general public remains largely uninformed on the matter.

Thus the public may in fact be dissatisfied with the limited choices now made available, but nowhere can it find any details of other alternatives. To argue, a priori, that the public would not choose any alternative that involved a conscious effort to restrain growth is spurious, for human motivation is complex. As Caldwell (*21*) points out,

> One might as convincingly argue that one presumably likes the environment in which circumstances place him if he makes no effort to escape his surroundings or to change them. To the extent that . . . they [the public] consider efforts to change it hopeless or unwise, they may endure an environment that they consider far from ideal. Dissatisfied with what they have, they have no clear vision of what the ideal might be or have no notion of how a better environment might be attained at a price they would be willing to pay.

The land planner is in a position to play a significant role in broadening the basis for public choice.

But before the land planner can be expected to provide the vision Caldwell seeks and, therefore, before planning can be expected to yield the cultural and esthetic harvest of which it is capable, it is necessary that an attack be mounted against the assumption that the population explosion is inevitable. Here the land planner can be immensely useful, for, though the American public remains apathetic to statistical predictions of population growth, it evidences a genuine and growing concern with the landscape this population is producing. In large part, the land-planning movement owes its existence to the public's aversion to a completely man-dominated landscape, and this fact can be capitalized on.

Mumford (*22*) tells us that statistics can provide us with essential information if we treat them for what they are worth, and would have us use "statistical predictions as road guides that indicate what will happen if we go further, at the same pace, on the same route, not as commands to continue on this road if we find by consulting the map that we are headed in the wrong direction." When confronted with the statistic predicting a national population topping the billion mark in less than a century, the planner is in a position to inform the public of the increasingly undesirable environmental effects this route entails and thereby to dramatize the fact that the map reveals us to be heading in the wrong direction.

Surely we can expect that, if encouraged to do so, the planner will provide widespread dissemination of the insight set forth by Stewart L. Udall (*23*), who, in discussing the irresistible pressure that continued population increase places on even the most dedicated of public lands [national parks and wilderness areas], suggests that, "We might formulate a law governing population and open space: *The amount of open space available per person will tend to decrease at a faster rate than the population increases.*" When messages such as Udall's are combined with the many other predictable environmental consequences of continued population growth—increasing problems of environmental pollution, the threat to outdoor recreation, the decline and then demise of wildlife—when these are made abundantly clear to the public, then perhaps the land planner will be able to work within a demographic situation that offers a reasonable promise of success. Cook states that there is conclusive evidence that in the United States the birth rate is largely under voluntary control and that, as a consequence, if we "give the people an accurate picture of what lies ahead populationwise . . . they can be expected to cut their fertility to fit . . . the realities of the modern world" (*18*, pp. 67–68). While Cook's optimism may prove to be unfounded, we can surely do no less than to give the public the reasonably accurate depiction of the environmental consequences of sustained population growth which has been so notably lacking in the past.

I believe the planner's reluctance to deal directly with the problems posed by population growth results from the facts that (i) most planners have not yet realized the truly profound implications population growth presents to their practice, and (ii) other planners, noting the potentially serious consequences of population growth, believe these matters lie outside their domain (*24*). I hope that my effort here will serve in some measure to overcome this reluctance by convincing planners of the first persuasion that a new perspective on growth is called for, and, by bringing this problem to the attention of a wide segment of the American scientific community, I hope that planners of the second persuasion will be encouraged to enlarge their conception of what planning should be. If we as a society are to create and maintain a suitable human environment, we must ask more of our planners, and we must also be prepared to give them the understanding and support they will need.

Man's recent and phenomenal increase in numbers, coupled with his tendency to spread construction activities over ever-wider areas, has led to a growing concern for the quality of his future environment. Land plan-

ners, though they acknowledge the relevance of both of these factors, have concentrated exclusively on measures designed to modify and guide construction activities and have ignored the problems posed by unlimited population growth in a limited space. The mathematics of biology and space indicate that this oversight can be, at best, a short-term luxury.

Because land planners have not yet chosen to face squarely the implications of sustained population growth, contemporary planning exhibits serious weaknesses and poses a dilemma. The opinion that optimum human living is to be found under certain environmental conditions clashes head on with the principle of unlimited growth which precludes developing and sustaining the type of environment judged most desirable.

John Dewey (*25*), in discussing the basic needs of modern society, stated:

> What is needed is intelligent examination of the consequences that are actually effected by inherited institutions and customs, in order that there may be intelligent consideration of the ways in which they are to be intentionally modified in behalf of the generation of different consequences.

I suggest that an examination of the environmental consequences of our inherited belief that a perpetual increase in the number of men and, perforce, in their space-using proclivities is good, will show us an environment that becomes increasingly undesirable with the passage of time. Therefore, in order to bring about more desirable consequences, it is well past time for the serious reexamination and intentional modification of these uncritical beliefs. It is a gross understatement to say that a major revision of land planning would be warranted if the idea of growth were more fully explored. Only the willfully irrational can ignore the implications of such an exploration.

References and Notes

1. "What the Future Holds for America," *U.S. News & World Rept.* **50**, No. 25, 40–67 (1964).
2. J. K. Galbraith, *ibid.*, p. 58. In *Science* **145**, 117 (1964) Galbraith presents a more complete statement on this subject. Central to his thesis is the notion that in a poor society nothing is more important than the poverty which characterizes it. Therefore in such a society economic considerations dominate social attitudes and rigidly specify the problems that will be accorded priority. However, Galbraith argues that to assume that economic considerations must be an equally dominant influence on social thought and action in a rich society is to set up a barrier to rational thought and needed action when social problems have ceased to be primarily economic.
3. See G. Macinko, *Land Econ.* **50**, 318 (1964).
4. "Conservation" as used here refers to the traditional type of conservation program which emphasizes measures such as contour planting, diversion terraces, cover crops, stream-bank plantings, sanitary landfills, and so forth. When the Association began its operations in 1945, these activities were considered not only as being central to a conservation program, but as encompassing nearly the whole of it. Industrial and residential construction lay outside the sphere of conservation, whose focus was on the land per se, not on people.
5. P. Blake, *Saturday Evening Post*, No. 34, 14 (5 Oct. 1963). Later these ideas received fuller expression in P. Blake, *God's Own Junkyard: The Planned Deterioration of America's Landscape* (Holt, Rinehart and Winston, New York, 1964). A more technical and detailed elaboration of basically the same approach is found in W. H. Whyte, *Cluster Development* (Woodhaven Press Association, for the American Conservation Association, New York, 1964).
6. For a different point of view on the relation of economics to progress see (*2*).
7. The argument that economic health is best stimulated by population growth is not accorded universal agreement, and those who take exception to the argument grow in number and influence. See statements by A. W. Schmidt, L. duP. Copeland, and M. S. Eccles in *The Economic Consequences of the Population Explosion*, report on a Conference sponsored by the Planned Parenthood Federation of America–World Population Emergency Campaign (New York, 1963). These exceptions have not yet made any significant impression on land-planning philosophy.
8. See Wilmington *Morning News*, 19 Nov. 1963. Approximately 400 people attended the forum to see the architect's slide lecture. The program generated enough interest to warrant a repeat performance before more than 900 people on 28 January 1964. Both showings took place in Wilmington, a city of 90,000, and they provide another example of the public's growing concern for the future of its landscape.
9. Virtually every contemporary land-planning organization accepts this premise uncritically, and in fact justifies its existence largely on the basis that the burgeoning of real-estate activities is an inexorable process destined to go on forever. The process is regarded as being subject to partial control in that it might be channelled or guided, but, at the same time, it is held to be outside of human control in that it cannot be curtailed. The question to be resolved, however, is whether such a conclusion may not be more dogmatic than axiomatic.
10. A. L. Strong, *Open Space in the Penjerdel Region Now or Never* (Pennsylvania-New Jersey-Delaware Metropolitan Project, Inc., Philadelphia, 1963) p. 40.
11. I am familiar with the argument that various renewal programs may convert built-up lands to open lands. Inasmuch as the nation's annual loss of open land for various construction purposes—residential, industrial, and transportation—has exceeded a million acres for more than a decade, and the amount of land which reverts to open status is but a very small percentage of this figure, the argument has little significance.
12. L. B. Leopold, *U.S. Geol. Surv. Circ. 414-A* (1960), pp. 3–4.
13. A. N. Woodbury, in *Principles of General Ecology* (McGraw-Hill, New York, 1954), states the principle thus: "It is easy to show mathematically that if each of the young ones of any species which are started into life in each generation could grow, develop, and reproduce, a relatively small number of generations would produce standing room only for that species." Quoted by W. P. Taylor, in *Natural Resources*, M. R. Huberty and W. L. Flock, Eds. (McGraw-Hill, New York, 1959), p. 241.
14. National Academy of Sciences–National Research Council, *The Growth of World Population*, A report prepared by the Committee on Science and Public Policy, National Academy of Sciences, (NAS–NRC Publ. No. 1091, Washington, D.C., 1963), p. 9. For a pithy, philosophical synopsis of the ecological and demographic dimensions of our burgeoning space problems, see P. B. Sears, *Science* **127**, 9 (1958).
15. National Academy of Sciences–National Research Council, *The Growth of U.S. Population*, A report prepared by the Committee on Population, National Academy of Sciences. Quoted by E. Langer in *Science* **148**, 1205 (1965).
16. National Academy of Sciences, *The Growth of World Population*, A report prepared by the Committee on Science and Public Policy, National Academy of Sciences (NAS–NRC Publ. No. 1091, Washington, D.C., 1963), pp. 8–9.
17. J. H. Fremlin, *New Scientist* **415**, 287 (1964).
18. R. C. Cook, *Social Educ.* **24**, No. 2, 65 (1965).
19. F. N. Notestein, in *World Population and Future Resources*, P. K. Hatt, Ed. (American Book Co., New York, 1952), p. 58.
20. Wilmington *Morning News*, 13 Oct. 1964.
21. L. K. Caldwell, reprint from the *Transactions of the Twenty-Sixth North American Wildlife and Natural Resources Conference*, 6–8 March 1961 (Wildlife Management Institute, Washington, D.C., 1961), pp. 41–42.
22. L. Mumford, from a lecture at Princeton University, November 1964. Quoted in the Philadelphia *Evening Bulletin*, 16 May 1965.
23. S. L. Udall, *Population Bull.* **20**, No. 4, 99 (1964).
24. In a personal communication, dated 12 April 1965, a Delaware planner states, "The planners' public service is essentially finite and statistical work. Casting future balances is our social contribution. We can't preach and sound the alarm, except as a quiet sideline. It is the responsibility of others to change attitudes, I fear. However, noting the grave portents of over-population, planners are naturally grateful when the alarms are sounded."
25. J. Dewey, in *Readings in Ethics*, G. H. Clark and T. V. Smith, Eds. (Appleton Century Crofts, New York, ed. 2, 1935), p. 418.

26. This study was supported by a University of Delaware Summer Faculty Fellowship.