CONTROLLING THE FLOW OF REBUILDING AND REPLANNING IN RESIDENTIAL AREAS

By

Kevin Lynch

Submitted in Partial Fulfillment of the

Requirements for the Degree of

Bachelor in City Planning

at the

Massachusetts Institute of Technology

May 1947

Author's Signature ______________________

Certified by ______________________

Head, Department of City and Regional Planning

Cambridge, Massachusetts
May 23, 1947

Professor Frederick J. Adams
Department of City and Regional
 Planning
Massachusetts Institute of Technology
Cambridge, Massachusetts

Dear Professor Adams:

In partial fulfillment of the requirements for the degree of Bachelor in City Planning, I submit this thesis entitled Controlling the Flow of Rebuilding and Replanning in Residential Areas.

Respectfully,

Kevin Lynch

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There is nothing in all world that continues in the same state. Even time itself glides on with a constant progress, no otherwise than a river. For neither can the river, nor the fleeting hour stop in its course; but, as wave is impelled by wave, and the one before is pressed on by that which follows, and itself presses on that before it; so do the moments similarly fly on, and similarly do they follow, and they are ever renewed. The time was, when only as embryos, and the earliest hope of human beings, we lived in the womb of the mother. Nature applied her skillful hands, and willed not that our bodies should be tortured by being shut up within the entrails of the distended parent, and brought us forth from our dwelling into the vacant air.

For my part, I cannot believe that anything lasts long under the same form. I have seen land made from the sea; and far away from the ocean the sea-shells lay, and old anchors were found there on the tops of the mountains. That which was a plain, a current of water has made into a valley, and by a flood the mountain has been leveled into a plain; the ground that was swampy is parched with dry sand; and places which have endured drought, are wet with standing pools. The heavens, and whatever there is beneath them, and the earth, and whatever is upon it, change their form.

--Pythagoras, in Ovid's Metamorphoses, Book XV

Many of our great systems of production are founded on a continuous, even forced, process of obsolescence, of short-term use and discard, of high turnover and quantity production. Fortunately or unfortunately, one notable exception is the physical environment and spatial organization in which we live and work. There have been vast physical changes, especially in our urban areas, but primarily they have been the changes of expansion, of increments to size, complexity, and intensity of use. Except in the central and industrial areas of intense activity, these changes in the main have not been characterized by the replacement of old forms and structures.

This is particularly true of our living areas. We live in our predecessors' houses, on site plans laid down by our fathers and our grandfathers. It may not go further back than this, since we are a "new" country. Most of our population, the author included, have never lived in anything but second-hand housing, other than the new army barracks that sprang up in 1941 and 1942.

It is intended in this paper to explore the possibilities and implications of encouraging a more rapid rate of the replanning and rebuilding of our living environment. A suggested program is outlined in the last pages, which can be referred to at this point as an indication of the goal toward which the discussion is pointed.

Proposals to allow each generation to rebuild its own environment are not new. To quote a dialogue in Hawthorne's "The House of the Seven Gables," written in 1851:

"I ought to have said, too, that we live in dead men's houses; as, for example, this of the Seven Gables!"

"And why not," said Phoebe, "so long as we can be comfortable in them?"

"But we shall live to see the day, I trust," went on the artist, "when no man shall build his house for posterity. Why should he? He might just as reasonably order a durable suit of clothes--leather, or gutta-percha, or whatever else lasts longest,--so that his great grand-children should have the benefit of them, and cut precisely the same figure in the world that he himself does. If each generation were allowed and expected to build its own houses, that single change, comparatively unimportant in itself, would imply almost every reform which society is now suffering for. I doubt whether even our public edifices--our capitols, state-houses, court-houses, city halls and churches--ought to be built of such permanent materials as stone or brick. It were better that they should crumble to ruin, once in twenty years, or thereabouts, as a hint to the people to examine into and reform the institutions which they symbolize."

"How you hate everything old!" said Phoebe, in dismay. "It makes me dizzy to think of such a shifting world!"[1]

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[1]Nathaniel Hawthorne, "The House of the Seven Gables," (Boston: Houghton Mifflin, ed. of 1879), Ch. XII, pp. 210-211.

Some chapters later, however, in the midst of marrying into the inheritance, the artist undergoes a change of heart:

"But I wonder that the late Judge--being so opulent, and with a reasonable prospect of transmitting his wealth to descendants of his own--should have not felt the propriety of embodying so excellent a piece of domestic architecture in stone, rather than in wood. Then, every generation of the family might have altered the interior, to suit its own taste and convenience; while the exterior, through the lapse of years, might have been adding venerableness to its original beauty, and thus giving that impression of permanence which I consider essential to the happiness of any one moment."

"Why," cried Phoebe, gazing into the artist's face with infinite amazement, "how wonderfully your ideas are changed! A house of stone, indeed! It is but two or three weeks ago, that you seemed to wish people to live in something as fragile and temporary as a bird's nest!"

"Ah, Phoebe, I told you how it would be!" said the artist, with a half-melancholy laugh. "You find me a conservative already!"[2]

The late H. G. Wells wrote of his future Utopia:

"And with equal facility now a house is cleared

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[2] _Ibid._, Ch. XXI, p. 356.

away.... Clearing away...is the primary characteristic of the Modern Age.... Man has learnt the real lesson of plenty, that far more important than getting things is getting rid of things."[3]

And within the last few years, there have been several proposals, usually in connection with the advocacy of the prefabricated house, to furnish dwellings that could be erected, scrapped, moved, expanded, or contracted with speed and facility, in accordance with the inhabitant's changing needs and desires.

Nevertheless, the pervading ideal of a house is one which is permanent and durable. The good house, the "sound" house, is one which will last physically for the maximum number of years with the minimum of repairs. Popular and official manuals on home building all stress the importance of durability. Even the prefabricators disclaim any taint of impermanency in their structures.

This ideal of physical durability is close to the real situation. It is even closer to the reality of the persistence of site layout. The immutability of city street patterns after their original platting, and the manner in which they throttle and pervert the vastly different activities that must now go on within them, has been widely

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[3]H. G. Wells, "The Shape of Things to Come," (New York: MacMillan, 1933), pp. 409-410.

and bitterly commented upon. Even where the original master plats were worked out as a whole, as in the case of upper New York City, with its goals of river-to-river access, order and saleability, their rigid persistence has had tragic effects. Gloag and Wornum describe the decaying medieval palaces along the 18th century Strand in London, and state that the evil of decaying and discarded wealthy houses "has haunted large cities for centuries."[4]

It is now widely accepted that there are large areas of our cities in which the site patterns and the structures in or on the ground have become so unsuitable for their purpose that we must proceed to wipe the slate clean and begin all over again. An effort will be made to plan these areas in a more coordinated and functional fashion than that by which they were originally laid out, but beyond this there has been little thought for the possible repetition of the cycle in the future.

Depreciation, Obsolescence and Replacement

Structures in general undergo a decline in their value or usability as they grow older. Market values may vary irregularly about this downward trend, due to outside economic forces, and, exceptionally, particular structures may gain in value due to destruction or deterioration of

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[4]John Gloag and Grey Wornum, "House Out of Factory," (London: Allen and Unwin, 1946), p. 86.

other comparable utilities, or due to historic value. But, for the most part, the decline is insistent over longer periods. Such decline is due both to physical depreciation of the structure itself, and to obsolescence, which may either be in relation to newer, improved structures, or due to changes in needs and demands. In regard to housing, the latter type of obsolescence may come as the result of local shifts in demand, such as changes in the neighborhood, or of more general shifts, such as decreasing family size or the decline of the family unit as the center of a great number of domestic, recreational, educational, and industrial functions.

Available data on this process may be divided into: first, depreciation rates; second, rates of "normal" obsolescence; and third, measures or indications of the actual rate at which the structures are being replaced. It is based in part on fragmentary studies, more often on simple opinion. In general, in the absence of more exact information, it is assumed that the decline in value is a simple straight line process, in which the annual rate is equal to 100% divided by the number of years of physical or useful life.

The National Housing Agency states that the average good house has a physical life of 60 to 80 years, unless unusual maintenance measures are taken.[5] Zangerle, in 1924,

[5]U.S. National Housing Agency, "Housing Costs," (Washington: Government Printing Office, 1944), p. 29.

in furnishing data for property tax assessors, gives annual depreciation rates for dwellings that average about 1 to 1 1/4%.[6] Prouty, Collins, and Prouty, in their assessor's manual written in 1930, set up similar rates varying from 1% for brick, owner occupied houses, to 3% for frame, tenant-occupied structures.[7] Both sources would limit total depreciation to 80% regardless of time, as long as the structure is still occupied.

Obsolescence, however, is more rapid, and is the dominant element in value decline. From an overall viewpoint, and insofar as they are caused by introduction of improved utilities, losses due to obsolescence are not an economic waste, although they may be costly to particular individuals.[8] A fluid system of expanding production must value its stock of capital goods not on the basis of original cost, but on the cost of replacement or their present usefulness. In industrial practice, physical wear and tear is a minor consideration in setting up amortization rates; machines are rarely replaced because they have simply worn out. So acute is the recognition of obsolescence that in general new equipment is only purchased if it is estimated that

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[6] In Mabel Walker, "Urban Blight and Slums," (Cambridge: Harvard University Press, 1938), p. 156.

[7] Prouty, Collins, and Prouty, "Appraisers' and Assessors' Manual" (New York: McGraw-Hill, 1930), table 18, p. 67.

[8] R. F. Fowler, "The Depreciation of Capital," (London: P. S. King, 1934), p. 23.

its cost can be paid off in savings or profits in less than five years.[9]

The economically useful life of a house is often said to range from 40 to 60 years.[10] This is little more than a common assumption: in terms of ability to produce income, houses may have a much longer useful life, and in terms of their ability to meet rising standards of good housing, dwellings may have a much shorter useful life.

The National Housing Agency states that 40 years is a reasonable average effective life for a house.[11] The Bureau of Internal Revenue gives the "reasonable useful life" for various structures, to be used as the basis for computing depreciation losses in income tax schedules. This useful life is assumed to include depreciation under "reasonable" repairs and maintenance, and "normal" obsolescence, excluding sudden shifts in the neighborhood, or the erection of new competing structures of far superior qualities. Considering the structure alone, without its equipment, the life of an apartment building is assumed to be 50 years, that of other dwellings 60 years. If equipment as well as structure is to be amortized, the figures range

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[9]Ruth Mack, "The Flow of Business Funds and Consumer Purchasing Power," (New York: Columbia University Press, 1941), pp. 235-236, and pp. 296-297.

[10]Walker, op. cit., p. 82.

[11]National Housing Agency, "Housing Costs," p. 27.

from 33 to 40 years for apartments, 33 to 50 years for other dwellings.[12]

In contrast to this, an actual study of real estate transfers in Lucas County, Ohio, revealed an annual rate of value decline of 0.6%. It was found that 50-year old, 1 1/2 and 2 story frame houses standing in 1938 retained over 70% of their original value, cyclical influences having been removed.[13]

Most authorities would seem to set some figure near 80 years for the physical life of a house, and about half that figure for its effective or useful life. Yet many actual houses produce income and retain value far beyond this period.

The picture goes out of focus when we consider the rate at which we are replacing our housing. In a study made in 1934, the yearly increment of population was subtracted from the estimated capacity in persons of the new additional housing built in a certain year, and the remainder divided by the total national population to obtain a figure for the annual fraction of housing replaced. In the peak building years 1923-1927 the replacement was comparable to a rate of

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[12] U.S. Treasury, Bureau of Internal Revenue, Bulletin F, "Income Tax Depreciation and Obsolescence--Estimated Useful Lives and Depreciation Rates," (Washington: Government Printing Office, 1942), p. 17.

[13] William Hoad, "Real Estate Prices, A Study of Residential Real Estate Transfers in Lucas County, Ohio," (unpublished doctor's dissertation, University of Michigan, 1942), pp. 99-100; as summarized in National Housing Agency, "Housing Needs," (Washington: Government Printing Office, 1944), p. 18.

once every 45 years. Over the period 1921-1933, the average rate of replacement was only once in every 142 years![14]

In their estimate of housing needs in 1944, the NHA computed that 2.6 million dwelling units not substandard in 1940 would become so in 1955 and would need replacement, basing their estimate on the rate at which dwelling units come to need major repairs as they age, as estimated from real property surveys in 30 selected cities. This rate is not explicitly stated, but on figuring backwards from their stated assumptions and method of calculations, it appears to equal a replacement rate of once in 141 years.[15] This is peculiarly close to the former calculation.

The U.S. Housing Census of 1940 gives the following data as to the age composition of the national housing stock. It should be noted that in spot checks of this data it has been found to consistently underestimate the age of structures (in Chicago, the Census indicated that only 25% of the dwelling units were erected before 1900, while building permit data showed that 40% were built before this date):[16]

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[14]From a study by Frank Watson, summarized in "Only Once Every 142 Years," Fortune, June 1935, vol. 11, p. 77.

[15]National Housing Agency, "Housing Needs," p. 17.

[16]Homer Hoyt, "Principles of City Growth and Structure," (mimeographed course text, Massachusetts Institute of Technology, 1946), p. 93.

Type of housing	% of total non-farm structures	Median age in yrs	% of those reporting built in the periods:							
			1930 -40	1920 -29	1910 -19	1900 -09	1890 -99	1880 -89	1860 -79	Before 1859
Urban	72.9	26.1	11.2	27.8	19.2	18.9	11.3	5.8	4.1	1.9
Rural non-farm	27.1	20.2	27.0	23.3	16.1	14.0	7.7	4.5	4.0	3.4
All non-farm	100.0	24.5	15.6	26.5	18.3	17.5	10.3	5.4	4.1	2.3

We may conclude that the median age of non-farm housing in 1940 was appreciably higher than 25 years, is older now, and by long-term replacement rates, is moving steadily toward a figure of the order of 50 years. This is in sharp distinction to our conception of the age at which "sound" housing may be expected to become obsolete. The housing stock grows spasmodically in some rough correlation to the growth in population, but there is little rebuilding, few decent burials for the structures in the older layers of the housing deposit.

In themselves, the utilities, underground and surface structures which serve as distribution networks for the dwellings, suffer a much slower rate of depreciation and obsolescence than do the houses. Underground facilities have a particularly long life; water and sewer laterals, for example, may be considered to last almost indefinitely, as long as minor repairs and replacements are made. Cast-iron water pipes have given good service for as long as 250 years.[17] Water mains, however, carrying large volumes under pressure, have a limited physical life, perhaps fifteen years as a conservative estimate. In general, minor streets need little replacement, beyond retopping at about twenty year intervals. Major streets, however, may require replacement of their pavements every twenty years, representing about 20-25% of the total original cost.

These utilities also suffer little obsolescence in themselves, since their function is relatively simple and slow to change. Water and sewer mains may become obsolete as their capacity becomes insufficient to supply increased demands (though they are usually generously over-designed in the beginning to allow for such changes), or if the location of their source or disposal becomes inadequate. Laterals rarely become inadequate, unless there is an extreme shift in the intensity of the local land use. Minor streets are in much the same classification of long usefulness; main thoroughfares, of course, may rapidly become obsolete following changes in the volume and character of the traffic which they must bear.

But these utilities, along with the pattern of land ownership, fix and freeze the original site plan.

[17] C. V. Davis (ed.), "Handbook of Applied Hydraulics," (New York: McGraw-Hill, 1942), p. 494.

Once that particular organization of space has lost its usefulness, then the utility system so intimately bound up with it also becomes obsolete.

According to the "filtration" theory, it is by means of the process of obsolescence that housing is made available to the low, and to much of the middle, income groups. A question mark covers the extent to which low rent housing is supplied by the gradual obsolescence of high cost structures, in contrast to supply by the original construction of cheap, substandard units, by more intensive use of existing units, or by the absorption of abnormal capital losses on the part of various housing owners. It is nevertheless true that the low income groups are generally housed in the old, the obsolete, and often the most intensively used, portions of the housing stock, and that new housing, meeting modern minimum standards, cannot be built for them without some type of subsidy. Thus any program that would reduce the number of obsolete dwellings by speeding the rate of rebuilding must consider the effect on the provision of low cost housing.

<u>Three Sample Areas</u>

A brief study was made of three areas in the City of Cambridge, in order to gain a sharper picture of the nature of the physical change which has taken place in the urban residential environment, to give some picture of the obsolescence that has occurred there, and to relate it as much as possible to the changing functions that that environment has served.

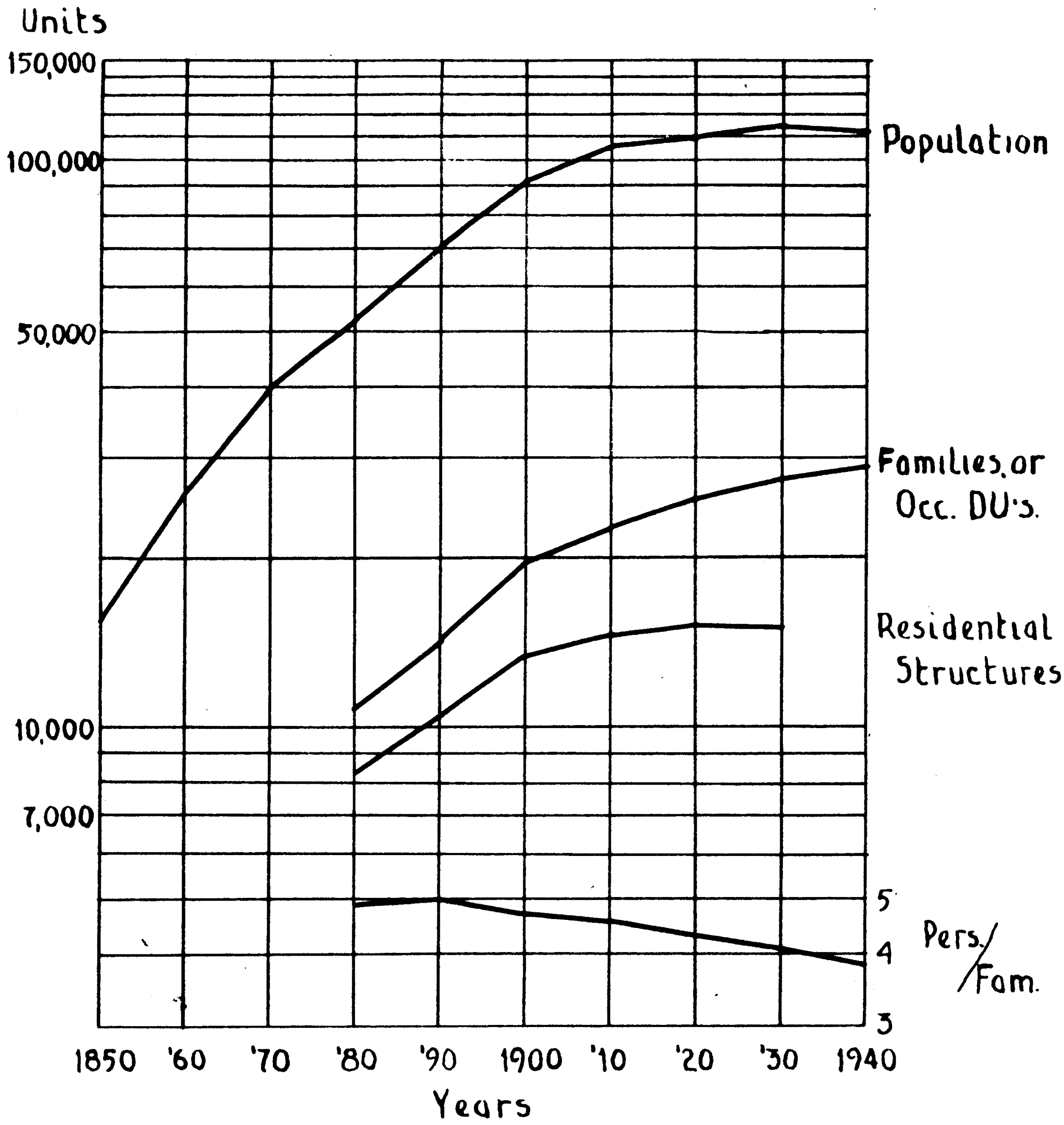
Location of the three areas are shown in the key map, Figure I. The areas were chosen in Cambridge for the variety in character within small radius, and the accessibility of material. Areas were chosen that had been urban residential zones for an appreciable length of time, that were not in extreme stages of obsolescence, and that had not been affected by any dramatic blighting factors, such as marked intrusion by non-residential land uses, major traffic streams, or "undesirable" ethnic groups. Areas B and C have undergone decided changes in 60 years; Area A is the exception which has managed to maintain much more of its original character over this period.

Principal use was made of a sequence of maps showing the site plans, lot lines, structures, and lot ownerships at various periods of time. These were: a map of Cambridge by an engineer, Walling, dated 1854; and the series of city atlases by Hopkins and later by Bromley, dated 1873, 1886, 1894, 1903, 1916, and 1930. These latter are a consistent series, showing practically the same data in the same manner. In addition, ten structures were followed through the files of the City Assessor from 1906 to 1946, as a spot check on changes in ownership and of assessed values of land and buildings. Present land use was taken from a Planning Board map dated 1942 and from personal inspection. Block data was abstracted from the U.S. Census of Housing, 1940; zoning maps were consulted; and some of the local history was gleaned from talks with residents and with local real estate agents.

The local changes occurred against the background of the changes in Cambridge shown in Fig. II. The rapid growth of population in the latter half of the 19th century, leveling off from 1910 to 1930, is roughly correlated with the growth in the number of residential structures. The continuing upward climb of the number of census families is a function of the decline in the average number of persons per family. The general picture is one of continuing pressure of families for space until the city was almost solidly built up by the 1920's.

Each of the areas has had a particular history of a different type. Area A, on upper Brattle Street, was in the process of being cut out of farm land in 1854, but was already developing as a wealthy residential district. By 1873 the trend was definite. These blocks are part of a section that early took position as the fashionable district of Cambridge and the residence of many university people. It still holds pre-eminent place within the city, although its decline had already set in by 1930 as the wealthy families moved out to more outlying districts. Area B had developed earlier than A, and by 1873 exhibited upper class homes along Harvard Street and north to Broadway.

Population & Housing, Cambridge



Source: U.S. Census.

This was second only to the Brattle Street section in fashionable estimation. The Harvard Street area, however, was submerged by an increasing tide of population, and the large lots were gradually cut up into smaller pieces. Area B has shown more physical change than the other two, many of the older houses have been replaced by more intensive uses: apartments, flats, and small houses on narrow lots.

Area C was open land in 1854, bordered by a belt of marsh. In 1873 it had been subdivided into neat and orderly rectangular lots by two firms on either side of Pearl Street. It was not until the 1880's that an appreciable amount of building was done, principally on the east side of Pearl. The new houses here were not expensive ones; they were built for middle-class people, with a sprinkling of upper-middle class around Hastings Square. A good proportion of two-family houses were built from the start. This area has seen the changes in ownership and use that occurred in Area B, but there has been little replacement. The land had been steadily filled up with buildings, until there was no room left. Then the building process stopped, with the impression that it stopped for good.

Present land use in the three areas is shown in Fig. III. The following data on the areas is taken from the 1940 U.S. Housing Census:

Land Use 1947

Single Family
Two to Five Family
Over Five Family
Commercial
Public & Semi-Public
• Checked thru Assessor's Files.

III

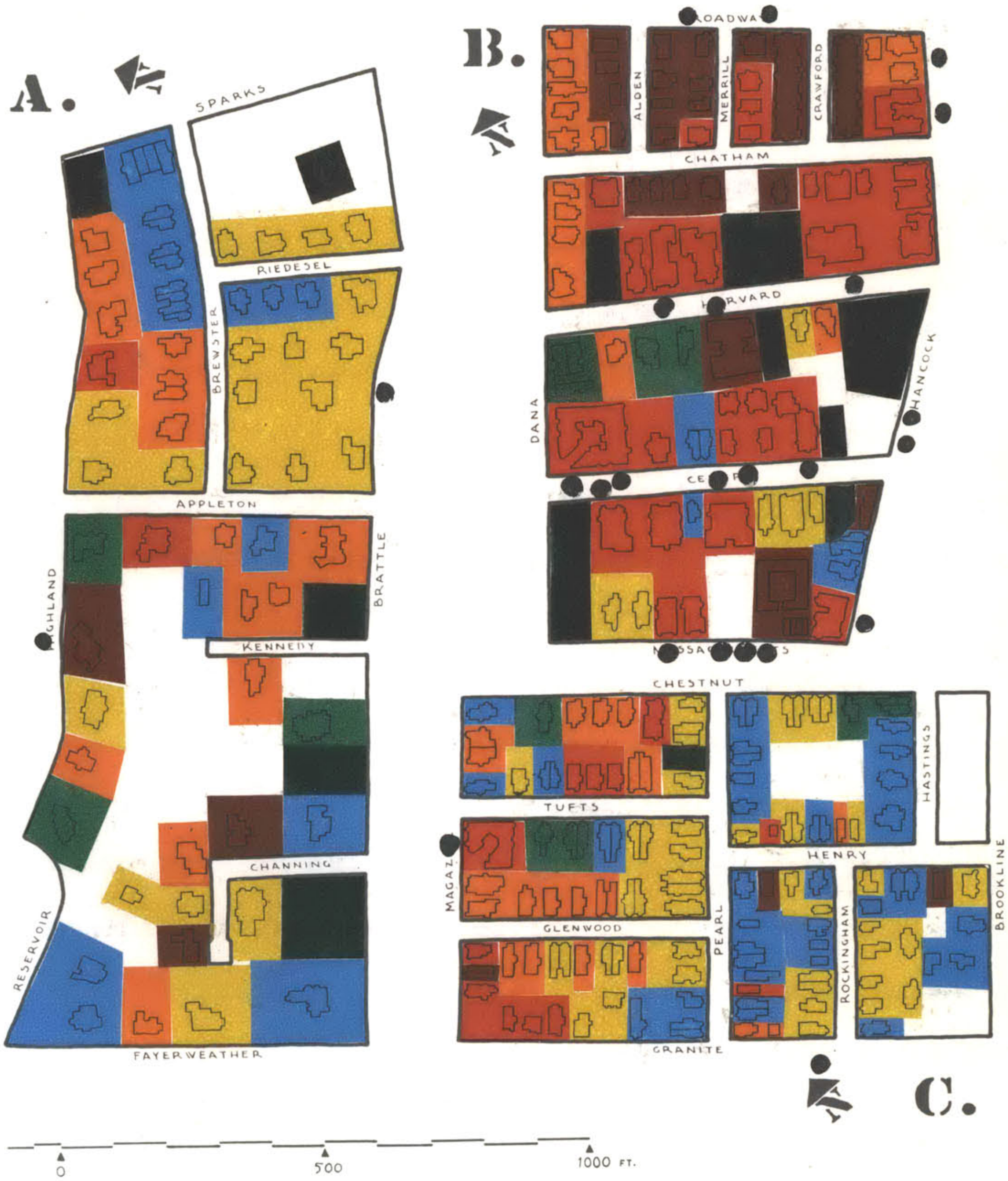
	Areas A	Areas B	Areas C
Total structures	71 (68)	103 (98)	118 (128)
Total dwelling units	75	522	286
Owner-occupied	56	40	74
Tenant-occupied	16	454	207
Vacant	3	28	5
Number reporting repairs and plumbing	65	465	237
Needing major repairs or lacking private bath	0	20	24
Number reporting mortgage status	51	38	67
Mortgaged units	15	35	50
Average monthly contract or estimated rent	$168.70	48.92	32.65

Note: Figures in parentheses after "Total structures" indicate number of structures on the ground, according to official plats, in 1930. From that date up to 1946, there have been two structures erected and one demolished in Area A, one demolished in Area B, and three structures erected in Area C. An appreciable census error in Area C is indicated. Due to variance of dates, it was found impossible to compare building age data.

Fig. IV indicates the period at which the various houses were built, and the location of demolitions, over the period 1854-1930. This may be summarized:

	Areas A	Areas B	Areas C
Residential structures on the land, 1854	6	25	2
Residential structures erected, 1854-1930	64	93	128
Residential structures demolished, 1854-1930	2	20	2

Erections & Demolitions



Structure erected:

- before 1854
- 1855 - 1873
- 1874 - 1886
- 1887 - 1894
- 1895 - 1903
- 1904 - 1916
- 1917 - 1930
- ● Orig. Struct. Demolished

IV

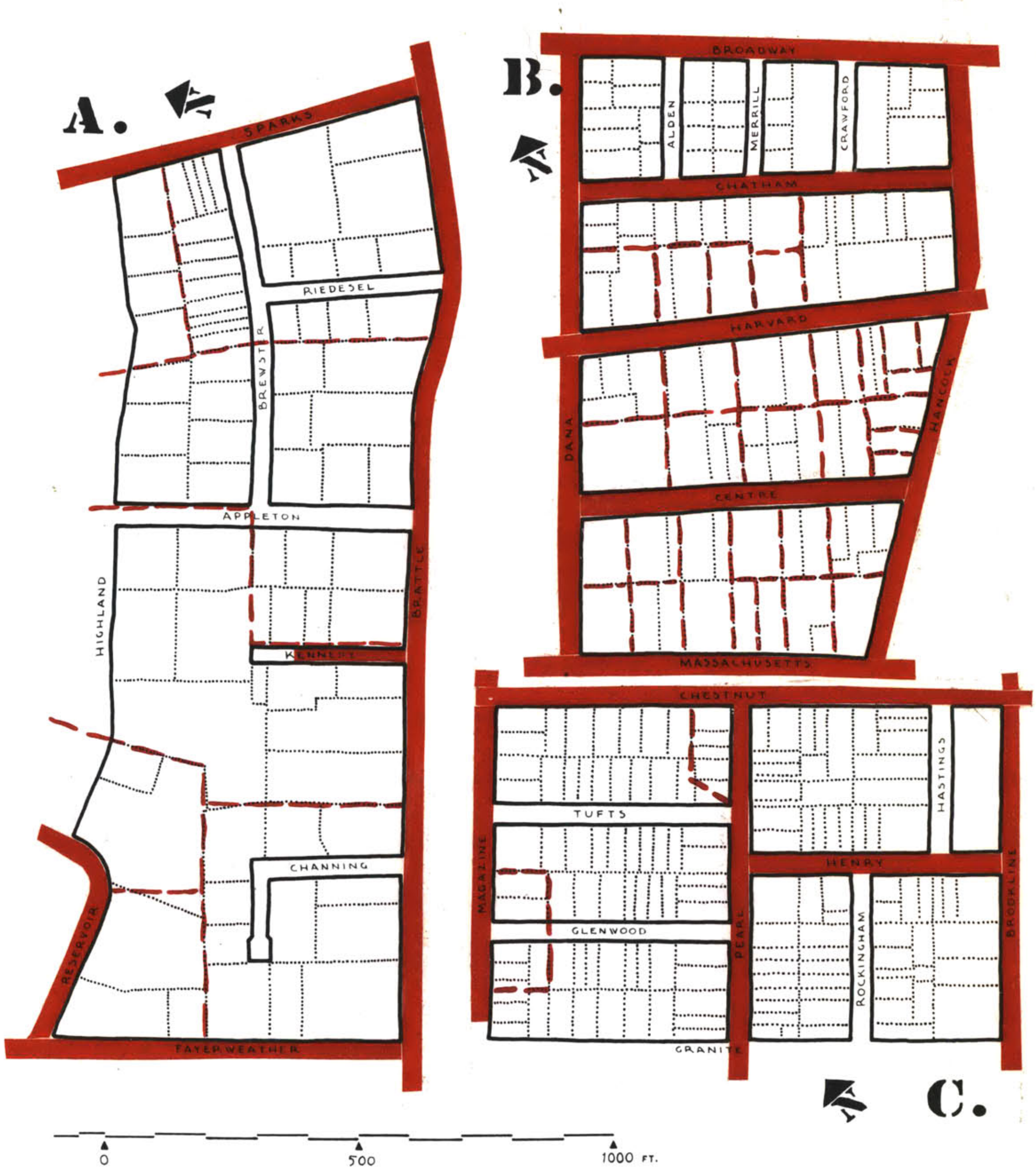
Fig. V shows the changes in site plan and lot lines that occurred over the same period. The inflexibility of the site layout, and the immutability of the property lines, except for continuous division and redivision of the existing parcels, is evident.

As a very rough measure of the turnover in occupation of buildings, a count was made of the number of times the owners' names attached to the various lots changed between successive atlases, in the period 1873-1930. Sales of freshly-subdivided land to the first individual owner were not counted. These totals were divided by the total number of lots in the area, as a general index of the average number of times that a piece of real estate changed hands in the 57-year period. As an index of change in occupancy, these indexes have several defects. They do not take into account changes in tenancy; extra sales that would occur between atlas dates would not be counted; changes in ownership between members of the same family are disregarded. Presumably, then, they indicate a much lower turnover than was actually the case. These indexes are as follows:

Area	A	1.62
	B	2.36
	C	1.53

Except for a period of higher turnover in Area A in 1886-1894, all the sections show an increasing number of sales from period to period, all ascending in much the same geometric

Site Plan Changes 1854-1930



Streets, 1854
Property Lines, 1854
Streets, 1930
Property Lines, 1930

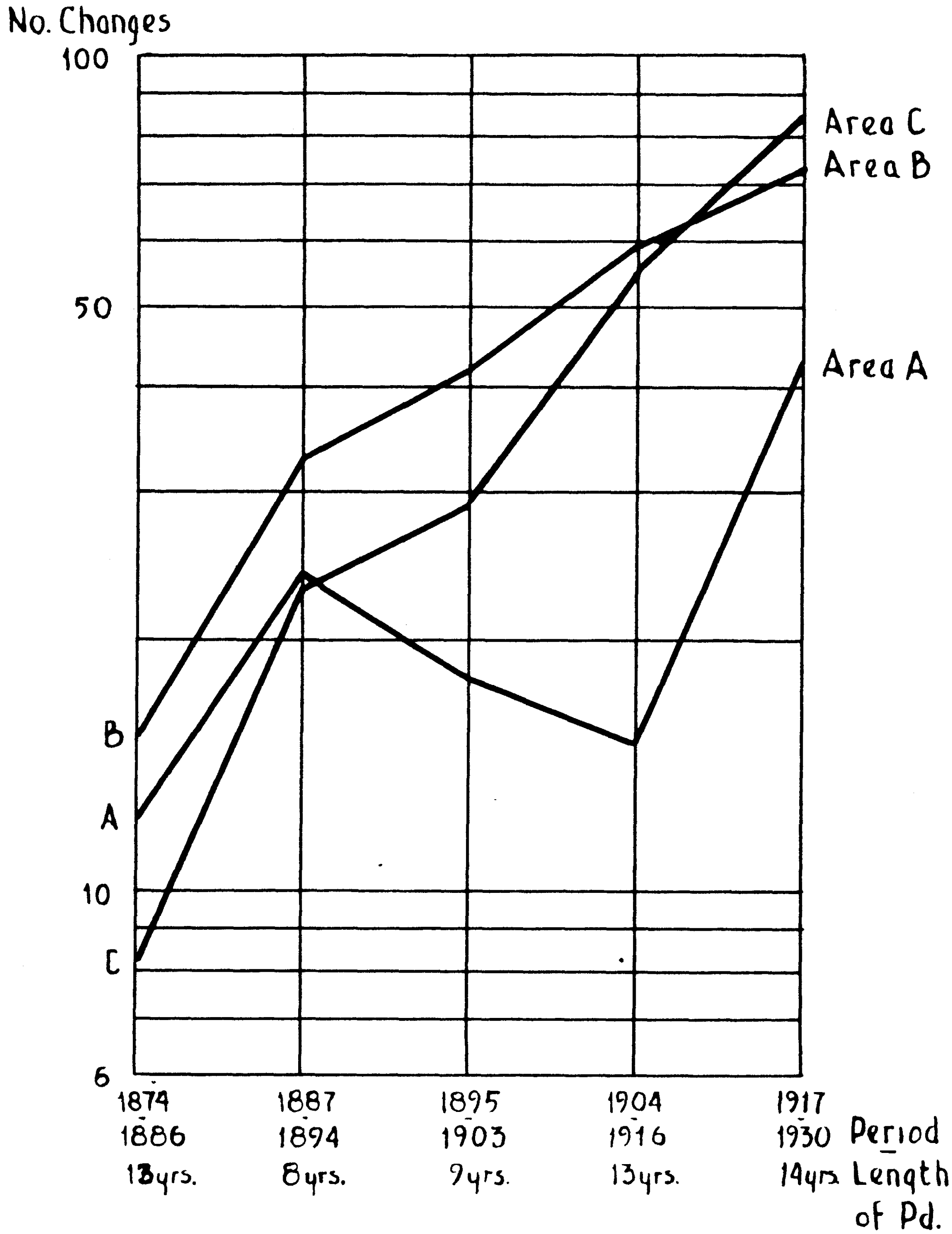
ratio (see Fig. VI).

Assessed values for the ten selected properties from 1906 to 1946 for their location (see Fig. III) showed generally increasing or level land valuations. Building valuations, with minor irregularities, remained level or declined slightly. One valuation increased appreciably, possibly due to alterations. Only two building valuations declined in any manner that might be thought consistent with depreciation or obsolescence: a large old house at the corner of Reservoir and Fayerweather Streets, and another at Henry Street and Hastings Square. The latter had passed from one owner to another with unusual speed (see Appendix A).

All three areas have seen changes in use out of proportion to physical adjustments, although to a lesser degree in Area A. Both B and C have been swept over irregularly by new waves of owners and tenants, very noticeably after 1903. To some extent it seems to have been an ethnic change: Irish names in particular replace the older New England names. Area B began as an upper class area in the northern end, and middle class to the south; C was a more homogeneous middle class section. The economic level of the inhabitants of both have gone down. By 1930 and 1940 almost all of the remaining large old houses had been converted into two and three family structures. Yet neither of them are what would formally be classified as "substandard" areas.

Area A is still in the high rent section of

Ownership Changes by Area



Note: original sales new lots not included.
periods are of varying length.
Source: comparative analysis city atlases.

Cambridge. The conversions, the extreme subdivision of the land, the new group of tenants, are changes that in the main are still only impending over upper Brattle Street.

The major changes in B and C cannot be laid to the encroachment of non-residential use, or the intrusion of traffic. The commercial uses and heavy traffic on Massachusetts Avenue have certainly forced changes on the southern edge of area B. But the bulk of the section is not touched by this. Industrial zones have come in on both sides of C, taking up the new land filled on the former marsh. But within or even on the edges of the area, the neighboring presence of industry is hardly apparent.

The old estates have been broken up, and the large houses converted, as progressive taxation made extensive physical manifestation of wealth difficult and unseemly, as the wealthier residents used the new means of transportation to find more space on the outskirts, as the buildings themselves deteriorated and became less pleasant to live in, as the increasing pressure of families needing quarters made profitable a more intensive use of the land, as the decline in size and importance of the family made extensive dwelling space difficult to use. Now many of the older structures are being used in a way for which they were not originally designed, and the new buildings are forced onto narrow and awkward sites, the leftovers of early construction. There were dynamics in the whole social and economic structure, changes in the customs and living habits of the people themselves, which made it impossible to continue living by older patterns, to keep the houses in the hands of the same families, or to use the physical facilities in the same way.

Although it has had a considerable turnover in ownership, Area A has more closely retained its original character. It has had peculiar advantages in doing so. First has been the tradition of fashionableness, the accumulated tradition of being the finest residential section in the city. The high incomes of its inhabitants have enabled them to maintain houses and grounds up to high standards, to preserve their land in relatively large pieces, to resist invasion by "undesirables." Finally, the area has had a strong community of interest through the large proportion of university people. The university's influence has gone beyond this, since by its retirement policy it has enabled some of the older residents to continue to live in and maintain large houses, where otherwise they might have been forced to move to smaller quarters. Nevertheless, there are indications that the area has already begun to move into a period of more rapid change.

By its inclusion in a single-family zone, the area has been able to throw off the threat of a few conversions, but the zoning ordinance only began to operate in more recent history. The district does not owe its stability to the original land planning, although the effect of design on the rate of change can be seen from the relatively higher turnover in the double and row houses on Brewster Street. The whole section still retains a pleasant character, especially in the larger block, where the big, well-kept houses seem to be scattered through its depth in almost park-like confusion.

Area B has as yet some interest and variety, with the old houses mixed in with the new brick apartments and the older wooden flats. There is some scattered open space, mostly as empty lots, and good trees along the streets. But the small, crowded dwellings, the brick apartment masses coiled up on their proper piece of ground, are hardly the better for it as homes to live in. Area C strikes a note of greyness and pervading sameness of all the houses of whatever age, a facade of unpainted wood and new asphalt shingle. It gives the impression of a great abandoned storage dump, filled with rows of great boxes, which no one intends to take away again. Yet it is not a slum area, the houses are still structurally sound.

Certain broad conclusions may be drawn, not as scientific generalizations from the data above, but using these three areas as illustrative material. It is the exceptional urban area that can maintain a stable function over as long a span as 50 years; the basic requirements usually are high income residents backed by strong tradition or community of interest. Good original planning can retard the speed of impending changes, but it is neither a necessary nor a sufficient condition for stability. Most urban areas undergo distinct changes in use and in occupancy over the period of a generation (although if they reach the bottom of the pile they may there achieve greater stability). Ordinarily the physical facilities keep pace with these functional changes only insofar as they can do so by filling in of open land, by redivision and crowding of earlier lots, by conversion of existing structures so that they can house more people. Rebuilding and replacement does not take place unless by virtue of central location or relation to transportation it is possible to change over to more intensive uses: multi-family or non-residential structures. In any case, the site plan, the street layouts, the utility systems, the lot patterns, are endowed with a fateful persistence, and new construction must conform to their demands.

Five Reactions to Obsolescence

There are five general methods by which we can react to this problem of the ageing of our residential communities, although they are not all mutually exclusive.

First, the older areas, once built up, may be neglected, and allowed gradually to rot away into complete uselessness, while new building is carried on in ever spreading circles from the urban center. Eventually it might be hoped that the central areas become so completely abandoned that they could be taken over at no cost and converted to open space or new low intensity housing.

Alternatively, the old areas near the center may be progressively replaced by higher and higher intensities of land use, which are able to absorb the remaining values of the old housing. This is typical of most of the replacement that has occurred in our cities. It cannot now be relied upon as an automatic renewal system, other than in a few small areas. The movement of population towards the urban periphery has set in too strongly. Admittedly, however, if we use ingenious technical solutions, we are far from being at the limiting ratio of people to the acreage they live on. Such a progressive intensification of land use could be carried out as a controlled, planned program, if we thought it desirable. Le Corbusier's proposals are a logical application of this method.

Thirdly, we can allow the old residential sections to decline to a certain critical stage of obsolescence; then condemn them and wipe them out, clearing the land for new construction. The community as a whole bears the cost of destroying the old values.

Fourthly, we can apply the known techniques of planning in the design of new areas or the reworking of older areas, with the view of preventing obsolescence wherever possible. We can hope to extend the usable community life to much longer periods, making necessary adjustments over time in the form of gradual, controlled modifications.

Finally, we may accept obsolescence and a short usable life as normal events, and plan communities at the beginning for a definite, limited, period of use. Here we must invent techniques by which we can progressively write off original costs over the usable life, so that the land will at the end of this time be free for large-scale reconstruction or modification of its facilities.

This paper will discuss the ~~latter~~ last method in more detail. It is not intended to analyze the other methods extensively, but some comparative comments should be made.

Method #1 is in actual operation today, for default of another program. It is also the counsel of desperation, in the face of the multitudinous difficulties of redevelopment. It may have some value as an immediate tactic, especially as it points to the concentration of planning energies in the areas where the opportunities for guidance now exist. But it cannot be supported as a long range program. The economic costs of maintaining partially used central services while providing new ones on the periphery, are well known. Of greater importance, the wastage of human resources in deteriorating urban areas cannot be tolerated as part of a conscious policy.

Method #2 assumes that we have no objection to further increases of population densities in our cities. It denies the promise of improved techniques of transportation and communication; and would reverse the search for more living space.

#3 is a solution now widely proposed. Its immediate necessity in the face of present conditions cannot be denied. To the extent that an area is rebuilt before it rots away, the human and economic wastage of Method #1 is proportionately reduced. But the human erosion has already appeared before the section has reached a sufficiently critical stage to force action. The obstacles of scattered titles, inflated land prices, good new buildings mixed in with the old, unamortized values, investment in existing streets and utilities, the need of the residents for rehousing, all present a formidable defense in depth to the redevelopment attack. The large acquisition costs must be taken in one gulp by the community, state or nation. The temptation to pay off some of these costs by crowding the land or developing for high-income occupancy is very seductive. In redeveloping the land, little provision is made for preventing the reappearance of the same dilemma, beyond the use of a better site plan. If complete reliance is placed on this type of spasmodic effort to avert present catastrophe, it can only be on the theory that we cannot plan ahead as far as another generation, although by erecting permanent structures we are extending the effects of present planning at least that far.

Method #4 has a better sound to it. If we could eliminate, or almost eliminate, obsolescence, then there would be no need to worry over it. We can build structures that will last centuries, or at least one century, with little extra effort. Communities could develop as stable efficient working units. The risks of loss and change could be eliminated. But even given good design at the start, is it possible to achieve this stability in a world of changing technology, changing economic opportunity, changing family composition and function, changing customs and beliefs? If possible, is it desirable so to limit individual mobility? Further, we could no longer rely on obsolescence to furnish middle and low income housing, but would be committed to the provision of new housing for all income ranges, high, middle, and low. This may be good or bad, but the economic implication must be met. In the report of the Harvard Conference on Urbanism, 1942, Mr. Draper is quoted as questioning the possibility of anchoring a particular economic group to houses originally built for them, as new housing with new equipment comes on the market.[18] In another conference in the same year at Cranbrook, Mr. Mitchell, in commenting upon Saarinen's conception of the stable residential cell, wonders what happens when new residents decide to move in, or new factories are set up,

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[18] Guy Greer (ed.), "The Problem of the Cities and Towns," Harvard Conference on Urbanism, 1942, pp. 26-27.

or old ones grow.[19]

<u>The Social Basis for a Replacement System</u>

Let us assume then that we have perfected a method whereby we can plan our areas from the beginning on the basis of a definite and limited period of use, starting either on new undeveloped land or on land cleared by a redevelopment process. We have in addition some technique of amortization by means of which the land and all the structures on it are returned to the public authority free of cost at the end of their useful life, with the presumption that they will be largely cleared away and thoroughly replanned for new development. Assume, subject to later modification, that houses and their environment will be allowed to stand only for one generation, say 25-30 years. What might be the effects on the people that live within them?

Permanence or impermanence in houses are not goods in themselves. In the fortified medieval house, with its elementary equipment, with the need for solidity and defendability, permanence was an asset. When you must move frequently to find fresh grazing or crop land, impermanence or demountability of shelter is desirable. Their relative value depends on the social and economic situation. We have a common ideal that a house should serve a family

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[19]Urban Land Institute, "Proceedings, Conference on Urban Redevelopment, Cranbrook Academy of Art, 1942," (Washington, mimeographed, 1942), p. 9.

through several generations, that when we build, we "build for our children." Nothing is further from the facts. The case is now rare, in an urban area, and except in situations forced by lack of alternative shelter, where the second generation family brings up its children in the same house in which they grew up. Furthermore, it is now more common for one family to live in several houses, as its numbers grow and decline, as its income rises or falls, as its economic opportunities shift from one locality to another. This mobility is a basic prerequisite for the pliability of our productive system. From the standpoint of the individual family there is no reason for extending the life of a house beyond a single generation.

It has been considered desirable for a family to stay in one location at least through the "formative years" of its children, perhaps until they have reached their middle teens. Young children may find the very first stages of adjustment to new friends more difficult than adults do, and very frequent moving may give them a feeling of insecurity, but much of it will arise as a reflection of any emotions of uncertainty or inferiority on the part of their parents. It is questionable whether familiarity with adjustment to new situations may not have an equal value. Most of the psychological effects of mobility depend on prevalent social attitudes toward new people in a community.

Meanwhile we make shift to live in the hard shell of an old environment, built up by long accretion.

"The old house...with its patch-work application of modern appliances, constantly added to so that the householder may be able to live appropriately in his own century, gradually takes control of the life that goes on within its walls.... Life cannot be based only upon the possession of a few modern heating, cooking, and refrigerating appliances."[20]

The new needs and the new functions struggle with the old forms. The large old houses converted to more intensive use are notoriously lacking in space and privacy. Changes in the family and in the neighborhoods in which the families live have been sweeping in the last 50 years. There is no reason to believe that the rate of change will be any slower in the next 50. It is not houses alone that are subject to the impact of new demands. Certain types of community facilities, schools in particular, must be flexible and semi-permanent in nature.[21]

It is not only new needs and new functions that call for flexible and renewable residential environment. Advances in design and technology open new possibilities

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[20]Gloag and Wornum, op. cit., p. 86.

[21]Ernest J. Kump Co., "Master Development Plan, Survey, and Technical Report--Antioch-Live Oak Unified School District," (no date), pp. E12-13.

which must be thrown away if we cannot replace the old structures. Louis Justement quotes an article in 1854, praising contemporary homes as being at a point beyond which no further improvements can be made.[22] This may seem ridiculous now, knowing the low level of design of that period, but we can make only a very imperfect evaluation of the future usefulness of our own designs. It is true that we have standards of evaluation of design that go beyond the varying tastes of successive generations. But primarily a piece of architecture is good because it expresses and fulfills the functions of its own times. And the more detailed, complex, and small-scale those functions are, the more likely they are to undergo revision with time. The esthetic value of a house or its value as a record of human ideas and purposes is not weakened by the fact that it may no longer be able to serve the new functions of a new period. Examples of old structures, even among those of inherent good design, which are still a good medium for modern family life, are extremely rare in the bulk of our housing stock. We can make broad plans for the distant future, tailoring them to basic human needs, but we would be foolish to presume detailed foreknowledge.

The advance in the technological aspect of the house is particularly rapid. Past changes have been largely

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[22]Louis Justement, "New Cities for Old," (New York: McGraw-Hill, 1946), p. 39.

in its equipment, but we see now the impending changes in the structure itself, as well as the application of new skills in house and community design. We cannot foresee technological advances as yet unborn, but we do have a certain time interval in which to anticipate the results of ideas still in the developmental stage. To quote the National Resources Committee's study of trends in technology:

"Invention is a process, and there are faint beginnings, development, diffusion, and social influences occurring in sequence, all of which require time. From the early origins of an invention to its social effects the time interval averages 30 years."[23]

There are, of course, certain dangers in blindly accepting the ideal of the replaceable house. If we were to accept change as a good in itself, out of relation to whether it is needed to meet new conditions, then we would ape the fashion-motivated turnover in cars and clothes, regularly inventing new gadgets or design tricks each year, in order to make the new model house different, and therefore "better," than the previous one. But as long as we think in terms of 25 year life, and as we use a technique that makes replacement possible but not mandatory, we may outmaneuver the dangers.

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[23]U.S. National Resources Committee, "Technological Trends and National Policy," (Washington: Government Printing Office, 1937), p. ix.

An integrated community life is considered to be an important part of a good residential environment. There is probably a maximum rate of population turnover within a community beyond which it becomes difficult to maintain integration. In reality the speed of this turnover would probably not be greatly influenced by the life of the houses, as long as they were not reduced to five or ten years. But it would be important to avoid the replacement of an entire community area at one time. There should be staggered terms of replacement for smaller areas, to insure continuity to the whole organism. It would also be important to preserve certain key public or semi-public buildings over a longer period of time, to serve as a stable nucleus for the community.

From a human standpoint then, from the standpoint of fulfilling the functions for which it is designed, the optimum life of a house and of the environment which surrounds it should be no more than 25 or 30 years. Such a relatively flexible and plastic physical environment would not only more closely serve our needs, but could present a new and stimulating creative challenge to each succeeding generation.

The Economic Basis

From the viewpoint of costs, however, it may be necessary to modify this conception of the optimum usable life. A house and the utilities which serve it are complex and expensive capital goods. A shortening of their life will increase their annual cost. This would not be true if it were possible to reduce the original cost of a structure by virtue of the fact that its life was to be limited to a shorter period. At present there are no developed techniques for saving cost on a structure of shorter life; in order to meet minimum standards of health and safety, the components must be of such a nature that most of them will endure for 60 to 80 years, unless a structural life of perhaps three years or less is contemplated. Therefore, in analyzing the costs of non-durable structures, it will be assumed that their original costs are equal to those of comparable durable structures. Later we will return to the possibility of reduction of original cost.

Annual costs will not be increased proportionately with the decrease in the useful life, since there are other components in the annual cost besides that of amortization. To get some picture of the way in which the average annual cost of a structure would vary with its alloted years of useful life, we can develop an algebraic formula, in which the annual cost is assumed to be made up of amortization of the original cost over the useful life, interest on the remaining balance of debt, profit on the remaining balance of the equity, a tax rate on the declining balance of unamortized original cost, and costs of operation, maintenance, repairs and insurance as a fraction of the original cost. To cover the case of rental houses, a vacancy rate is also introduced. Some of the assumptions in this allocation of cost will be discussed later. Then, if:

X is the original cost

p is the fraction of the cost furnished by a loan

i is the interest on the debt

r is the rate of profit on the equity

t is the tax rate

c is the fraction of the original cost required yearly to cover operation, maintenance, repairs and insurance

n is the number of years of useful life

v is the vacancy rate

and

E is the <u>average</u> annual cost (since the particular annual costs decline over the years)

$$\frac{E}{X} = \frac{1}{1 - v} \quad c + \frac{r}{2} + \frac{t}{2} + \frac{p}{2}(i - r) + \frac{2 + r + t + p(i - r)}{2n} \quad .$$

If, for rental housing, we assume that $v = 0.03$, $i = 0.03$, $r = 0.06$, $t = 0.03$, $c = 0.05$, and $p = 0.9$, the general formula reduces to:

$$\frac{E}{X} = 0.084 + \frac{1.09}{n} \quad ,$$

and if we tabulate the values for various years of life, and compute the ratio of the $\frac{E}{X}$ for any particular life to that obtained for a 100 year life (in this case $\frac{E}{X}$ for 100 year life = 0.0949), we obtain the following:

Years of life	10	20	30	40	50	60	70	80	90	100
Ratio $\frac{E}{X}$ to that for 100 year life	2.04	1.46	1.27	1.17	1.12	1.08	1.05	1.03	1.01	1

That is, assuming the original cost is the same, it would for example increase the average annual cost 17% to shorten the useful life from 100 years to 40 years. These results would be varied by the values assumed for the constants. In particular, as the value of c is increased, the effect on annual cost of shortening the life is decreased. Similar results, to a lesser degree, are obtained by decreasing r, t, and i, or increasing p.

In the case of public utilities, where t, v, and r are zero, and p is 1, then the general formula becomes:

$$\frac{E}{X} = c + \frac{i}{2} + \frac{2 + i}{2n} .$$

Assuming i = 0.03, c = 0.01; then $\frac{E}{X}$ for 100 year life = 0.0351 and:

Years of life	10	20	30	40	50	60	70	80	90	100
Ratio of $\frac{E}{X}$ to that for 100 year life	3.57	2.14	1.67	1.43	1.29	1.19	1.12	1.07	1.03	1

The assumption has been made here that the operating costs are a constant percentage of the original cost in any year, and also that this percentage does not change regardless of the length of life of the structure. The former assumption is not realistic, but is a workable and convenient one for comparing average costs. The latter, however, has only been taken for lack of any better information regarding the relation of repair and maintenance costs to durability. Undoubtedly these would in part be a function of the length of intended life, and this variation should be introduced into any critical comparison of the relative costs of durable or temporary structures. From a purely economic viewpoint, and in a theoretical "stationary state," there would be for any one structure a certain life at which the annual costs would be lowest. This life would depend on the relation of original and repair costs.[24]

Nevertheless we have a rough basis for computing

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[24] Herbert W. Robinson, "Economics of Building," (London: P. S. King, 1939), pp. 29-36.

the additional economic costs imposed by limiting the structural life in better accordance with human needs. It also can be seen, under the values of the constants given above, and again assuming that c is a constant, which may be even riskier here, that if we could save 17% of the first cost in a structure that was only intended to last 40 years instead of 100, or again if we could save 23% of first cost in a 30 year structure as against an 80 year structure, then the annual costs would remain the same.

But there are extensive and probably more important economic effects from stepping up the rate of turnover. The "Housing Needs" study of the National Housing Agency estimated that in 1955 there would be 36,795,000 non-farm families in the nation requiring separate dwelling units.[25] If we were to replace our houses every 30 years, such a number of families would require about 1.23 million new dwellings every year for replacements alone. This is slightly over the NHA's estimated yearly requirements, which were based to only a small extent on replacement, but principally on wiping out the existing numerical shortages, meeting population growth, and replacing half the "substandard" houses in the country within a ten year period.[26] Both figures are above construction figures for the peak

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[25] National Housing Agency, "Housing Needs," p. 11.

[26] *Ibid.*, p.

year of the 1920's.

A large volume and relatively regular demand for new construction would have economic advantages that would probably be so basic as to outweigh increased costs resulting from a shorter life, even if no way was found to reduce first costs because of this decreased durability. Firstly, such a large volume would produce a basis for a modern and efficient housing industry, in which many hope to find the solution to high construction costs, and would open the way for the savings of quantity production.

Secondly, any increase in the rate of replacement proportionately decreases the sensitivity of building demand to changes in population due to natural growth and decline, immigration and emigration.[27] Thus if the replacement rate in one area is once in 100 years, and in another once in 50 years, and the number of families in both areas increases 1% in a certain year, then in the former the new building demand will double, while in the latter it will only increase by 50%. Similar effects result when there are shifts in the population between income ranges, or family size ranges, sufficiently large to affect the type of house they demand. These magnified fluctuations of building demand due to minor fluctuations in basic population factors are one of the major obstacles

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[27] Robinson, op. cit., p. 40.

to an efficient construction system, discouraging the investment of large amounts of production capital, and making difficult the retention of personnel in an organization. An increased replacement rate would do a great deal toward evening out these cyclical movements.

Thirdly, in the present housing market, new construction is such a small percentage of the total housing stock that new house prices are largely dominated by the going prices for comparable old houses. Cost reductions achieved in new structures are quickly absorbed as extra profit by the host of agencies involved in building a house, and the price level tends to stay up at the level of second-hand prices, nullifying the original economies and forfeiting the opportunity of widening the market by means of cheaper costs.[28] If the rate of replacement were to be increased, new reproduction costs might come to dominate the price of old houses, vested interests to protect equities against obsolescence over long periods might become less tenacious, and it would become possible for production economies to appear as permanent price reductions.

Finally, as many economists have pointed out, a large volume of construction would be an important weapon of fiscal policy, by its ability to absorb prevalent over-

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[28]Ramsay Wood, "Housing Needs and the Housing Market," in Postwar Economic Studies #6, Board of Governors of the Federal Reserve System, (Washington: Government Printing Office, 1946), pp. 18-22 and 37-38.

saving in the economic system.[29] A large and regular flow of new construction, as could be produced by a shortened replacement period, would be a factor in smoothing out economic cycles. It is not intended here, however, that any such counter-cyclical policy should dominate the basic purpose of providing an adequate living environment for the people.

Having considered the fact that shorter-lived houses would reduce the human risk of being forced to live in obsolete dwellings, we can turn the statement over to say that such houses would also reduce the economic risks of sudden obsolescence before the investment has been recovered. It is after 20 to 30 years that structures begin to run the major risks of becoming obsolete by comparison with new buildings or by reason of local changes, and thus undergoing unpredictable losses in value. The life of a short-term house would lie within a more predictable realm of future changes in demand, values would undergo a more consistent and regular deflation with age, and there would be a tendency to minimize violent fluctuations in market prices. Some obsolescence losses are, however, unavoidable. They may be considered as the costs of individual freedom to move, and those which make possible a sufficiently fluid system for the introduction of new techniques and improved

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[29] Robinson, op. cit., pp. 156-157.

production. Part of the increased annual cost of short-term housing would be attributable to the risks of obsolescence, and would simply regularize them and bring them into the open.

The annual cost calculations performed above were based on an assumed amortization period for debt and equity which would be exactly equal to the life of the structure. This is not present practice. It is usual now to amortize the debt at least in 20 to 30 years, and to extend the income-producing life far beyond this point. In part this expected future period of debt-free enjoyment of the income is a means of hedging against obsolescence risks, in part it may be an unjustified period of profit arising long after the invested principal has been paid off. But since putting a definite term on the structure brings obsolescence costs into the open, then the assumption of this type of risk is logically a component of the rate of profit, and this rate should be earned on the portion of the equity not yet recovered. Therefore, amortization of debt and equity was stretched out over the entire life, and interest and profit were indicated as being earned only on the declining balance of the debt and equity.

A similar rationalization of the risks due to loss from physical depreciation could be met by proposals for a system of property-life insurance. Such an insurance scheme would, for the payment of an annual premium, guarantee building owners against loss from damage as a result of physical depreciation, for the period of life expectancy. Any paid-in funds left in the policy at the end of the structure's life, after payments for physical damages have been made, and less profit and administrative expenses of the insuring agency, would accrue to the owner as a partial fund for replacement of the structure.[30] Thus it is a mixture of depreciation insurance and partial amortization. Perhaps it would be better to disentangle the two elements, and concentrate on a technique of providing all necessary maintenance and repairs on a structure, whenever they occur, for a fixed annual fee.[31] If such a technique could be perfected, it also would make possible a clear evaluation of the quantity "c" in the calculations performed above, and thus a better judgment as to the relative costs of varying terms of useful life. It must be noted, however, that property-life insurance and its modifications are intended to rationalize the risks of physical depreciation and not of obsolescence, which is the major risk and the most difficult to handle.

There are certain other economic problems involved in a scheme for the forced retirement of the house and its

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[30] Hans Heymann, "Property-Life Insurance," (New York: Harper Bros., 1939), p. 61 et seq.

[31] National Housing Agency, "Housing Costs," pp. 30-31.

setting, as here proposed. If such a scheme were to operate only in areas coming under public control through redevelopment or purchase of open land, it would then be in competition with other areas where there was no restriction on the life of a building, as long as it conformed with certain minimum standards of structural safety. In such unrestricted areas house owners would have expectations of future profits from their structures (however wrong their guesses might be) in the years after similar buildings in the restricted areas had been retired. There might be no takers for construction on restricted land. For such a technique to be effective, it would be necessary, as a minimum, to apply it to all areas of any size suitable for new development within the range of effective competition, probably the metropolitan area. It might be necessary to apply it to all new construction, along with certain modified limitations of life placed retroactively on existing structures.

Finally, there still remains the problem of housing the low income groups, which a forced replacement system would not solve any more than would a program of stabilizing communities, nor than do our present methods. Present reliance, at least verbally, is placed on the process of "filtration," by means of which new housing built for the well-to-do gradually comes within the means of lower and lower economic levels as it declines in value. Actually this is a very incomplete solution, due both to the irregularity of value decline, some structures even appreciating in value over time; and due to the onion shape of income distribution, which requires large over-production of high income housing in order to obtain any significant downward circulation in the middle and lower ranges. It is also characterized by the extremely poor quality of the product once it has finally reached the lower levels. But a replacement system, like a stabilization program except in the reversed direction, might aggravate the problem. There would be a greater proportion of new houses, and fewer obsolete ones; fewer cut-price, substandard dwellings. New housing would have to be built both for middle and low income ranges. But insofar as present low-rent houses are supplied by virtue of their being below minimum standards of health and decency, insofar as we now realize the necessity of rehousing large sections of our population, to that extent a replacement system would simply bring the low rent housing problem into the open. One adjustment could be made to face these difficulties. When land and structures are returned to the community at the end of their stated life, and since rebuilding would not be mandatory, the community could choose to continue the use of the old structures as low rent housing, if there were groups that could not be housed by other means. Here, at least, if the buildings were obsolete or substandard in any respect, they would be under public control and the government could choose how it wished to face the problem. As long as the incomes of large fractions of the people are too low to pay the costs of adequate housing, there is no magic in a replacement scheme which would wipe out the need for housing subsidy, and public housing.

Neal MacGiehan proposes a much more radical system of housing replacement.[32] Sticking to the thesis of the broad similarity of the house and the automobile market, since they are both selling durable consumer's goods and are both affected by a large supply of second hand units, he points to the turnover in car ownership. Ever since the failure of the Model T at the point when car sales largely became replacement sales, new cars have only been purchased by the upper 20% of incomes. An extensive second-hand market and trade-in system has been organized, assuring a continual flow of cars through the hands of successive owners of successively lower incomes, until the vehicle is scrapped. Between 1907 and 1939, 110 different makes of low-priced cars ($100-$600) were put on the market and all of them failed. Consumers seemed to prefer a second-hand edition of an expensive car rather than a new, cheap car, stripped to its essentials. Thus he believes that "filtration" actually operates in the automobile market, and

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[32] Neal MacGiehan, "The Myth of the Low-Priced Home," Prefabricated Homes, Part I, Jan. 1945, pp. 12, 13, 17, and 21; Part II, Feb. 1945, pp. 16, 17, 25, and 29.

similarly could be made to operate in the housing market. He proposes the production of demountable houses, sold independent of their sites by a series of successive trade-ins, the whole market to be kept moving by making each yearly model technically obsolete (or at least seemingly so) by comparison with the next year's model. He suggests a new price in the neighborhood of $6000 to $8000, and that each unit go through about four successive ownerships, each ownership lasting about 7 to 8 years. The house would lose 50% of its value in the course of each turnover, and be scrapped at the end of 28 to 32 years.

Although the arguments in support of such a proposal are basically similar to those advanced for a slower replacement system, there must be some doubts about stepping the process up to such a pitch. Firstly, the claims that such a market would solve not only the sales problems of the new prefabrication industry, but also the difficulties of supplying low rent housing, must be discounted. A car is a standard, single-purpose article that in one general design can fit the needs of various people on a wide variety of income levels; but the high-income house is unsuitable for the needs of families on an entirely different economic scale, and the fact that many low-income families have to live in old houses originally designed for the well-to-do is one of the fundamental elements of wastefulness in the present process of filtration. Again, due to the irregular distribution of family income, it is difficult, even with Mr. MacGiehan's geometric curve of value decline, to deflate to prices within reach of each successive quartile of the population unless the original new price is put at the lower edge of what can be afforded by the upper 25%. Even with the turnover system in the automobile industry, a large fraction of population do not own cars of any type. This could not be tolerated in the case of housing.

There may be some bitter truth in the observation that many people would prefer a shopworn replica of a more expensive house to one designed for their own needs. But we cannot presume such a preference for prestige over functional efficiency until we give people a chance to choose something better than cast-off housing. Although manipulation of such a prestige psychology might be a practical method of ensuring continuous replacement and discard of housing, it would be a dangerous expedient on which to rely if we are concerned with supplying housing that can be adjusted to fit changes in needs, and not changes in fashion.

That there may be merit in the idea of selling demountable and standardized dwellings independent of their site, handling the whole process with the simplicity of personal property transfer, will be discussed farther on.

After wandering through the economic woods we come out a little scratched but still clinging to the idea of some control to make possible the replacement of residential areas at regular intervals. From the human viewpoint it seemed clear that the interval should not be more than about 30 years. The economic answer is less decided. To what extent improvement of the housing market or technical advances could offset increased annual costs is not clear. It would be a question of the type that could only be decided by broad study in a particular situation. Probably the interval should be set somewhere between the extreme limits of 25 and 70 years.

Legal Problems

What legal techniques could be employed to ensure the type of turnover we want? First it is necessary to disclaim any attempt to set up a method which would be politically practical in the immediate future. Public repossession of property after a stated time period, if carried out over large enough areas to have real effects, and unless markedly substandard conditions of health or safety could be demonstrated, would for the present be considered as immoral limitations of private enterprise and individual liberty. The limitations which would be placed on private enterprise are real, however beneficial they might be. The limitations on individual freedom would be largely imaginary, except for the small minority of families which desire and are able to own and maintain a house for their own use over a long period.

Far more often, a family does not continue to use a house over more than a generation, and, if they own it, their ownership is uncertain and to large extent fictitious.

One basic problem is that of preventing a structure originally designed for a definite life from becoming a permanent fixture when the life expires and the structure still has some use value. The last of the "temporary" houses built to meet the emergency of the London fire of 1666 was demolished in 1943.[33] The worst of the Chicago slums are the "temporary" structures put up after its own great fire in 1873, some of which my grandfather helped to build.

Public control of real estate is neither new nor unusual; it is one of the more heavily regulated sectors of the economy. There are precedents for the limitation of building life. Recent emergency war housing is to be disposed of within a specified time following upon the official cessation of the war, unless specific action is taken to continue its use. "Time zoning," which provides that non-conforming uses within a section must be demolished by a fixed date or at the end of a certain number of years of life, is in legal effect in several American cities.[34]

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[33]Hugh Anthony, "Houses, Permanence and Prefabrication," (London: Pleiades, 1945), p. 30.

[34]City of Boston, "Zoning Regulations" (as amended by Chapter 373, Acts of 1941, Massachusetts General Court), Sect. 9, par. 1.

The Uthwatt Committee of Compensation and Betterment also recommended the application of a limited life to non-conforming or substandard structures, although they rejected the imposition of a limited life to all buildings.[35] The Massachusetts State Board of Housing has recently proposed a bill to enable towns to deed municipal land to non-profit housing corporations. Dwellings erected by these corporations would be amortized over 32 years, and at the end of this time both land and buildings would be returned to the municipality without compensation.[36] In Sweden, low-rent prefabricated cottages are erected on city land, largely by the prospective owner's labor. The city installs semi-permanent streets and utilities. The loan on the house is amortized over 30 years; the land is leased to the owner for 60 years. At the end of this time land and buildings are returned to the city on payment of "fair value" for the house, although the arrangement may be extended.[37]

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[35] Great Britain, Expert Committee on Compensation and Betterment, "Final Report," (London: H. M. Stationery Office, 1942), pp. 91 and 100.

[36] Commonwealth of Massachusetts, House Document #48 (accompanying the 5th recommendation of the State Board of Housing), 1947, "An Act to authorize the establishment of non-profit corporations to engage in providing homes for veterans."

[37] Donald F. Monell, "Sweden, Planning and Housing," (unpublished master's thesis, Massachusetts Institute of Technology, 1941), vol. II, p. 117 et seq.

Some deflation of housing values and replacement might be effected by the enforcement of drastic sanitary and safety codes, but this has not been very useful in the past, due to the difficulties of enforcement (especially where no alternative shelter is available to low-income groups), due to the possibility of prolonging life by patchwork repairs, and since it affects only the very worst housing unless standards are raised to much greater heights.

Time zoning is useful as a precedent, but cannot be employed here since it is only applicable to non-conforming uses.

Another technique could be the application of a statutory life to structures, at the end of which time they would have a legal value of zero for purposes of condemnation, the legal value declining regularly between its original cost and this final zero point. This is the method recommended by the Uthwatt Commission in connection with the condemnation of "unfit" buildings. This could be applied broadly to all structures, and would be effective in the normal residential area of mixed building age.

Another means of control already at hand is the building permit. These permits could not only be issued on compliance with certain health and safety standards, but could be issued only for a certain period. At the end of this time it would be illegal to continue the use of the structure.[38] Such regulation might be extremely difficult to enforce.

A final and a clear-cut method of regulation would be municipal ownership of large areas of land suitable for development or redevelopment. This has much to recommend it for other control purposes: control of design and density, and ease of revision of site plan or land use. Here provisions as to the return of structures on the land to the community at the end of the period, without compensation, could be inserted in the lease itself.

Tax incentives have also been proposed. Most of them are clear subsidies, to encourage the immediate construction of housing. Rapid depreciation features in the income tax law are already in effect for certain types of rental housing, and are proposed on economic grounds for application to all types of capital investment. Louis Justement suggests the use of property tax assessments which decline regularly from original value to zero at the end of the allowed building life.[39] As long as municipal finance continues to be based on property taxation, this would be a logical corollary of limited structural life. It would provide the necessary municipal incentive to clear the

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[38] Justement, op. cit., p. 41.

[39] Ibid., p. 42.

land for new buildings at new assessed values, instead of keeping old structures in use after their legal life has expired. It would make clear that the tax base did not depend on the desperate preservation of old values, but on a continuous stream of new capital expenditure. As long as the desired flow of new construction was maintained, city finances would not be impaired. Such a declining assessment was employed in the formula developed above for the dependence of annual cost on the length of life.

Enabling legislation would be required for most of these proposals. The question also arises as to who should set the figure for legal structural life. Much of the basic determination, which would be concerned with broad social problems, and considerations of economic cost, the effect on the housing market, and the capacity of the building industry, would have to be done on a national level or at least by large national regions. Detailed regulation, application and control would be exercised by metropolitan agencies for a metropolitan region as a whole.

This would be an extension of planning controls into the dimension of time, meeting problems that ordinary zoning, subdivision, master plan, and even redevelopment controls cannot face. It would of course require the exercise of continuous and unified planning supervision--planning the region in terms of time as well as space, determining the best revised land use for areas as they become available for rebuilding.

Design Approach

There are also partial solutions to the problems of flexibility and replaceability that can be achieved by techniques of design. The ideal solution would be one of two types. In one, the dwellings and all the associated structures and utilities would be designed to wear out simultaneously at the end of a specified period: the walls, the roofs, the plumbing, the streets, the mains, would all crumble away just at the end of say the 41st year. Alternatively, all the elements would be designed to be interchangeable and demountable; streets, utilities, and houses could all be moved about and recombined in various patterns at will.

For lack of such techniques, fixing a specified life on an area would allow designers to concentrate on economies achievable by employing or inventing elements whose physical life is closer to the desired useful life. Again, where structures are by nature permanent or where they are of the type whose annual cost might be sharply increased by limitation of life, means might be developed either of making them demountable or of rendering them independent of the particular land use. Thus research could be instituted on the problem of so designing underground utilities that a whole series of site plans could be fitted over them. Once the problem has been definitely set, technical research is a long way toward a final solution.

If underground structures are not placed under the streets, which more closely regulate the siting of the buildings, but in a broad and regular pattern under open ground, then it would be easier to modify the site plan without disturbing the utility network. Similarly, free siting of buildings with respect to the streets should be encouraged. If broad channels were reserved for major routes and main utility lines, whose general pattern can be more permanently fixed, then it would be possible to redesign or expand these facilities without disturbing adjoining land uses.

Generous provision of space in general will increase the flexibility of any plan. Large reliance is placed on openness of plan in allowing for future adjustment in a community planned for stability. Such reliance on space has its limitations, however; first because it may be difficult to allow sufficient openness, and second because it is an exhaustible asset and successive changes tend to make the plan tighter and more crowded. Liberal space provision within dwellings would also make them far more adaptable to conversion, if only we could afford to build large houses for all families.

In regard to the dwellings themselves, flexibility seems to be within more immediate reach. Partial or complete prefabrication holds the promise of development of standardized, interchangeable parts, which would allow facile remodeling of the individual house in accordance with changing needs. When problems of weight and firmness of joints are better solved, it may be possible to have an efficient demountable house, permitting simple transfers of the house as personal and not real property. This would greatly facilitate the sale and re-use of second houses, since they would be standardized and independent of any site considerations.[40] Periodic repossession of the land by the community would encourage development of such demountable structures, for at the termination of his lease the owner could take his house with him. In the case of the re-erection of a demountable dwelling, it would be necessary to require reconditioning and remodeling of the structure. The extent of the reconditioning required would depend on the age of the structure, and in accordance with the generally rising standards of the structural, health and housing codes; such that a point would also be reached at which it would be economical to abandon the structure and buy a new or newer one. Trailers, as the extreme form of demountability, would be under closest regulation. Demountable houses by themselves, of course, would not produce the required flexibility, since it is the sense of this

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[40] MacGiehan, op. cit., Part II, p. 25.

discussion that it is not only the buildings, but perhaps even more critically the site plan and land use of an area, that create the oppressive effects of rigidity. Demountable houses alone would intensify the necessity for positive planning control of their siting.

There is a final design approach to face the needs of flexibility. Instead of creating a local sense of community and a general sense of structure in our cities by creating permanent boundaries for various sections and a cellular pattern in the city as a whole, it might rather be wiser to accomplish the same thing by creating permanent centers, from metropolitan centers down to local foci. While retaining stable key points for the attachment of group consciousness and common purposes, the intervening areas would be left relatively free to change and adjust. We will also have created the basis for an exciting interplay of architectural contrast: strong, monumental centers set among the light and changing forms of the houses.

The Program

The major proposals brought out in this discussion should now be presented in a more clarified form:

1. A legal life should be placed on all privately-owned structures within residential areas, and on all dwellings wherever located within metropolitan areas. Whether such

provisions should also be extended to other types of structures in commercial and industrial sections was not considered here.

2. Basic determination of the length of life should be made at the national or the inter-state regional level, or perhaps as a matter of political necessity by agencies of the state governments which would be the authorities granting the necessary enabling legislation. Determination would be based on social needs, the effect on the housing market, the effect on costs, the capacity of the industry, resources available, and so on. Length of life would probably lie somewhere between the extremes of 25 and 70 years.

3. Detailed application of these plans would be made by an agency of the metropolitan region, by two methods:

a. The municipality or the regional authority takes and retains title to as many good-sized pieces of land suitable for development or redevelopment as is feasible. This land is developed and leased to private builders, for a term corresponding to the legal life, with the provision that not only the land but all structures on it revert to the public agency without compensation at the end of the lease. At this time the municipality can take one or a combination of several courses: either demolish the structures, replat and redevelop the land for new use; or demolish the structures only, to clear the way for rebuilding; or rent the existing structures at short term to the present users in the event of a shortage or other emergency; or convert the existing buildings for use as low-rent housing; or preserve certain sections or structures for historical or esthetic reasons.

b. In areas not covered by public ownership of the land, all structures shall have a value for purposes of condemnation which declines regularly from the original value to zero at the end of the legal life. This provision would extend to existing structures as well, with some adjustment for the fact of its being a retroactive regulation. Wherever the community desired to preserve certain structures, it could do so either by taking them over and leasing them out, or by extending the legal life of a particular structure upon payment by the owner of a fair value and with an upward revision of the assessment. Where the municipality exercises its condemnation rights, it pays fair value for the land only, and can either use the property in the manner described in a) above, or resell the land cleared of structures to private ownership.

4. In both cases the owner of the structure would be allowed to keep it in his possession by taking it off the land, if it were demountable. Strict standards would be imposed for the re-erection of demountable structures, and would require more extensive renovation as the age of the structure increased.

5. Property tax assessments would decline regularly

from year to year, beginning at the original value, and striking zero value at the end of the legal life.

6. Within this framework it would be the general policy to develop different types of permanent community centers composed of public and semi-public buildings cultural in nature, or whose functions do not vary widely over time, or which can serve as physical manifestations of common ideals and purposes. Main utilities and major transportation networks would be assumed to have a relatively long life, especially as regards their locations. All dwellings, and other private buildings and community facilities would be assigned a specific life, although it would not be necessary to give all types of structures the same life.

7. Whole communities would not be planned to complete their life cycle all at one point. Rather the terms would be staggered by areas only large enough to permit unhampered redevelopment, perhaps of the order of four city blocks. The aim would be to produce a continuous flow of reconstruction in any one community. Special modifications of life terms would have to be made when the program was first applied to a metropolitan region, to create from the beginning a regular flow of rebuilding.

8. Every effort should be made in the physical design to devise means of increasing flexibility: by the use of economical materials whose physical life is close

to the design life; by employment of standardized, interchangeable and demountable elements; by generous space provisions; by rendering certain elements of simple function as independent of the particular site pattern as possible; and so on.

9. All of these activities would be under continuous and unified planning control, including particularly the design of new developments on public land, and determination of the best future use for all land as it becomes free for clearance or modification of use.

The above may not be an immediately practical program in terms of political realities, but yet if assent is given to its basic proposals and supporting arguments, then it cannot only point toward a long-range program, but also be of importance in making present decisions, especially those influenced by attitudes toward the desirable permanency of housing, the necessity of preserving old "values," or the morality of large-scale municipal ownership of the land.

Appendix A

Changes in Ownership and Land and Building Valuations of Ten Selected Residential Structures in the Three Cambridge Areas Studied, 1906-1946

Source: Assessor's Files, City of Cambridge

Address	Owner	Year	Land Assessment	Year	Building Assessment
19 Appleton St.	1906 Smith		$6900		$6500
		1917	8500		6000
				1924	7500
	1930 Nichols			1944	11300
28 Fayer-weather St.	1906 Henshaw		$12000		$21000
		1917	22200		15000
		1941	17600		10000
	1942 Thurston				
7 Riesedel St.	1906 Brewster		$4750		$8000
		1917	6875		7100
	1921 Turner		5000		6000
17 Centre St.	1906 Kelley		$1900		$3000
		1909	2100		
		1917	2700		
				1918	2500
	1921 Telfer				3000
				1927	3800
				1932	3600
	1936 Cambridge Savings Bank				
	1941 Hahn				
	1943 Kallen				
318 Harvard St.	1906 Goodnow		$3900		$2000
		1917	5400		1500
		1918	4400		
	1930 Dickey				2000
				1932	2600
	1942 MacCallum				

Address	Owner	Land Assessment		Building Assessment	
329 Harvard St.	1906 Whitte-more		$11500		$5000
		1917	15700		4000
		1919	14700		
				1924	5200
				1944	3200
5 Hastings Sq.	1906 Thayer		$4000		$6400
				1910	7000
		1914	5000		
		1917	6000		6000
	1923 Cacciola				
	1926 Duchur				
	1930 Daylon				
	1934 Exchange Trust Co.				4300
	1940 Serino				3000
152 Magazine St.	1906 Winslow		$2600		$4300
				1917	4000
	1925 Roberts				
	1944 Cochrane				
	1946 Lawrence				
306-308 Pearl St.	1911 Perry (1st entry)		$1600		$3500
		1917	2500		
				1918	2500
	1926 Carlson				
				1932	3700
				1935	3600
13 Rockingham St.	1906 Cook		$1200		$2700
		1917	1400		2000

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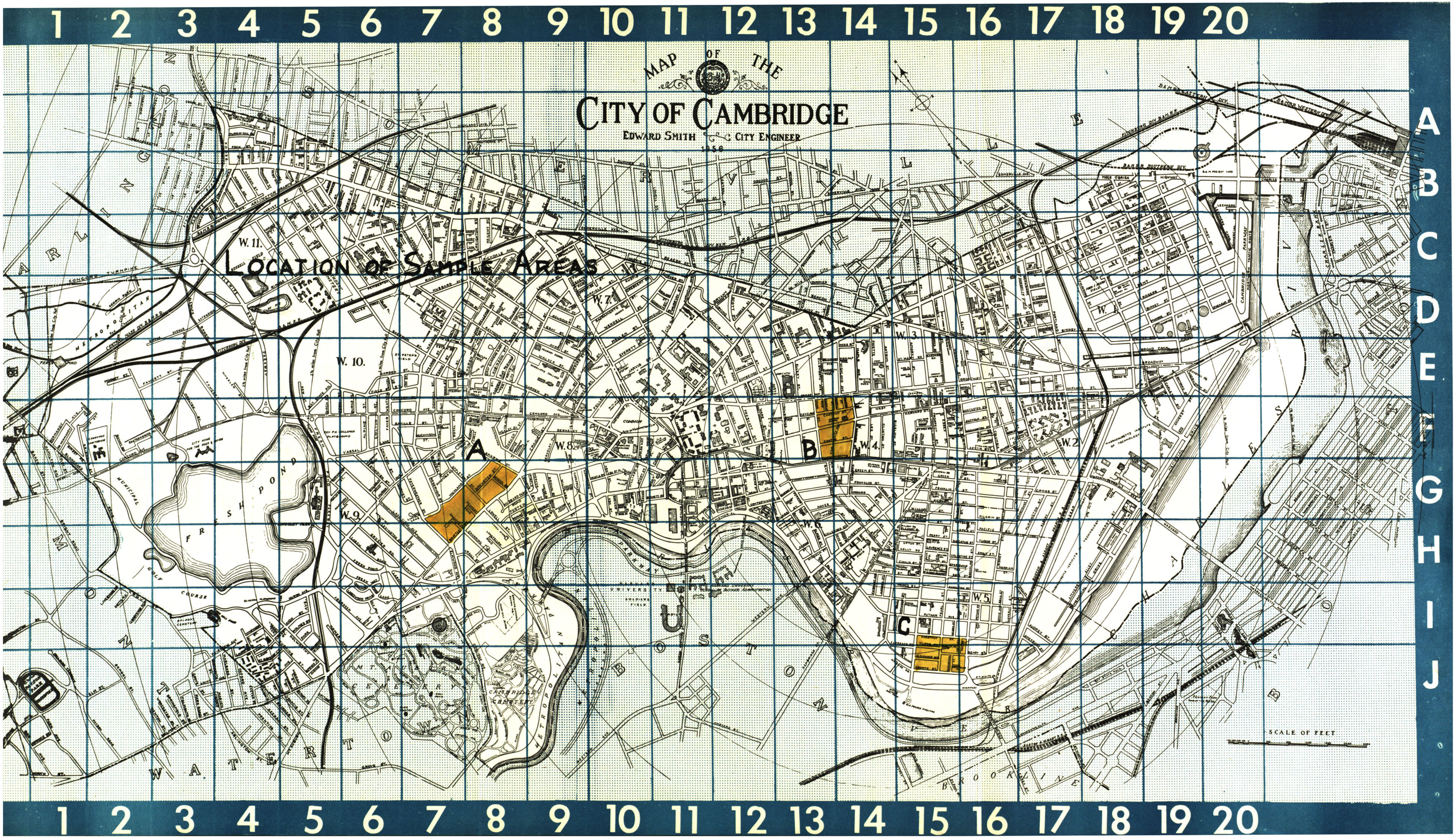
MAP OF THE
CITY OF CAMBRIDGE
EDWARD SMITH CITY ENGINEER
LOCATION OF SAMPLE AREAS
A
B
C
W. 10.
W. 11.
W. 2
W. 3
W. 4
W. 5
W. 7
W. 9
FRESH POND
SCALE OF FEET
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
A B C D E F G H I J