Massachusetts Route 128 Impact Study

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This paper summarizes the major findings of the study, and analyzes the influence of the highway on adjacent land use. The impact of land use changes on the communities along the highway and on the metropolitan area also are explored. The effect on Route 128 of the traffic generated at new industrial plants is evaluated.

The methodology used in the study is critically examined and suggestions are made for improvements in impact study techniques, and for further areas of needed research.

● THE PURPOSE of the Massachusetts Route 128 Impact Study was to investigate land use changes that have taken place along Route 128, the basic factors underlying such changes, and the traffic generation characteristics of the industrial development adjoining the highway. In addition, an attempt was made to evaluate the impact of this development and its traffic on Route 128 and on the metropolitan area. The work was sponsored by the Massachusetts Department of Public Works with the cooperation of the United States Bureau of Public Roads.

This report deals with some of the principal findings of the industrial and residential development surveys, and discusses the methodology used. It supplements an earlier report on industrial development (1). The traffic phase of the study is presented in a separate paper (2).

The Route 128 study was authorized in the summer of 1956. Work started on pilot studies in the fall of 1956. The industrial and employee travel pattern surveys were conducted in the summer of 1957 and represent the status of industrial development as of September 1957. The residential survey and analysis of employee traffic patterns and origins and destinations of Route 128 traffic were made in the summer of 1958. During the writing of the report, certain statistics were brought up to September 1958.

The full industrial and residential development of properties along Route 128 has by no means been attained. In fact, in many areas it has just started or has yet to start. The study, therefore, cannot be more than a progress report of what the ultimate impact of the highway will be.

DESCRIPTION OF ROUTE 128

Route 128 is a limited-access, divided 4- and 6-lane circumferential highway extending for about 60 miles around metropolitan Boston. Since the ocean lies to the east of the city, the highway actually describes a semi-circle on the western side about 10 miles from the central business district. The highway has been constructed in stages since 1933. The most important central link was completed in 1951 providing for the first time a continuous, high-speed route around the city with frequent interchanges at important radial highways. The major development along the highway dates from this year. Further improvements have been made and are still in progress at the southerly end of the route.

Traffic volumes range from 40,000 to 50,000 vehicles per day, in the middle section of the road, and are less on the two ends. The construction and land costs for the 57 miles completed to September 1957 was about $62,500,000.

UNIQUE CHARACTER OF ROUTE 128

By locating Route 128 in vacant land just outside existing developed areas, it was possible to meet most engineering requirements, bypass the centers of towns surrounding Boston, keep land costs low and avoid disturbing home owners. As a circumferential highway, the route cut across large sectors of undeveloped land between older radial highways.

Both the timing and location of the highway were ideal for opening up land necessary to satisfy the outward (or suburban) movement of people and industry which took place in the post-war period. The highway gave access to low-priced land in areas on the edge of the metropolitan labor market, not too far from the core of the city and yet close to attractive suburbs. At the same time many in-town businesses were expanding to the point where they could no longer operate efficiently in obsolete buildings on cramped sites. Developers took advantage of this situation and promoted the development of Route 128 industrial sites. In considering the phenomenon of Route 128 these factors should be taken into account.

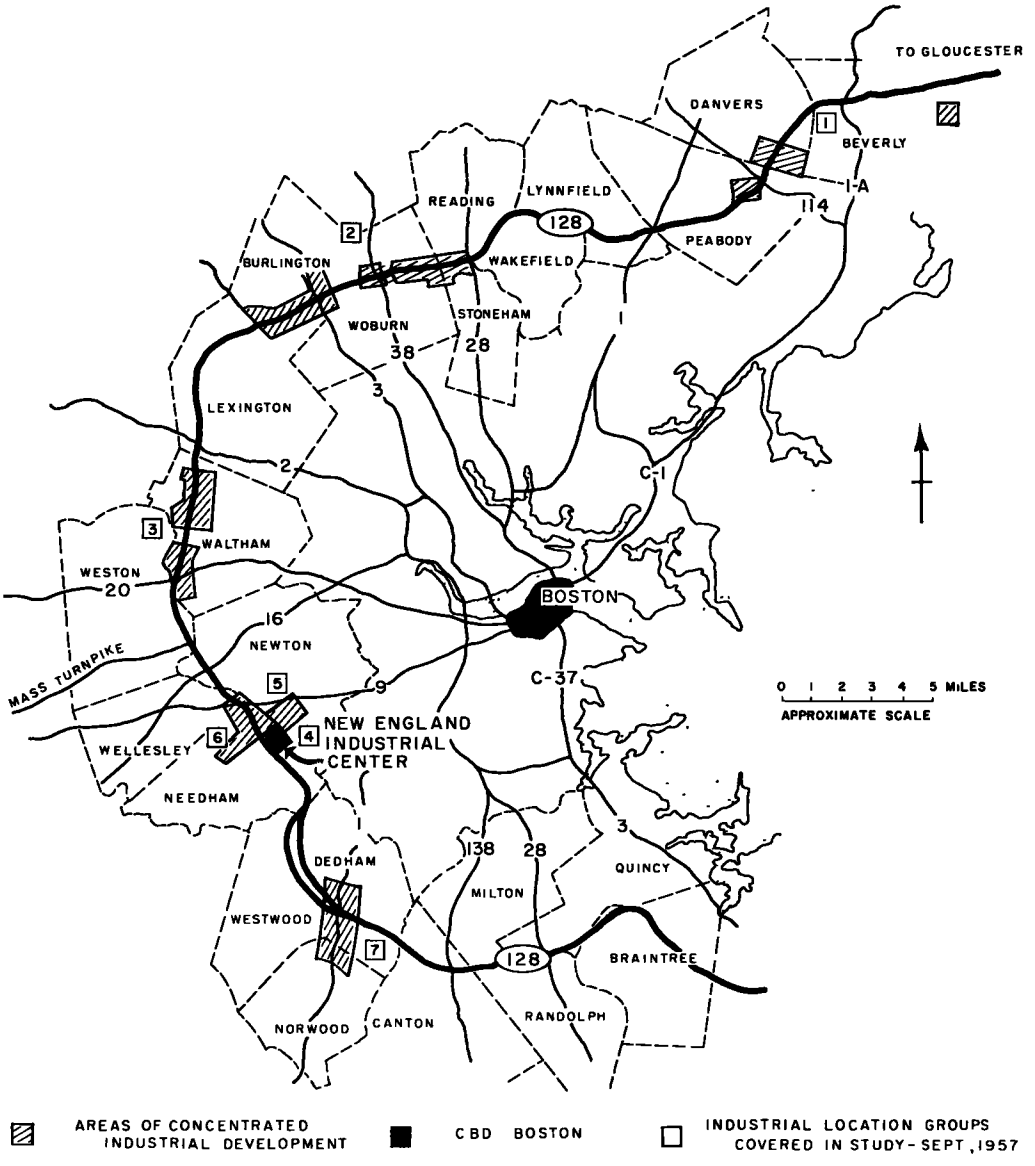


Figure 1. Layout of Route 128 showing areas of industrial development.

TABLE 1

STATISTICS OF NEW ROUTE 128 PLANTS

Locational Area	Type of Industry	Number of Plants	Percent of Total Plants	Total Employment	Average Employment at Present Site	Total Land Area	Average Land Area	Building Area	Land/Building Area Ratio	Total Investment (in dollars)				Average Investment (in dollars)			Percent of Total Investment	
						(in square feet)				Building	Land	Equipment	Total	Building	Land	Total	Building	Land
Area #1	Prod.	2	5.13	2450	1225.0	3,833,280	1,916,640	270,000	14.22	2,700,000	172,000	3,714,000	6,586,000	1,350,000	86,000	3,293,000	41.00	2.61
North of U.S. 1 North	R. & D.																	
	Dist.																	
	Service																	
	All Inds.	2	2.08	2450	1225.0	3,833,280	1,916,640	270,000	14.22	2,700,000	172,000	3,714,000	6,586,000	1,350,000	86,000	3,293,000	41.00	2.61
Area #2	Prod.	6	15.38	2365	394.0	14,819,400	2,469,900	355,650	41.67	6,399,000	591,050	4,507,000	11,497,050	1,066,500	98,508	1,916,175	55.66	5.41
Burlington and	R. & D.	3	33.33	455	151.7	827,640	275,880	108,000	7.66	1,535,000	151,000	846,000	2,532,000	511,667	50,333	844,000	60.62	5.96
North to U.S. 1 North	Dist.	5	11.90	172	34.4	1,428,580	285,716	79,600	17.95	815,000	97,000	373,000	1,285,000	163,000	19,400	257,000	63.42	7.55
	Service																	
	All Inds.	14	14.58	2992	213.7	17,075,620	1,219,687	543,250	31.62	8,746,000	839,050	5,726,000	15,314,050	624,929	59,932	1,093,861	57.13	5.48
Area #3	Prod.	7	17.95	3001	428.7	9,888,430	1,412,633	1,538,356	6.43	5,464,732	763,633	4,770,327	10,998,692	780,676	109,090	1,571,242	49.69	6.94
Waltham	R. & D.	2	22.22	1110	555.0	767,256	383,628	170,680	4.50	930,000	361,600	1,585,500	2,877,100	465,000	180,800	1,438,550	32.32	12.57
	Dist.	1	2.38	44	44.0	108,000	108,000	39,000	2.77	485,000	54,000	215,000	754,000	485,000	54,000	750,000	64.67	7.20
	Service	2	33.33	318	159.0	3,804,095	1,902,048	81,800	46.63	1,723,000	277,000	——	2,000,000	861,800	138,500	1,000,000	86.15	13.85
	All Inds.	12	12.50	4473	372.8	14,567,781	1,213,982	1,829,836	7.96	8,602,732	1,456,233	6,570,827	16,629,792	716,894	121,353	1,385,483	51.74	8.76
Area #4	Prod.	4	10.26	1244	311.0	2,102,386	525,965	678,000	3.10	6,325,784	1,303,769	1,568,725	9,198,278	1,581,446	325,942	2,299,570	68.77	14.17
N.E.I.C.	R. & D.	2	22.22	66	33.0	70,000	35,000	31,000	2.26	487,285	35,257	160,000	682,542	243,643	17,629	341,271	71.39	5.17
	Dist.	15	28.00	840	56.0	1,778,664	118,578	792,910	2.24	5,696,465	1,030,488	408,500	7,135,453	379,764	68,699	475,697	79.83	14.44
	Service	1	16.67	26	26.0	15,000	15,000	3,000	5.00	60,000	13,159	35,000	108,159	60,000	13,159	108,159	55.47	12.17
	All Inds.	22	22.92	2176	98.9	3,966,050	180,275	1,504,910	2.64	12,569,534	2,382,673	2,172,225	17,124,432	571,361	108,303	778,383	73.40	13.91
Area #5	Prod.	4	10.26	512	128.0	461,358	115,340	133,760	3.45	838,145	465,665	330,000	1,633,810	209,536	116,416	408,453	51.03	28.50
Newton	R. & D.	1	11.11	500	500.0	200,000	200,000	60,000	3.33	675,000	300,000	180,000	1,155,000	675,000	300,000	1,555,000	58.44	25.97
	Dist.	11	26.19	618	56 2	1,171,434	106,494	373,721	3.13	3,478,000	1,288,900	1,438,400	6,205,300	326,181	117,173	564,118	56.05	20.77
	Service	1	16.67	150	150.0	28,000	28,000	5,300	5.09	60,000	40,000	——	100,000	60,000	40,000	100,000	60.00	40.00
	All Inds.	17	17.71	1780	104.7	1,860,792	109,458	572,981	3.25	5,051,145	2,094,565	1,948,400	9,094,110	297,126	123,210	534,948	55.54	23.15
Area #6	Prod.	7	17.95	65	9.3	147,164	21,023	37,300	3.95	502.000	133,900	148,000	783,900	71,714	19,129	111,986	64.04	17.08
Needham	R. & D.																	
	Dist.	8	19.05	302	37.8	714,295	89,287	152,460	4.69	1,433,000	574,848	358,550	2,366,398	179,125	71,856	295,800	60.56	24.29
	Service																	
	All Inds.	15	15.63	367	24.5	861,459	57,431	189,760	4.54	1,935,000	708,748	506,550	3,150,298	129,000	47,250	210,020	61.42	22.50
Area #7	Prod.	9	23.08	2750	305.6	4,896,700	544,078	795,500	6.16	9,711,000	1,002,000	4,697,000	15,410,000	1,079,000	111,333	1,712,222	63.02	6.50
South of Needham	R. & D.	1	11.11	45	45.0	130,700	130,700	16,000	8.17	252,500	25,000	300,000	577,500	252,500	25,000	577,500	43.72	4.33
	Dist.	2	4.76	26	13.0	202,460	101,230	35,000	5.78	200,000	48,000	12,000	260,000	100,000	24,000	130,000	76.92	18.46
	Service	2	33.33	17	8.5	734,795	367,398	37,000	19.86	480,000	135,000	500,000	1,115,000	240,000	67,500	557,500	43.05	12.11
	All Inds.	14	14.58	2838	202.7	5,964,655	426,047	883,500	6.75	10,643,500	1,210,000	5,509,000	17,362,500	760,250	86,429	1,240,179	61.30	6.97
All Areas	Prod.	39	40.63	12387	317.6	36,148,718	926,890	3,808,566	9.47	31,940,661	4,432,017	19,735,052	56,107,730	818,991	113,641	1,438,660	56.93	7.90
	R. & D.	9	9.38	2176	241.8	1,995,596	221,733	385,680	5.17	3,879,785	872,857	3,071,500	7,824,142	431,087	96,984	869,349	49.59	11.16
	Dist.	42	43.75	2002	47.7	5,403,433	128,653	1,472,691	3.67	12,107,465	3,093,236	2,805,450	18,006,151	288,273	73,648	428,718	67.24	17.18
	Service	6	6.25	511	85.2	4,581,890	763,648	172,300	35.99	2,323,000	465,159	535,000	3,323,159	387,167	77,527	553,859	69.90	14.00
	All Inds.	96	100.00	17076	178.9	48,129,637	501,350	5,794,237	8.31	50,250,911	8,863,269	26,147,002	85,261,182	523,447	92,326	888,137	64.96	10.40

INDUSTRIAL SURVEY

This survey included new industries located roughly within a mile of Route 128 between Route 1A in Beverly (north of Boston) to Route 138 in Canton (south of Boston), a length of about 55 miles (Fig. 1). Most of the plants were near enough to the route to be clearly visible from it.

Advance letters were sent to the management of each plant to be surveyed and interviews arranged. A management questionnaire (1) was designed to obtain information regarding investment in plant, number of employees, former location, parking facilities, etc., the second part asked qualitative questions, such as factors considered in choosing location on Route 128, other sites considered, labor procurement problems, and benefits expected and received.

During the summer of 1957, contacts were made with 99 plants and complete data obtained from 96.

RESULTS AND ANALYSIS OF INDUSTRIAL SURVEY

Separation of Industries by Type and Location

For analysis purposes, industries were divided into four types: (a) distribution, (b) production, (c) research and development, and (d) service. Geographically, they were separated into seven locational areas, as shown in Figure 1.

The group of plants in the Needham-Newton area were separated into three units to preserve the identities of the New England Industrial Center (NEIC) and the Newton Industrial Center, leaving other Needham plants in a third group. By separating the industries into locational groups it is possible to isolate some of the regional factors influencing choice of site, employee travel patterns, shifts in employee residences, etc. Some of the basic statistics obtained from Route 128 industries are shown in Table 1.

TABLE 2

PERCENTAGE DISTRIBUTION OF INVESTMENT, EMPLOYMENT, AND NUMBER OF PLANTS BY TYPE OF INDUSTRY ON ROUTE 128

Type of Industry	Percent of Investment	Percent of Employment	Percent of Number of Plants
Distribution	21.1	11.7	43.7
Production	65.8	72.6	40.6
Research & Development	9.2	12.7	9.4
Service	3.9	3.0	6.3
All Types	100.0	100.0	100.0

In making comparisons by types of industry or by locational groups, use is made of percent of investment and percent of employment in the plants involved. In this way, the magnitude of operations involved is revealed more significantly than by considering number of plants alone. For example, in Table 2, distribution type industries comprise 43.7 percent of total number of plants but account for only 11.7 percent of employment and 21.1 percent of investment. It is evident that comparisons based on number of plants would give a distorted picture of the true relationships.

Investment, Employment and Other Characteristics of Route 128 Plants

The capital investment in the 96 plants in operation on Route 128 by September 1957 amounted to $85,000,000 and the employment to 17,000 persons. Plants completed or under construction since that date have an estimated investment of $52,000,000 and employment of 10,500. Approximately 60 percent of this additional development was completed by September 1958.

Table 1 shows the distribution of total investment, employment and number of plants in each of the seven locational areas, with a further separation by type of industry. The locational areas are identified in Figure 1.

Three of the industrial location groups are immediately adjacent to each other and are served by the same Route 128 interchange (Highland Ave.). They are Location Areas 4, 5 and 6 (NEIC, Newton and Needham). These three groups when combined represent about one-third of the Route 128 investment and about one-quarter of the employment. When the adjoinging Location Area 3 (Waltham) to the north is added, one-half of both investment and employment is included. It is significant that these areas of such large concentration of industry are centrally located on Route 128, close to major radial highway Routes 9 and 20, and to the Massachusetts Turnpike. These three highways carry the major flow of traffic from Boston to the west and south.

TABLE 3

INVESTMENT AND EMPLOYMENT AT NEW ROUTE 128 COMPANIES BY CLASSIFICATION AND TYPE OF INDUSTRY[1]

Classification	Investment				
	Type of Industry				Total
	Distribution	Production	R. & D.[2]	Service	
"New" Industries	$ 110,598	$ 846,000	$1,155,000	$ 0	$ 2,111,598
"New" Branch Plants	1,329,499	14,268,781	1,099,357	950,000	17,647,637
Relocated Industries	7,118,171	31,077,759	3,284,285	2,208,159	43,688,374
Relocated Branch Plants	9,447,883	9,915,190	2,285,500	165,000	21,813,573
Total Investment	$18,006,151	$56,107,730	$7,824,142	$3,323,159	$85,261,182
Percent of Total Investment	21.1	65.8	9.2	3.9	100.0

Classification	Employment				
	Type of Industry				Total
	Distribution	Production	R. & D.[2]	Service	
"New" Industries	20	54	500	0	574
"New" Branch Plants	84	2,897	130	9	3,120
Relocated Industries	893	6,600	646	494	8,633
Relocated Branch Plants	1,005	2,836	900	8	4,749
Total Employment	2,002	12,387	2,176	511	17,076
Percent of Employment	11.7	72.6	12.7	3.0	100.0

Classification	Percent Investment				
	Type of Industry				Total
	Distribution	Production	R. & D.[2]	Service	
"New" Industries	0.6	1.5	14.8	0	2.5
"New" Branch Plants	7.4	25.4	14.1	28.6	20.7
Relocated Industries	39.5	55.4	41.9	66.4	51.2
Relocated Branch Plants	52.5	17.7	29.2	5.0	25.6
Total	100.0	100.0	100.0	100.0	100.0

Classification	Percent Employment				
	Type of Industry				Total
	Distribution	Production	R. & D.[2]	Service	
"New" Industries	1.0	0.4	23.0	0	3.4
"New" Branch Plants	4.2	23.4	6.0	1.8	18.3
Relocated Industries	44.6	53.3	29.7	96.6	50.5
Relocated Branch Plants	50.2	22.9	41.3	1.6	27.8
Total	100.0	100.0	100.0	100.0	100.0

[1] Based on 96 new plants in operation along Route 128 in September 1957 of which 77 were relocated.
[2] Research and Development.

Classification of New Companies on Route 128

In this section another classification is used to distinguish between companies which opened for the first time and those which merely relocated from other sites. New industries or branch plants represent the inauguration of new business enterprises or outlets which were just started or founded. Relocated industries or branch plants indicate those firms which moved to Route 128 from other locations. A further separation is made between industries which only have one plant or have their headquarters plant on Route 128, and branch plants which are an outlet or subdivision of a company. The investment and employment in each class of plant is given by industry types in Table 3.

Determination of Net Gains to the Metropolitan Area Contributed by the Route 128 Industrial Development

The investment in new industries and new branch plants represents a gain for the Route 128 locality and also for the metropolitan area. Similarly the employment at these new companies represents new job opportunities in the Route 128 locality and in the metropolitan area. The investment and job opportunities at relocated companies and branches represent an addition to the Route 128 locality, but may or may not be a net gain for the metropolitan area, depending upon the investment and employment changes at the sites vacated by the companies that moved to Route 128. Consequently, in order to determine the gain to the metropolitan area represented by the industry on Route 128, it is necessary to consider the new and relocated companies separately and to determine any in-town losses occuring at the former sites of the relocated firms. Essentially, all of the new industry investment and employment is considered a gain, while the relocated industry gains must be offset by the in-town losses.

In order to determine the net gains or losses, an investigation was needed of conditions at the former sites of relocated firms. Since only a sample of such firms was investigated, it was necessary to determine the loss for the sample and then expand this figure to represent the total for all relocated companies.

Investigation of Conditions at Former Sites of Relocated Companies

The former locations of companies that moved to new locations on Route 128 are shown in Figure 2. Most of these companies' former plants (or branches) were located near the heart of downtown Boston. In terms of total investment in relocated companies, 68 percent were formerly situated within a 2¼-mile radius of the city center (State House) and 96 percent were within a 4½-mile radius.

In the spring of 1958 an investigation was made of the disposition of the in-town sites vacated by 25 of the 77 relocated companies now on Route 128 (this investigation was conducted as part of a thesis, "The Re-Use of Vacated Commercial Sites in Downtown Boston," by Brigitte G. Orent, submitted in partial fulfillment of the requirements for the degree of Master of City Planning, Department of City and Regional Planning, Massachusetts Institute of Technology, June 1958, pages 16-18). This sample represents 28 percent of employment and 38 percent of the investment in the relocated companies included in the September 1957 survey. Prior to moving, these companies occupied 32 in-town sites.

Of the floor space formerly occupied, 64 percent was in use (spring 1958), 32 percent was vacant and 4 percent had been demolished for highway construction. Some of the characteristics of the in-town sites before and after companies moved to Route 128 are given in Table 4.

The in-town sites were reoccupied by 61 companies having 45 percent less employees, and 33 percent less floor space, resulting in an increase of 23 percent in floor space per employee. This suggests that the companies moving into the vacant space left by Route 128 industries were seeking space to expand their activities. This was substantiated by questions directed to 44 of the 61 companies asking why they left their old sites. The replies are summarized as follows by percent of companies:

(1) 54 percent expanding and wanting more space and/or facilities.
(2) 25 percent displaced by public improvements (highway and garages).
(3) 14 percent displaced by private parties.
(4) 7 percent old space too expensive for their operations.

Information on site selection factors considered by companies now on Route 128 (presented in a later section) shows that a major factor influencing their choice of site was need of land for expansion and for increased operational efficiency. Hence it appears that some of the motives behind the companies which filled the vacancies left by Route 128 industries were much the same as those which brought the vacating industries to Route 128.

Estimate of Investment and Employment Opportunities Added in Metropolitan Boston Area by Route 128 Plants

As pointed out in "Determination of Net Gains to the Metropolitan Area Contributed by the Route 128 Industrial Development" the investment and jobs provided by new Route 128 companies doing business for the first time represents a gain not only to the Route 128 locality, but also to the Boston Metropolitan Area. From Table 3 an investment is found of about $20,000,000 in new plants and an employment of 3,700.

TABLE 4

UTILIZATION OF IN-TOWN SITES FORMERLY OCCUPIED BY COMPANIES NOW LOCATED ON ROUTE 128

In-Town Site Characteristics	BEFORE Companies Moved to Route 128	AFTER Route 128 Companies Vacated Sites
Number of Sites Occupied	32	25
Number of Firms Occupying Sites	25	61
Assessed Valuation	$16,299,000	$14,602,000
Total Employment	2701	2028
Total Sq Ft Floor Space Used	1,089,000	696,960[1]
Avg. Floor Space per Company	41,900	11,360
Avg. Floor Space per Employee	279	342
Avg. Employees per Company	150	33

[1] Only 1,045,550 sq ft available for use due to demolition.

The capital investment and employment at relocated plants from Table 3 amounts to about $65,500,000 and 13,382 persons. This investment and employment represents a gain to the Route 128 locality, but only the increase over subsequent investment and employment at vacated sites is a gain to the metropolitan area.

Assessed valuation and employment both have dropped at the former sites of relocated companies since these firms have moved to Route 128 (Table 4). Part of this decrease or loss was due to demolition of buildings for public purposes. The exact amount of this demolition loss in valuation and employment is not known. If one assumes it to be proportional to the 4 percent of floor space removed, then a demolition loss of $16,299,000 x 0.04 = $652,000 in valuation and 3,701 x 0.04 = 148 in employment is found. The net loss at the in-town sites due to the relocation of firms to Route 128 was therefore $16,299,000 - 652,000 - 14,602,000 = $1,045,000 in assessed valuation and 3,701 - 148 - 2,028 = 1,525 in employment.

Some of the characteristics of the 25 firms who relocated on Route 128 are compared with data from 70 of the relocated firms on the highway in Table 5.

The 25 company sample has characteristics similar to those of the 70 relocated firms (which include the 25) with respect to average company investment, employment and building area, indicating the possibility of a representative sample. However, it was also found that the percent of increase in employment for the 25 firms before and

after relocating was substantially lower than that for the 70 firm group of relocated companies. Therefore, any estimates of net gain of employment contributed to the area by relocated companies based on the 25 company sample will tend to be on the conservative side.

The value of the Route 128 industry was obtained in terms of capital investiment rather than assessed valuation as the assessment policies of the metropolitan area towns vary considerably. Also, the in-town policy varies, the valuations usually being a larger proportion of investment for industrial and commercial properties than for residences. For the purpose of this analysis it is assumed that the $1,000,000 assessed valuation loss at the in-town properties vacated by 25 relocated Route 128 firms represents 50 percent of the investment. On this basis the loss in investment would be

TABLE 5

EMPLOYMENT AND INVESTMENT CHARACTERISTICS OF 25 ROUTE 128 COMPANIES FORMERLY LOCATED IN-TOWN AND COMPARISON WITH 70 RELOCATED ROUTE 128 COMPANIES SURVEYED IN 1957

Number of Companies	25	70
Total Capital Investment	$24,955,000	$62,990,000
Total Employment	3,810	12,298
Total Building Area (sq ft)	1,614,550	3,850,961
Avg. Investment per Company	$998,193	$899,857
Avg. Employment per Company	159	176
Avg. Building Area per Company (sq ft)	64,582	55,014
Avg. Building Area per Employee (sq ft)	422	313

about $2,000,000 for the 25 relocated plants having a total investment of $24,955,000 (Table 5). The net gain to the area for this 25 plant sample then becomes about $23,000,000.

The total investment for all relocated companies on Route 128 (September 1957) was $65,500,000. When the net gain for the 25 firms is expanded in proportion to the investment ratio, the net gain for all relocated companies becomes:

$$\$23,000,000 \times \frac{65,500,000}{25,000,000} = \$60,000,000.$$

If this last amount is further projected to include plants completed or under construction since September 1957, it becomes:

$$\$60,000,000 \times \frac{137,000,000}{85,000,000} = \$97,000,000.$$

The investment in new industries and branches originating on Route 128 was about $20,000,000 in September 1957. When this figure is projected to include plants opened or under construction since that date, the gain from new industries is:

$$\$20,000,000 \times \frac{137,000,000}{85,000,000} = \$32,000,000$$

The net investment gains contributed to the metropolitan area by new and relocated companies are totaled and summarized in Table 7.

The employment expansion characteristics of 70 relocated companies which had complete data before and after moving to Route 128 are summarized in Table 6. All except service companies showed substantial expansion of their labor force, the largest increase taking place in production and research and development companies.

The net employment gain contributed to the area by the Route 128 companies will be analyzed in the same manner as that for investment. Earlier the net loss in employment at the in-town sites following the relocation of the 25 firm sample was shown to be 1,525. The Route 128 employment of these same firms was 3,810 (Table 5), making

TABLE 6

EMPLOYMENT AT RELOCATED COMPANIES (INDUSTRIES AND BRANCH PLANTS) BEFORE AND AFTER MOVING TO ROUTE 128[1]

Type of Industry	Employment			Percent Change Over Employment at Former Site
	Before	After	Change	
Distribution	1699	1866	+ 167	+ 9.8
Production	6664	8528	+1864	+28.0
R & D	1097	1546	+ 449	+40.9
Service	382	358	- 24	- 6.3
All Relocated Companies	9842	12298	+2456	+25.0

[1] Based on 70 of the 77 relocated companies in Table 3.

a net gain of 2,285 job opportunities for the sample. If this net gain is expanded in proportion to the employment represented by all relocated firms in operation by September 1957, the total becomes:

$$2,285 \times \frac{13,382}{3,810} = 8,000.$$

If this amount is projected to include plants completed or under construction since September 1957, the amount will be:

$$8,020 \times \frac{27,500}{17,000} = 13,000.$$

Again, the employment of the new industries and branches must be added to the above figures in order to obtain the total net gain of job opportunities in the area. As of September 1957, the employment in the new companies was 3,700, and when projected to include that of the new firms opened or under construction since that time, the total employment at new companies becomes:

$$3,700 \times \frac{27,500}{17,000} = 6,000.$$

The foregoing estimates of net gain in investment and employment opportunities in the area contributed by the Route 128 industrial development are summarized in Table 7. They are approximate, and can be considered reliable only to the extent that the methods used are valid and that the samples used are representative. Also, the estimates do not account for any additional losses in valuation or employment that may have occurred at places vacated by those companies that took the space formerly occupied by companies now on Route 128.

Net gain represented by the industrial development at Route 128 is, of course, not necessarily due to the construction of the highway. One way to determine the gain resulting from the building of Route 128 would be to determine how many of the plants would have been built without a new Route 128, and then to compare that investment (and employment) with what has actually been realized. Since it was not possible to determine the extent of industrial development had Route 128 not been built, this analysis presents only gains resulting from development along the highway.

Impact of Route 128 Industrial Development on the Metropolitan Area

A study by the Seminar Research Bureau of Boston College has stated that the economy of metropolitan Boston now provides about one million jobs, and that between 1955 and 1975 there will be an estimated 200,000 new jobs in the metropolitan area (3).

The total employment at Route 128 industries, including that expected at plants under

TABLE 7

SUMMARY OF ESTIMATES OF NET GAIN OF INVESTMENT AND EMPLOYMENT OPPORTUNITIES IN THE METROPOLITAN AREA CONTRIBUTED BY THE INDUSTRIAL DEVELOPMENT ON ROUTE 128

Net Gains to the Area Contributed by:	Investment	Employment
96 Plants Surveyed as of September 1957	$80,000,000	11,700
Plants Completed or Under Construction Between Sept. 1957 and Sept. 1958	$49,000,000	7,300
All Plants Completed or Under Construction as of September 1958	$129,000,000	19,000

construction by September 1958, was estimated in section "Investment, Employment and Other Characteristics of Route 128 Plants" as 27,500. This represents only 2.7 percent of the million employees in the metropolitan area. The net gain of new job opportunities at Route 128 since 1955, however, represents about 6 percent of the 200,000 predicted new jobs by 1975. As industrial growth continues along Route 128, the impact of that highway on the greater Boston employment pattern will become more substantial.

The annual or total investment in new industrial building in the metropolitan area for all years between 1951 and 1957 could not be found. A study by the Greater Boston Chamber of Commerce, however, derived $84,790,000 for business development completed or under construction in 1957, and an additional $61,692,000 authorized (4). The Route 128 industry included in these figures was 35 percent and 45 percent, respectively. If the two estimates are combined, the portion of the development on Route 128 is 38 percent.

Benefits of Industrial Development to Individual Towns.

The previous sections estimated the net gains in employment and investment contributed to the metropolitan area by Route 128 industry. That discussion applied to the development along the entire highway, and not to any specific area. This section is included to illustrate the impact of industrial growth on two of the towns adjacent to the route.

The New England Industrial Center (NEIC) in Needham contains approximately 100 acres of land, 93 percent of which was developed by September 1957. Development in the center started in 1953 following a zoning change to allow industry. The assessed valuation of this property previous to the industrial activity was only $113,500. In 1957 the tax valuation following development of the NEIC was $5,729,300 or a net tax base gain of $5,615,800. At the 1957 tax rate of $52 per $1,000 of valuation, this valuation gain produced an increase of tax revenue to Needham of $292,000, or 9.6 percent of Needham's total real estate revenue even though this industrial site includes only 1.2 percent of the town's land acreage.

Figure 3 shows the trend in assessed valuations in Needham since 1946. The sharp rise in industrial values since 1954 is due to the New England Industrial Center, and the smaller rise in "other" industrial property valuation is due in part to new industries built near Route 128 in the vicinity of that Center. The flattening of the trend in tax rate (1954-57) is the result of these valuation increases. It amounts to about $5.00 per thousand below the projected 1946-54 trend. The significance of this retardation of the upward tax rate trend is evident when one considers that the average assessment on the Needham home owner is about $9,000 and that a savings of $5.00 per thousand amounts to $45.00 per year.

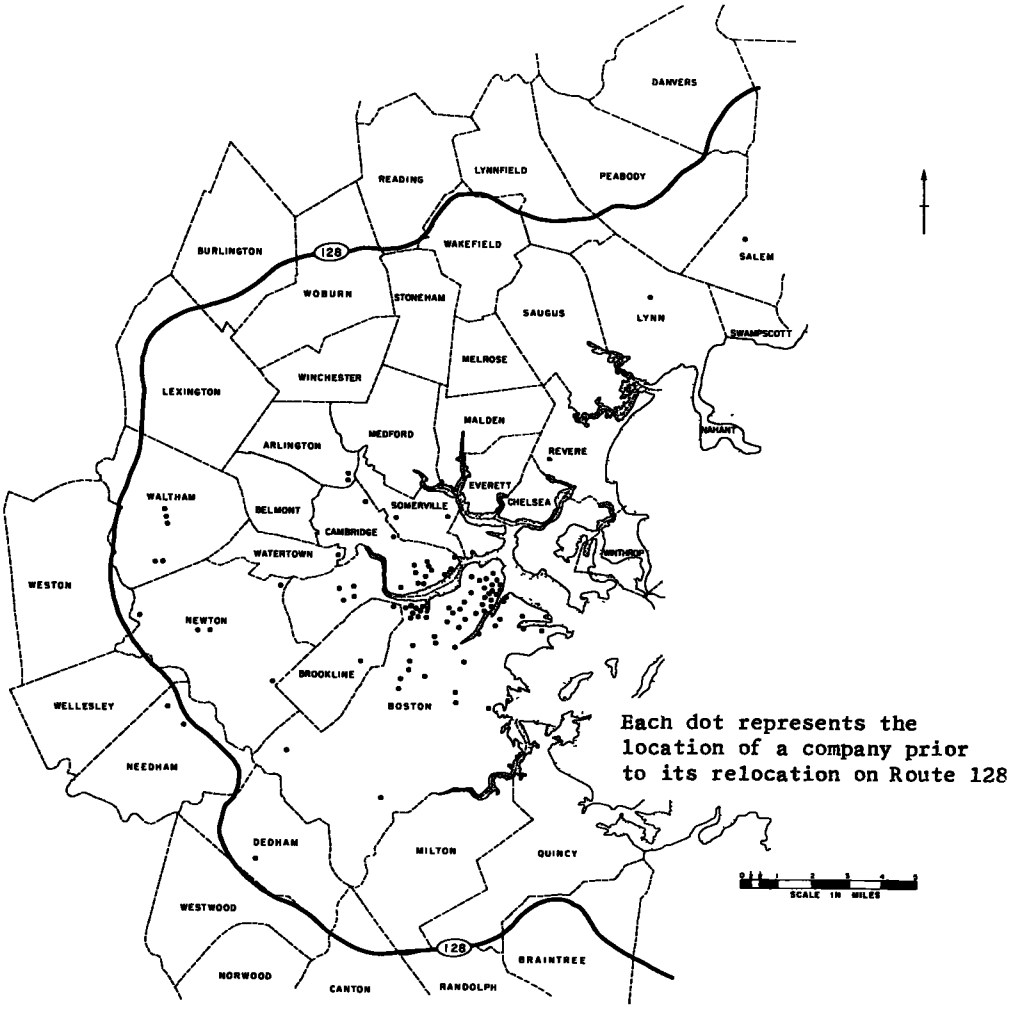
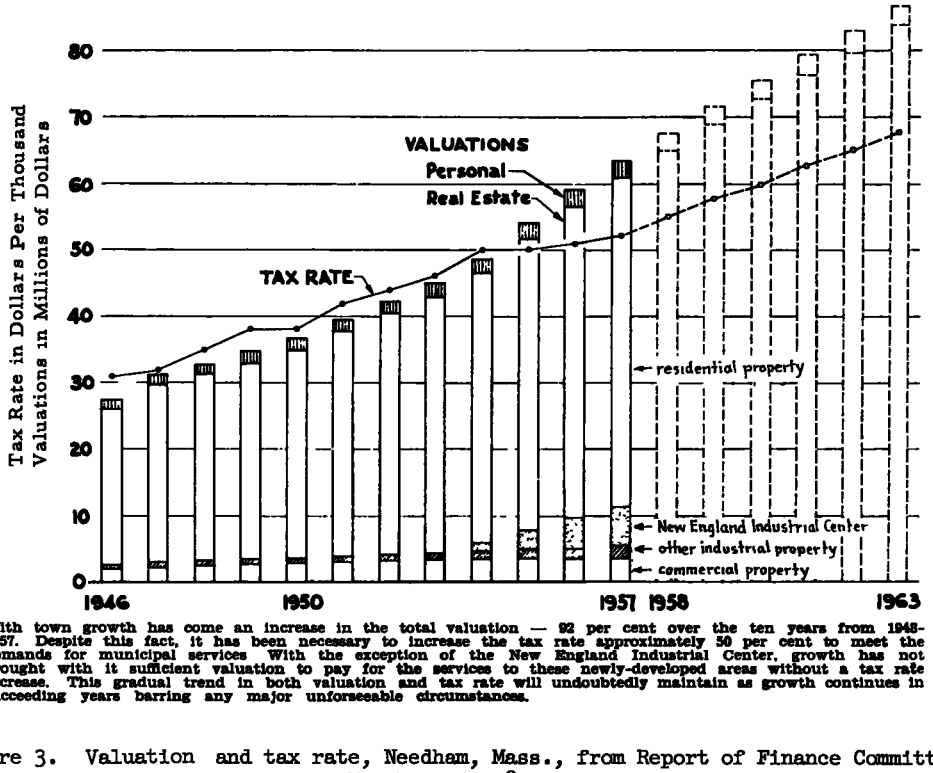


Figure 2. Former locations of companies which moved to Route 128 as of September 1957.

It might be argued that this industrial site if not rezoned would have been used for residential development. On the other hand, some town officials and land developers felt that the land would have been unsuitable for residential usage and would have remained vacant. However, assuming that the NEIC land was used for homes in place of industry, the probable gain or loss to the town of Needham has been estimated in the following manner.

The NEIC land area (with allowance for streets) could contain about 400 housing units, if the lot size were 10,000 sq ft. Using a tax valuation of 50 percent of an average sales price of $18,000 per house in 1957, the total residential tax base would be $3,600,000. The tax revenue from these imaginary residential properties at $52 per $1,000 would then be $187,000, or $105,000 less than the tax revenue from the actual industrial development even when the higher cost of town services to homeowners is neglected. The costs of town services to the NEIC is only about $25,000 per year, which without question is lower than it would be for 400 homes.

Waltham has experienced a similar advantage from its $22,000,000 of new plants along Route 128. Prior to the industrial growth, some of the developed area was



With town growth has come an increase in the total valuation — 92 per cent over the ten years from 1948-1957. Despite this fact, it has been necessary to increase the tax rate approximately 50 per cent to meet the demands for municipal services. With the exception of the New England Industrial Center, growth has not brought with it sufficient valuation to pay for the services to these newly-developed areas without a tax rate increase. This gradual trend in both valuation and tax rate will undoubtedly maintain as growth continues in succeeding years barring any major unforseeable circumstances.

Figure 3. Valuation and tax rate, Needham, Mass., from Report of Finance Committee, March 17, 1958.

unattractive and hardly feasible for residential properties. This peat-bog and pig-farm land has, however, been converted into a most attractive industrial center and research park. The new industrial properties contribute a net annual gain in gross tax revenue of approximately $400,000 (Jan. 1, 1958). However, for some years these gains will be offset by the interest and amortization costs on a $1,000,000 bond issue floated to extend the sewer system to the center.

The former value of land now occupied by industrial plants along Route 128 was low, in a range of $1,000 to $1,500 per acre. After being developed and built upon, the land values reported by occupants averaged $8,000 per acre. The total investment in land, plant and equipment averaged $77,000 per acre.

Relationship of Highway Construction and Zoning Changes to Rate of Industrial Development

Most of the discussion in the earlier portions of this report has dealt with the extent of the industrial activity along Route 128, its characteristics and its contribution of employment and investment to the towns adjoining the highway and to the metropolitan area. However, in order to determine the extent of the highway's influence on this activity it is pertinent to consider the yearly industrial growth along Route 128, the various stages of highway construction and the zoning changes that were made to allow industrial development.

The cumulative investment in new Route 128 industries for each year sinch 1951 is shown in Figure 4; the most important highway construction stages are also indicated on this figure.

The first spurt of development was primarily concentrated along the older, northern section of Route 128 in Locational Areas 1 and 2. Following this initial construction,

activity lagged for approximately two years while the communities along the road considered and adopted the necessary zoning changes to permit industry. Needham rezoned in 1953 to allow for the NEIC and Waltham followed in 1954 by rezoning about 300 acres for the Waltham Industrial Center and Research Park.

In the latter part of 1953 construction started in the NEIC just before and in anticipation of the re-building of old Route 128 south from Route 9. The bulk of the building activity in the center took place in 1954 and 1955 as the rebuilding of Route 128 neared completion. It is important to note that most of the industrial activity in the nearby Newton Industrial Center did not take place until reconstruction of old Route 128 was well under way. Similarly, most of the development in Dedham (Locational Area 7) coincided with or followed the rebuilding of Route 128 through that town.

Development in Waltham has been rapid since 1954, and has been even more active since 1957. The lag in its initial development was the result of lack of necessary zoning changes, and may have been retarded by the lack of a direct interchange with Route 128. This was added at Winter Street late in 1954. The major activity in Waltham followed that in the NEIC. Since September 1957 an additional $5,480,000 of industry has been completed or under construction in Waltham while only $1,000,000 has been added in the NEIC, which was 93 percent filled in 1957.

Other towns along Route 128 have followed Needham and Waltham in adopting the necessary zoning changes to permit industrial land uses. Wakefield, for example, in the fall of 1956 rezoned two areas, one for an industrial park yet to be developed and the other for the site of a recently completed multi-million dollar insurance building. In September 1958 Lexington took similar action to permit construction of a proposed $12,000,000 office building and research center on Route 128 near the Route 2 interchange.

Extent of Zoning for Industry and Relation to Plant Investment

An examination of zoning maps and regulations of the towns along the 55-mile length covered by the industrial survey shows that about 20 miles, or 21 percent of the frontage on the highway, which includes both sides of the road, is zoned for industrial or business uses. About 5,240 acres have been so zoned within one mile of the highway (September 1958). Table 1 indicates about 1,110 acres occupied by the 96 plants surveyed in September 1957. Plants completed or under construction since that date will bring the total occupied area to roughly 1,800 acres, or 34 percent of the zoned acreage within one mile of the highway. Hence it appears that there is as yet no shortage of available sites along Route 128, although the centrally located sites are being rapidly developed.

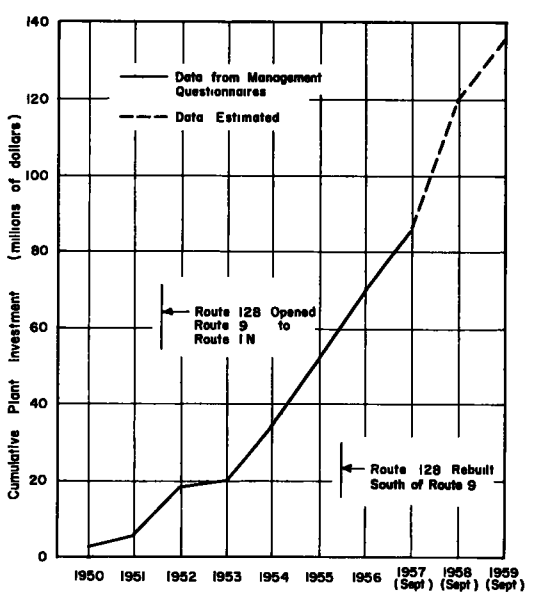


Figure 4. Cumulative total investment in New Route 128 plants by year of completion.

The greatest concentration of completed industrial development is in the NEIC with an investment of $185,000 per acre, amounting to $17,000,000 in 0.63 mile of frontage on Route 128. The concentration of investment is higher in the NEIC than can be expected in other areas (except the Newton Industrial Center) because the standards for land to building ratio were substantially lower than in subsequent developments. The total investment per frontage mile zoned for business or industry along Route 128, including establishments built and under construction as of September 1958, is estimated roughly as $7,000,000 per mile.

Explanation of Major Factors Influencing Route 128 Site Selection

In choosing a site on Route 128 each company was influenced by one or more factors, such as cost of site development, accessibility, space for expansion, labor market, taxes, and environment. One company might consider a given factor more important than another company. In the industrial survey it was hoped to bring out the major factors considered in order to provide data concerning the extent of the highway influence on the industrial growth.

When the management questionnaire was being prepared, consideration was given to attaching "weights" to the different replies, such as by asking the management to attach a percent of importance to each of the site selection factors which led them to locate on Route 128, or to list factors in the order of their importance. These methods were discarded as not likely to develop a reliable degree of distinction between one factor and another. Instead, it was decided to ask for only major factors, which, if more than one were given, could be considered of equal importance. To help reduce bias a list of factors was not suggested. Instead the officials being interviewed were asked to volunteer the major factors.

Each company stated their major site selection factors in different words, so a number of major factors were obtained. After a preliminary analysis of the interview replies, it was found that they could be grouped under fifteen headings as follows:

1. Land for Expansion.—Includes availability of enough land for both present and future space requirements. This space may be needed for enlarged production, more efficient operation in one-story buildings versus multiple story buildings, or a combination of these factors.

2. Labor Market.—Refers to labor market supply on Route 128 and ability of industry to acquire and hold labor force.

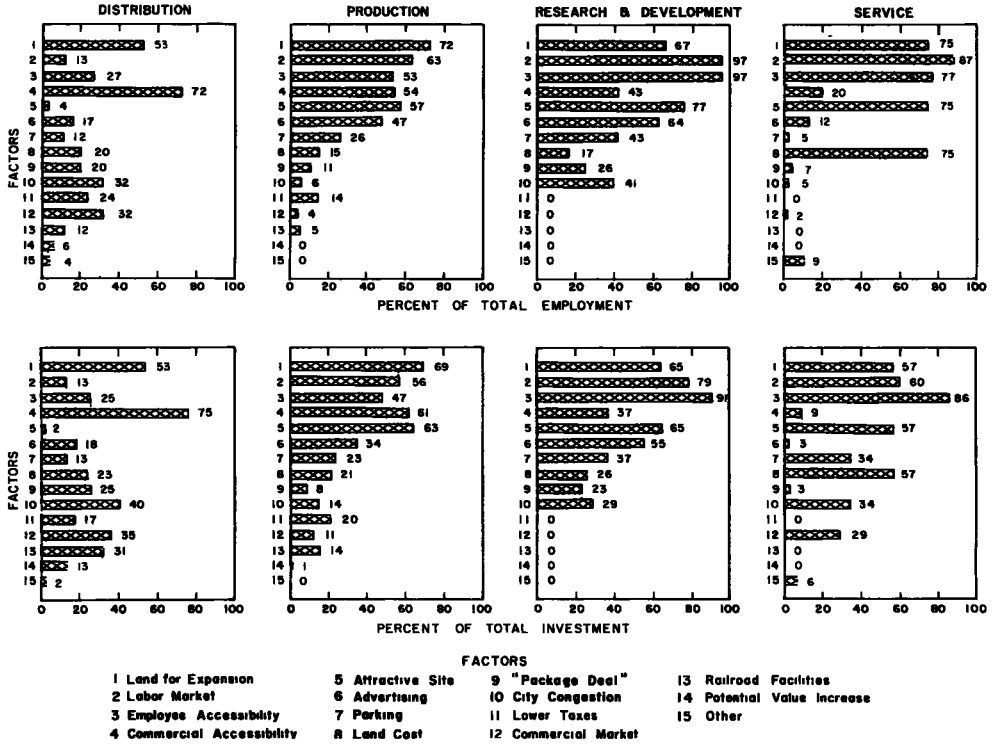


Figure 5. Rating of major factors considered in site selection by industries interviewed on Route 128—September 1957.

3. Employee Accessibility.—Refers to ease of access by employees involving savings in time and distance from home to work.

4. Commercial Accessibility.—Refers to ease of access for business purposes, such as truck pick-up and delivery, salesmen and business calls, and customers visits.

5. Attractive Site.—Indicates a desire to locate in a goodlooking site with respect to buildings and landscaping.

6. Advertising.—Includes expected benefit or increase in prestige to be derived from frequent viewing of signs and attractive grounds by passing motorists and potential customers.

7. Parking.—Implies need or desire to provide ample parking space for employees or trucking activity.

8. Land.—Indicated land cost was low, or lower than at other sites considered.

9. Package Deal.—Refers to the availability of a promoter who will provide a plant as a package, including land, preparation of site, erection of buildings to owner's specifications and aid in the financing of the project. Such plants may be acquired in different ways: some are bought outright, others are taken on lease, and others on lease with option to buy. The purchaser is relieved of the burden of site preparation and of dealing with many contractors. The developer is in a position to acquire desirable tracts of land at low price on a "wholesale" basis, and to gain economies from "volume" production of sites and buildings.

10. City Congestion.—Implies need or desire to move away from areas of severe traffic congestion.

11. Lower Taxes.—Refers to taxes being lower than at former site or at other sites considered, and also the prospect that taxes would not rise excessively in the future.

12. Commercial Market.—Indicates that the site selected offered more advantages in obtaining or holding their particular commercial market than their former or other sites.

13. Railroad Facilities.—Includes the necessity or desirability of having a rail siding available.

14. Potential Value Increase.—Implies that management officials expected their selected site to increase in value with time.

15. Other.—This includes any major factors listed by companies which did not fall into any other headings.

Evaluation of Major Site Selection Factors

For each of the fifteen factors a listing was made of the individual companies which indicated that factor as a major consideration. A company could be listed under one or more headings depending on the number of major factors given. For rating purposes, the investment and employment represented by each company were separately listed under each site selection factor and the amount in each category reduced to a percentage of total investment or employment. The results are shown in Figure 5.

The relative importance of the factors varies according to the particular needs of the industry types. The distribution plants stressed commercial accessibility and land for expansion; production companies emphasized land for expansion, attractive site, commercial accessibility, labor market, and employee accessibility. Those factors most important to research and development plants were employee accessibility, labor market, land for expansion, attractive site, and advertising. The most important factors to service industries were employee accessibility, labor market, land for expansion, attractive site and land cost.

The desire for better access shows up prominently for all companies; commercial access for distribution and production plants, and employee access for research and development and service companies. In this connection access is used in the broad sense to imply ease of access to all parts of the metropolitan or regional area. It does not apply to direct access to the highway which on Route 128 is limited to interchanges. The rapid growth of industry on Route 128 is witness to the fact that the advantages of regional access greatly outweigh the inconvenience caused by limiting access to the highway.

TABLE 8

PLANT SITES CONSIDERED PRIOR TO LOCATING ON ROUTE 128[1]

Type of Industry and Locational Area	Percent of Investment in Plants for Which		Percent of Investment Represented by Plants for which Other Sites were considered in				
	Only Rte. 128 Site Considered	Other Sites Considered	Downtown Boston	Boston Suburb	Other Rte. 128 Sites	Other Mass. Cities	Outside Mass.
A. TYPE OF INDUSTRY							
Distribution	20.4	79.6	25.9	79.5	38.8	38.3	0.0
Production	10.5	89.5	8.1	70.5	41.5	27.1	7.1
R & D	0.0	100.0	32.9	35.2	50.2	47.4	44.2
Service	4.2	95.8	4.7	16.4	88.3	0.0	0.0
B. LOCATIONAL AREA							
N. of Rte. 1	0.0	100.0	0.0	17.9	0.0	82.1	0.0
Burlington	3.2	96.8	9.4	66.2	36.0	15.4	0.0
Waltham	0.0	100.0	8.7	68.0	79.5	14.8	18.7
MEIC	49.6	50.4	58.9	78.5	9.7	3.3	0.0
Newton	5.6	94.4	18.9	81.1	42.3	0.0	6.4
Needham	61.7	38.3	5.4	94.6	69.0	0.0	0.0
South of Needham	0.5	99.5	11.4	71.6	46.5	0.0	20.6
ALL AREAS	11.5	88.5	14.4	66.6	43.5	14.9	9.6

[1] Based on 87 companies representing 92 percent of industrial plant investment on Route 128 in September 1957.

It can be concluded then that the need for accessibility, land for expansion, labor supply, along with an attractive site, were the most important factors behind the move of companies to Route 128. It can be argued that land for expansion, ample labor markets and attractive sites could be found in many parts of the metropolitan area. If this is true, the hypothesis is advanced that regional access, free of the traffic congestion so characteristic of in-town streets, was the factor that most influenced the industries in their decision to locate on Route 128 in preference to other sites.

Other Locations Considered by Companies Before Building on Route 128

In addition to establishing the effectiveness of Route 128 in attracting industries in preference to other locations, the management officials of industries were questioned regarding the consideration given to other sites before choosing their Route 128 location. The various sites considered, both inside and outside of Boston, were segregated into categories as shown in Table 8. The investment percentages represented by the plants in each category were entered under their appropriate headings. Since many companies considered more than one area, the investment percentage was included in more than one category. Consequently, the sum of the percentages in all categories is much more than 100.

The information in Table 8 clearly indicates that the great majority of all types of companies considered sites other than Route 128, although half of the industries in location 4 and 6 considered only their Route 128 site. Of those industries which considered other sites, most expressed an interest in suburban Boston or an alternate Route 128 location. The service industries gave much more consideration to alternate Route 128 sites than did the other industry types. This indicates a stronger attraction to Route 128 by these industry types. The research and development type showed a greater interest in other than Route 128 sites including downtown Boston, other Massachusetts cities and cities outside of the state.

The production type industries comprising 66 percent of Route 128 investment and 70 percent of employment, gave little consideration to downtown Boston sites, but were interested in suburban and alternate Route 128 sites. Apparently this type of

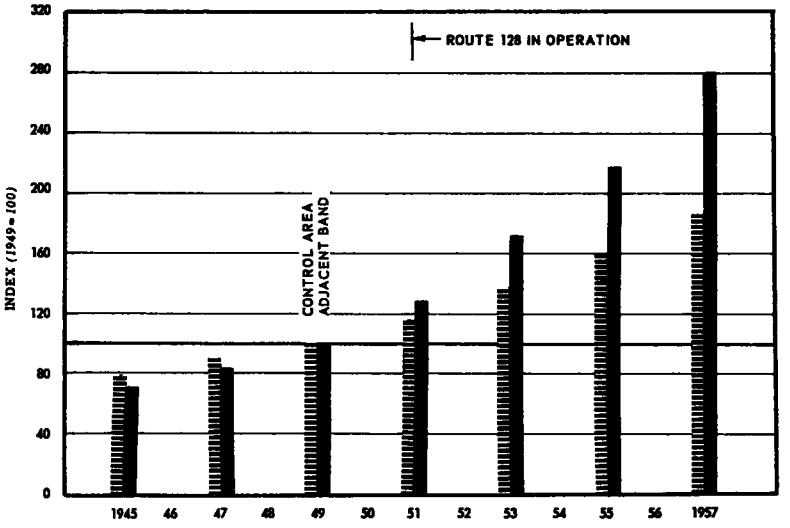


Figure 6. Index of assessments on taxable real estate in Lexington, Mass.—Adjacent Band Area and Control Area (rest of town).

industry is finding out-of-town sites most advantageous for its operations. Other industry types, although they actually chose a Route 128 location, gave more consideration to in-town sites, thereby suggesting a lesser desire to decentralize.

Considering all companies on Route 128, however, the urge to decentralize is evidenced by the fact that companies representing 55 percent of investment on Route 128 considered only a Route 128 location or another suburban site.

Benefits or Disadvantages, Expected or Realized by New Companies Locating on Route 128

The management officials of each firm were asked what benefits (or disadvantages) they expected because of the plant's proximity to Route 128, and what labor procurement and commuting problems they anticipated. Further, they were asked if these benefits were realized, and if they received other unanticipated advantages because of their particular relationship to the highway.

In nearly every case, management personnel stated that the expected benefits were closely related to the major factors in their decision to locate at their Route 128 site. In other words, if they chose their particular site because of the necessity for business accessibility, for example, they also expected that the route would provide this advantage or benefit.

In general, management felt the highway would provide access for business purposes and employees, and found this to be true. Most of the industries did not anticipate labor procurement or retention problems as they usually chose their particular site with regard to known labor markets and necessary access requirements. Generally they expected a higher quality of labor at the new site. However, those companies who located without regard to where their employees lived, or who employed principally unskilled and part-time help sometimes found difficulty in obtaining it at the new Route 128 location. For example, some of the industries are having this problem at the NEIC, which is not surprising when one considers that 47 percent of the old employees at that center had to change from public transportation and walking to automobiles.

For the most part, industries found their labor procurement problems much less difficult than anticipated. Quite often passing motorists voluntarily enter a Route 128 industry office seeking employment. On the other hand, those industries hiring engineers are finding some difficulty in holding them as these people can easily visit similar industries along the road during lunch hour and shop around for better job opportunities.

Some plants hiring principally secretarial personnel were hesitant in locating on the circumferential highway, as they felt it might be hard to retain this help due to the lack of car ownership and nearby shopping conveniences. However, most of these companies reported less turnover of secretarial help at the Route 128 location than in town.

A recent study sponsored by the Federal Reserve Bank of Boston concerned with some of the labor supply characteristics of Route 128 firms offers some information on the loss of personnel at the time a company transferred to Route 128, and on the annual quit or turnover rate at the new sites.

Of 21 firms having available data, the average percent of loss per company upon relocation was 7.7 percent. Those firms moving the farthest from their original site suffered the greatest loss. Also, it was brought out that those firms having the highest women-worker ratio had the highest relocation loss. Only 14 of the plants interviewed had information on the annual employment turnover rate following the relocation of the company at Route 128. Five of these were not able to make a comparison with the rate at their former site, but reported exceptionally low quit rates. Five of the remaining nine firms having before and after data had a definite decline in turnover, one had no change, and three had a higher quit rate than at their former site (5).

Some complaints have been made because of the lack of public transportation to and from the different plant locations along Route 128. However, in those cases where this service was offered after the company's move to Route 128, it was used by few employees, even in areas where more than 2,000 persons were employed, and therefore was discontinued. Some companies set up their own bus service to nearby towns, but almost all have since found this service unnecessary.

Many of the new establishments wanted to be located in a good-looking industrial park; some expressed the opinion that their personnel considered this quite important. Most companies are satisfied if not exceedingly proud, of being part of a good-looking industrial community.

Although few of the industries actually anticipated advertising or prestige value from from the highway, a number pointed out that they had received considerable benefit from this medium.

A disadvantage of Route 128 is the cost of access roads that would not be incurred at a downtown site. Following the construction of Route 128, there were few frontage type roads. In the development parks such as the NEIC, Waltham and Newton, the land developer provided the necessary access between the plant and Route 128 as required by the town zoning codes. Consequently, the cost of this service would necessarily be reflected in the cost of land as sold by the developers. In other cases individual companies found it necessary to build their own roads between their plant and Route 128 interchanges. In addition, the companies have had to make arrangements or buy the equipment for snow removal in their parking areas and on their private roads. At an in-town location, the municipality would have provided and maintained most of these facilities.

Another objection was made to the limited number of eating places along the road or in the vicinity of the industrial parks, and to the lack nearby shopping areas. Since the management interviews were conducted in September 1957, new eating establishments have been opened in Peabody, Lexington, and Dedham, and another is nearing completion in Waltham. These restaurants together with the present restaurant concessions should reduce this objection. The Northshore Shopping Center in Peabody was opened during 1958 and is within 15 minutes driving time of over 30 percent of the Route 128 employment. Also, another shopping center is being planned in Braintree, which when completed will be located within 15 minutes driving time of over 40 percent of the employment along Route 128.

RESIDENTIAL DEVELOPMENT STUDY

General

This study was undertaken to investigate the extent of residential activity along Route 128 and to isolate the effect of that route on this development. Studies of real estate activity were made in areas near the highway and in those farther away, and for years before and after the road was opened as a limited-access highway.

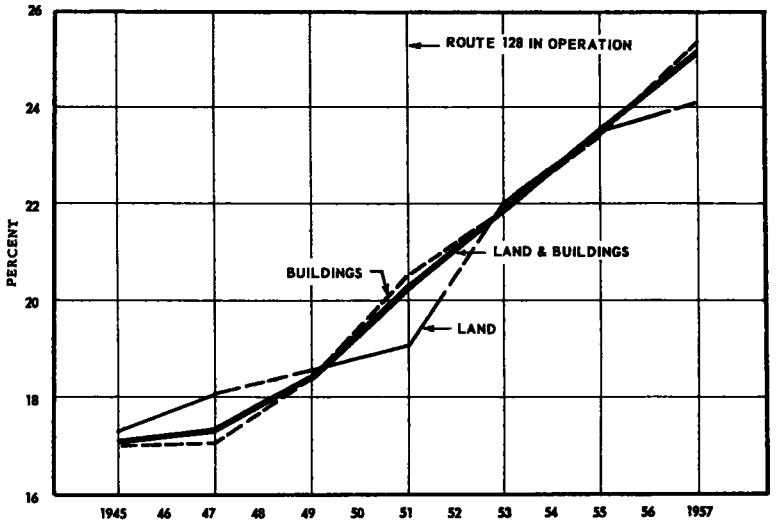


Figure 7. Assessed values in the adjacent Band Area of Lexington expressed as a percentage of assessed values in the entire town.

A pilot study in Needham indicated that considerable time and effort would be required to obtain real estate data for a single town. To obtain complete data for each of the 30 towns along Route 128 was beyond the scope of this study. Therefore, it was decided to concentrate on the towns of Needham and Lexington, each of which has about the same population, land area, distance from Boston, and length of Route 128. In Needham, the town center lies outside the arc of Route 128; in Lexington, it lies inside. Old Route 128 was first constructed in Needham in 1933 and later rebuilt as a limited-access highway in 1955. In Lexington the route was first opened as a new limited-access highway in 1951, replacing the old route which passed through the town center.

Procedure

Two general methods of approach were used in the study of highway influence. In the first an "adjacent band" area approximately one mile wide and roughly centered on the highway was chosen and compared with a "control area." In Lexington the adjacent band area (3,922 acres) was compared with the rest of the town (6,625 acres) as a control. In Needham the adjacent band area (1,187 acres) was compared with a control area (952 acres) located in another part of the town removed from Route 128.

In the second method, "access distance zones" were set off at 0-½, ½-1, and 1-½ miles travel distance from an interchange. These were compared with each other and also compared as a group with a "control zone" which in Lexington included areas within the town and over 1½ miles road distance from an interchange. In Needham, the control zone was a detached area in the same location as the control area. In every case the "zones" included only the land within 250 ft of each side of an existing street (as of September 1957); that is, the land built upon or available for building at that time. The access distance zones obviously increase in area with increasing distance from an interchange. In Lexington, for example, the nearest zone contained 262 acres, the next 801 acres, the next 1,353 acres, and the control zone contained 3,243 acres.

The indicators of residential real estate development which were examined included assessed valuations, building (or occupancy) permits, house densities and real estate sales. The period covered by the study was 1945 to 1957. In order to compare data for areas of different size, dwelling units were reduced to houses per acre, and sales data were expressed as indices based upon average of years 1948-50 = 100. These three years were taken as representative of the period just before the major link of Route 128 was opened to traffic.

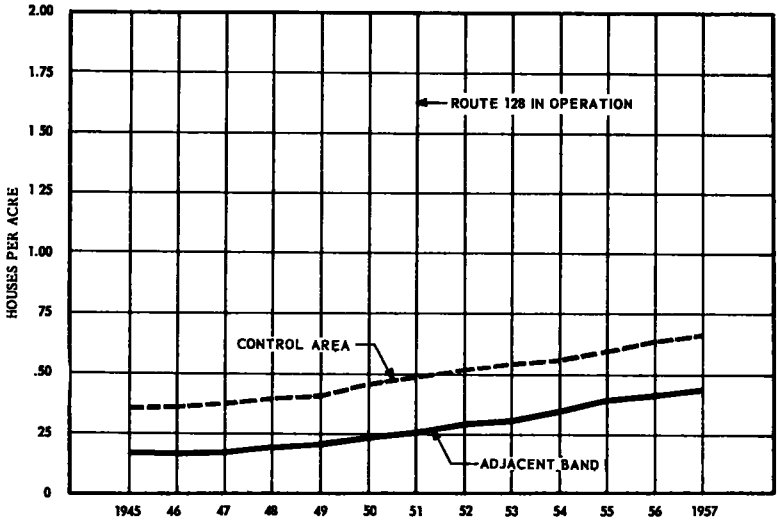


Figure 8. Density of houses—Lexington.

Data were gathered for the different types of study areas and control areas in the two towns, and are presented in considerable detail in the full report (6). In this paper only a few of the findings are illustrated and discussed.

Trends in Assessed Valuation of Real Estate in Lexington

Complete assessed valuation data for residential property were obtained in Lexington for every odd-numbered year from 1945 to 1957. The trend is illustrated in Figure 6 by an index graph based on average of 1948 - 1950 = 100 (in this case 1949 = 100). The average of these three years was adopted as representative of conditions before Route 128 was built and before it could have had an influence on adjacent land use. It will be noted from Figure 6 that since these base years, assessments in the adjacent band area

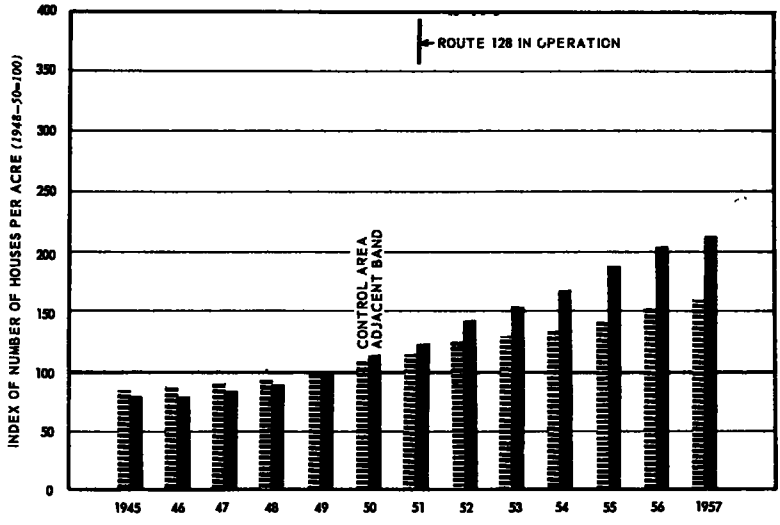


Figure 9. Index: Density of houses—Lexington.

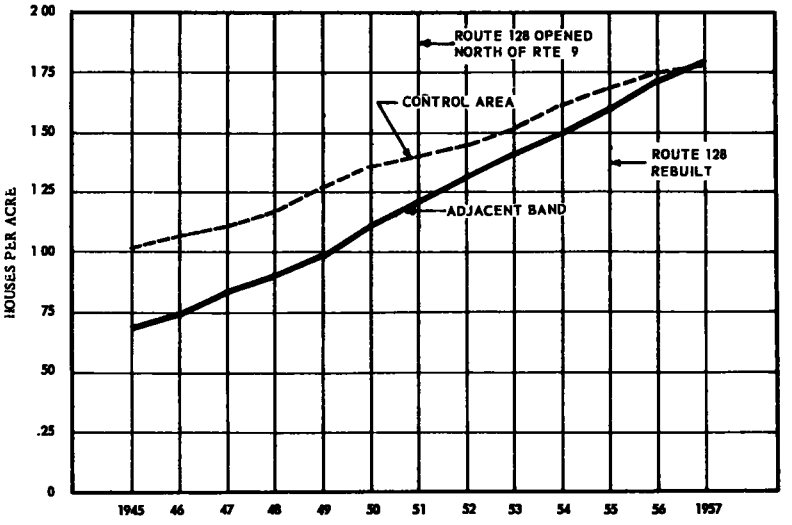


Figure 10. Density of houses—Needham.

have increased 180 percent while those in the rest of town increased 85 percent, indicating a more rapid rate of assessment growth with a corresponding increase in tax yield from the band area.

Figure 7 shows the increasing proportion of assessed value in the adjacent band with respect to the rest of Lexington. Using the assessed values for both land and buildings, it will be seen that in 1945, 17 percent of the entire town's assessed value was in the adjacent band. The percentage increased to 18 percent in 1949 and then climbed more rapidly to 25 percent in 1957. Since Route 128 was built, the growth in both areas has been accelerated, but the greater acceleration is taking place in the adjacent band.

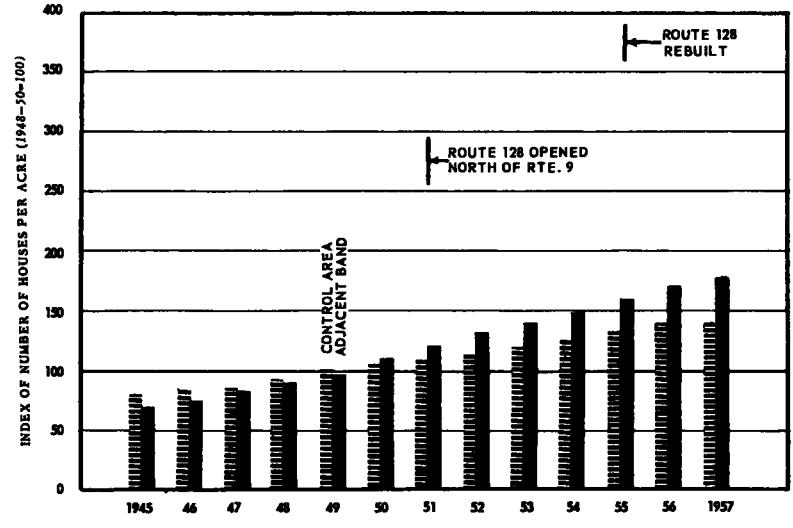


Figure 11. Index: Density of houses—Needham.

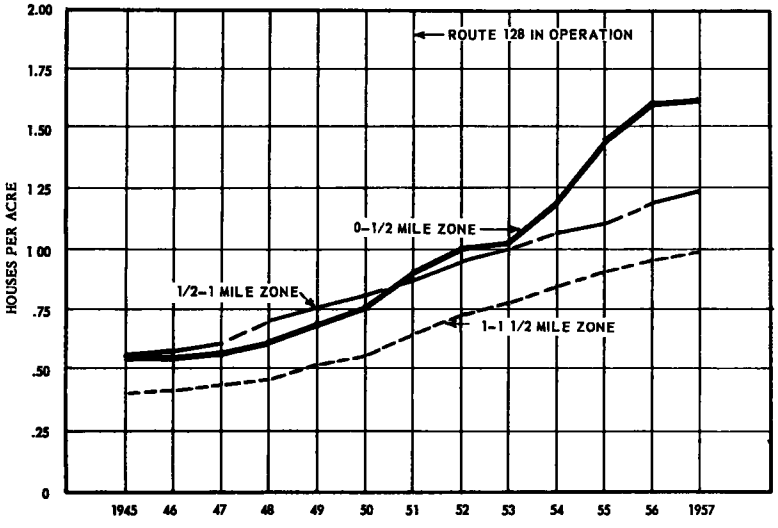


Figure 12. Density of houses in access distance zones—Lexington.

Trends in Houses per Unit Area

In order to obtain a measure of residential growth that would be representative of study areas of different gross areas, the number of houses standing in each area were reduced to a unit of houses per acre. These unit densities and their indices are shown for each year since 1945, in Figures 8 and 9 for Lexington and in Figures 10 and 11 for Needham. The increase in density is, of course, the result of new house construction. In Lexington the line plot (Fig. 8) shows higher densities in the control area, which is to be expected since the most populated parts of the town are in that area. In 1945 the band where Route 128 was later to be built was relatively undeveloped for residential purposes, and the house density was low. The two curves in Figure 8 are nearly parellel indicating about the same number of houses added in each area in each year.

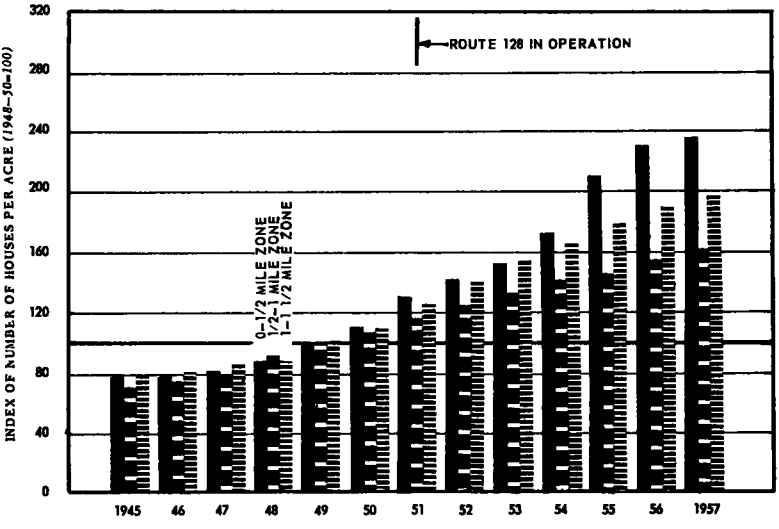


Figure 13. Index: Density of houses in access distance zones—Lexington.

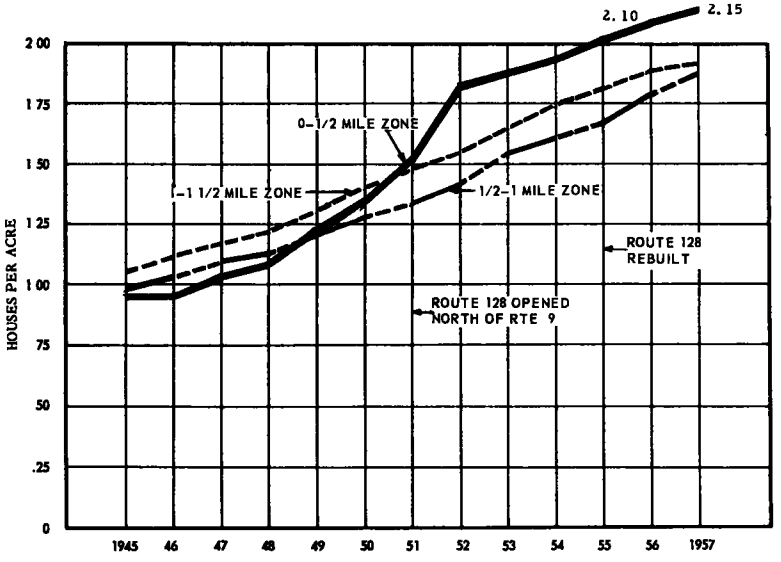


Figure 14. Density of houses in access distance zones—Needham.

In other words, the rate of increase is the same in both areas. The index graph (Fig. 9), however, shows that while the house density in the control area in 1957 was 58 percent over the 1948-50 average, that in the adjacent band was 112 percent greater. There was ample land available for home building in both the control area and in the adjacent band, even though the control area included the old part of Lexington.

Figure 10 shows the density of houses per acre in adjacent band and control areas in Needham. A more rapid growth in density is evident in the adjacent band than in the control area, especially since 1952. Based on average of years 1948-50 (Fig. 11) density increased 75 percent in adjacent band compared to 40 percent in control area. Residential growth near Route 128 has been active for many years, but has accelerated since Route 128 was rebuilt. In 1957 the two areas had about the same density. Since house lots are becoming scarce in both areas, the increase in building in each may be expected to diminish in future years.

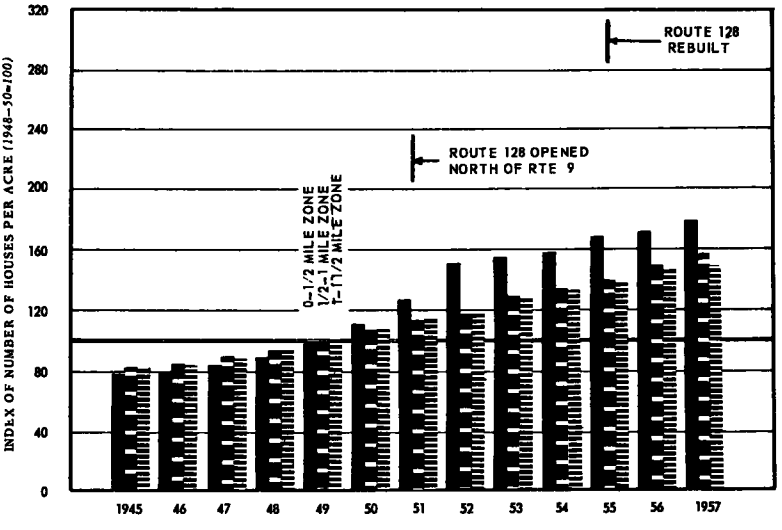


Figure 15. Index: Density of houses in access distance zones—Needham.

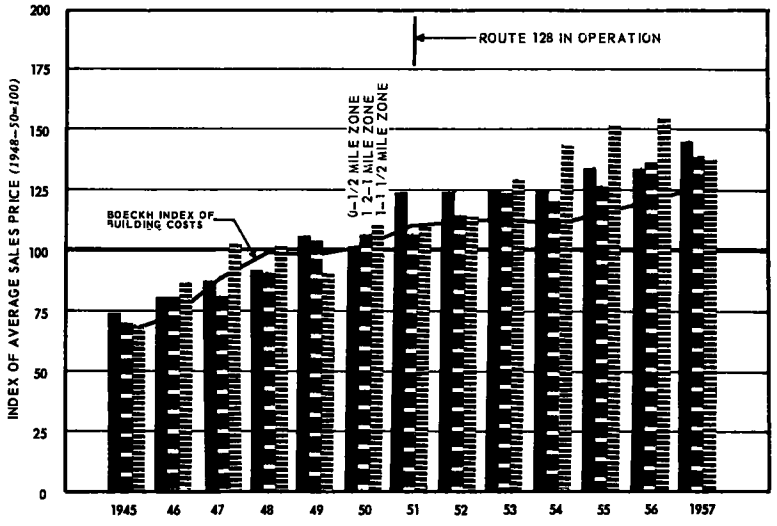


Figure 16. Average sales prices of houses built before 1942 in Lexington, Mass.—Index: Access distance zones.

The relative growth in house densities in the three access-distance zones is shown for Lexington in Figure 12, with corresponding indices in Figure 13. The trends are about the same in all three zones for years 1945 to 1953, after which the increase was greater in the 0-½ mile zone (from nearest interchange).

The increase in both 0-½ mile zone and in the adjacent band in Lexington have occured in spite of certain retarding influences in these areas, such as presence of low land less attractive for building sites than in other parts of town, presence of a transmission line, and the fact that sizable areas were either zoned for light industry or were being held off the real estate market pending zoning changes that would make them available for commercial or industrial purposes.

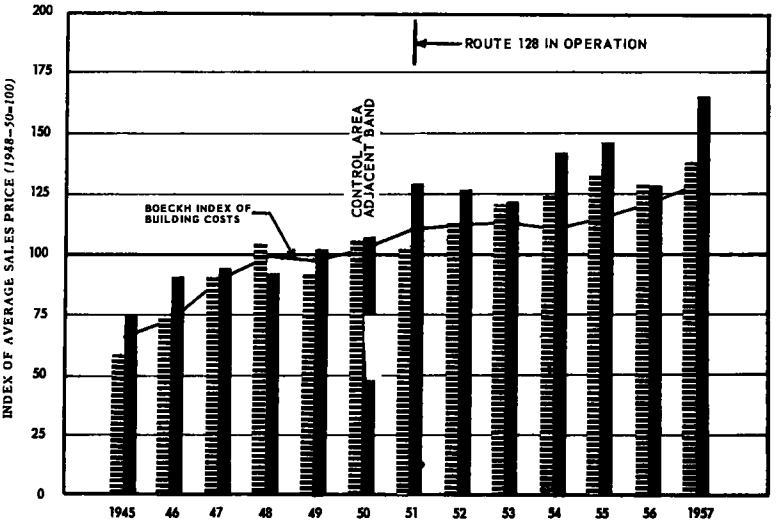


Figure 17. Average sales prices of houses built before 1942 in Lexington, Mass.—Index: Adjacent band and control area.

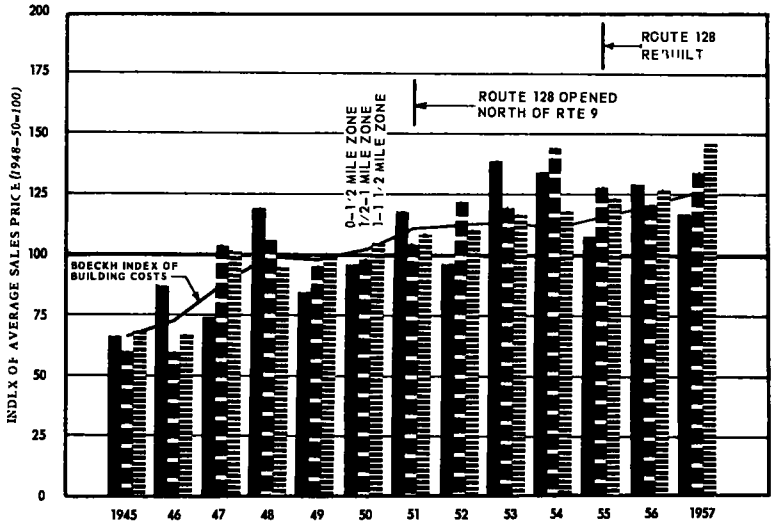


Figure 18. Average sales prices of houses built before 1942 in Needham, Mass.—Index: Access distance zones.

The house density trends in the three access-distance zones in Needham are shown in Figure 14. Indices are in Figure 15. The same upward trend appears in the 0-½ mile zone, although less marked than in Lexington. However, after 1952 the rate of increase in all zones was the same. In making comparisons between Figures 13 and 14, the curves in Figure 14 should be moved mentally to the right about a year, since house densities in Needham were compiled from building permits, which usually precede occupancy permits (used in Lexington) by one or two calendar years.

Average Prices of Houses

Number of sales annually and average sales prices were obtained for new houses

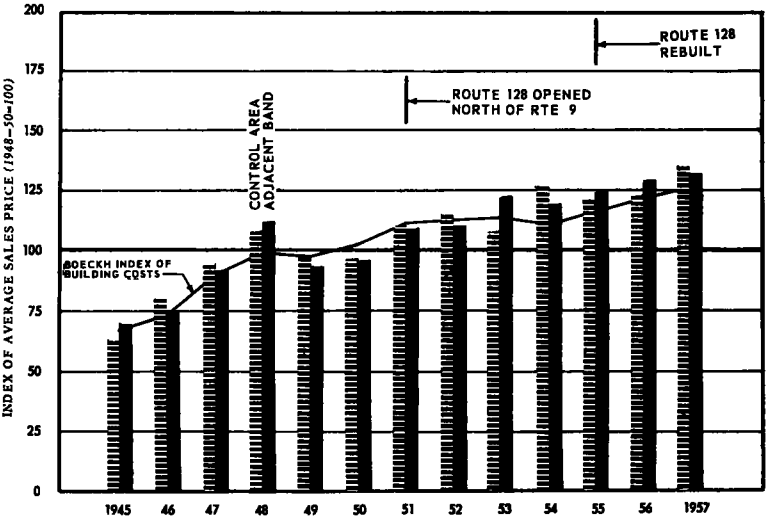


Figure 19. Average sales prices of houses built before 1942 in Needham, Mass.—Index: Adjacent band and control area.

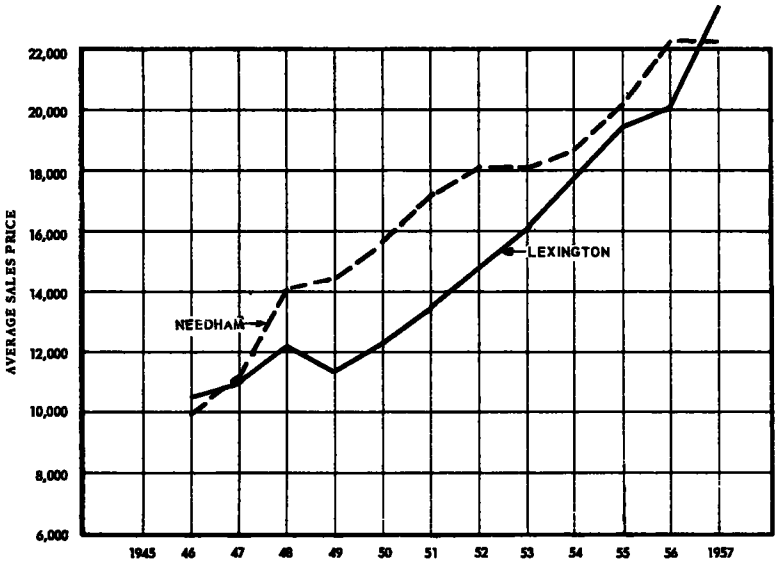


Figure 20. Average first sales prices of new houses in Lexington and Needham.

and old houses in the several study areas. In this paper, indices of average sales prices are shown for old houses only; that is, those in existence in 1942. Since no building of any consequence took place during World War II, the same number of houses existed in 1945. The prices, therefore, apply to resales of residential properties during the period 1945-57.

The Boeckh index of residential building costs in Metropolitan Boston has been added to all sales price index graphs to denote the inflationary trend. Prior to 1951 average sales price indices followed this index fairly closely, since then they have been above it.

In Lexington the trend has been for average sales prices to increase more rapidly in the adjacent band than in the control area (Fig. 17). In the three access zones the upward trend is more variable, the prices in the 0-½ mile zone are sometimes above

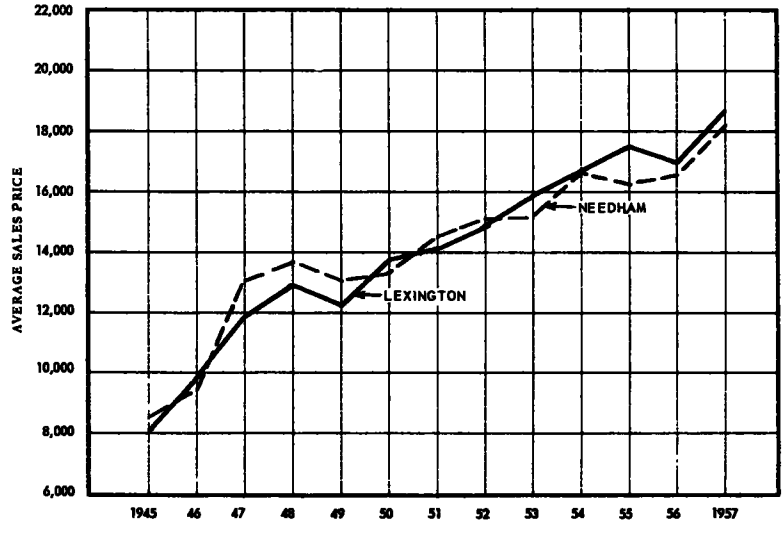


Figure 21. Average sales price of houses built before 1942 in Lexington and Needham.

and sometimes below those in the other zones. In terms of actual sales prices those in areas near Route 128 have been generally lower than in the control area, although the trend is for the difference to decrease (Figs. 20 and 21).

In Needham there appears to be no marked difference in average sales price trends in the adjacent band and control area (Fig. 19). In the access-distance zones the trend varies among zones. In 1951, 1953, 1954, and 1956 the greatest increase was in the 0-½ mile zone, but in other years since 1950 it was greater in the other zones.

The average sales prices in Needham were somewhat higher in the adjacent band and in the 0-½ mile zone than in the control area or in other zones (Figs. 20 and 21).

Figure 20 shows average first sales prices of new houses in Needham and in Lexington. Figure 21 shows similar data for old houses. Two trends are apparent: the prices of new homes have risen faster in Lexington than in Needham, and are nearly the same in 1957; the prices of older houses have risen about equal amounts in Lexington and Needham.

Since 1950 the index of average sales prices of old houses tends to be above the Boeckh index, particularly in Lexington, indicating a greater price rise than might be expected from inflation alone. This rise above the Boeckh index is more marked for average new house sales than for old house sales. A number of causes are suggested for this trend, such as increased development costs due to larger lot size requirements, better quality of house, and certain environmental factors attracting home seekers to Lexington and Needham. These factors appear as strong in areas near Route 128 as in those farther away.

Trends in Towns on or Near Route 128

A study was made of building permits issued and population trends in towns adjacent to Route 128 and outside of Route 128. For this purpose, each of the two above groups of towns were divided into three classes: towns on radial highways of high traffic, medium traffic and low traffic volume respectively. The results indicated a greater acceleration since 1950 of building activity and of population movement into towns having the lowest volume of radial traffic in 1950. In other words, a filling in of areas between major radials is taking place. For example, the net migration into towns on Route 128 that have least adequate radial highways increased 310 percent in 1950-55 over 1945-50, compared to an increase of 145 percent between the same periods in similarly located towns outside Route 128. Migration into suburban towns has been accompanied by migration out of Boston proper and the other centrally located towns. Since 1945 this outward migration has amounted to about 175,000 people. Although this type of growth might have been expected as a normal result of suburban expansion, there is evidence that Route 128 is a contributing factor since it provides an ease of access between radial highways which did not formerly exist.

COMMENTS ON IMPACT STUDIES

Most highway impact studies are limited in scope, considering only a few miles of highway and only a few indicators of impact, such as real estate activity and volume of retail sales. In this study substantial length of highway was investigated and an effort was made to relate the impact of the highway to the entire metropolitan area. Possible losses in investment and employment in places vacated by industries moving to Route 128 were considered as well as gains on Route 128. The motives behind the move of industries to Route 128 and the impact of land use changes on the use of the highway were investigated. The latter effect has been neglected in most impact studies.

As the study progressed, it became increasingly apparent that highway impact is a result of many factors, and is not limited to a specific area near the road. The net effect on the economy of the region in which the highway is located is important.

Whether a new highway attracts or stimulates development, depends upon the demand which exists in the region for such development. If there is no compulsion for industries to expand and move, or if there is no potential for new businesses to be started, little development except the usual gasoline stations, motels and restaurants can be expected along the highway.

Factors, such as the above, need to be evaluated before predicting future development along a proposed highway, forecasting future traffic or applying the results of experience observed in one area to another area of different characteristics.

In the residential phase of this study, considerable research was expended in exploring the use of different statistics or "indicators" of residential growth, and in selecting different types of study areas, both with respect to proximity to the highway and ease of access to and from interchanges. The distance-access zone method, based on travel distance from the nearest interchange, appears more logical than the adjacent band and control area method, especially for application to a controlled-access highway. However, in that method one is confronted with study areas of different sizes. In future studies it is suggested that serious consideration be given to dividing the region through which the road passes into units or sectors, and obtaining basic data for each unit. These units should preferably be of about equal area but not necessarily of regular shape. In a place where streets are laid out in a rectangular pattern, a grid system might be possible. In New England towns, such as Needham and Lexington, which have irregular street systems, varied land use and varied topography, the gathering of data would be expedited by selecting unit areas that conformed to street layouts and land uses. For each unit, such characteristics as zoning class and land available for development would be recorded as well as selected indicators of industrial and residential development. The objective would be to find out what was happening and where. No predetermined influence or control area would be set off, although the units could be assembled in any combination desired; in a band along the highway, in distance zones from an interchange, or according to some indicator of impact such as a selected percent increase in development over a former year. In this report town-lines were used as limits of study areas for the sake of convenience in obtaining data. In the sector method town boundaries might be conveniently used for dividing units, but they should not serve as boundaries of the system of units. The extent of the system would be determined by practical considerations, but, in general, it should extend beyond the areas of probable influence. The analysis of these data, however, would only provide information on where and how much residential development is taking place. The importance of the extent of the influence of the highway would still be unanswered. Seemingly, researchers would have to supplement the data analysis with home-owner and sub-divider interviews for this latter answer.

Machine computations would be a must for such a system of data analysis. The collection of data should be planned so that it could be tabulated directly by a coding system suitable for machine processing. In order to minimize the labor of obtaining basic statistics, thought should be given to the selection of the most reliable and most readily available indicators of residential and industrial growth that can be found in the area where the study is to be made. Once this basic data has been obtained and processed, a wide variety of analyses can be made in little time and at low expense using computers.

In this report residential and industrial development were studied separately and brought together for evaluation of the net influence on communities. This separation was made largely for convenience, and also because in the case of Route 128 the industrial development was more obvious than the residential. In the unit system a segregation within study units by land-uses would be necessary for analysis purposes.

Certain additional questions would have been desirable in the industrial questionnaire. Management was asked why they chose their site on Route 128. The answers usually also implied why they left their old sites. However, a positive question directly asking why they left their old sites would have been better. From this information a more direct evaluation could have been made of the motives behind their move to Route 128. Additional questions should have been asked retarding the old site, such as, investment in old plant, taxes paid, floor space, and amount and adequacy of parking space. Dollar volume of business at old and new sites would also have been useful.

CONCLUSIONS

The principal impact of Route 128 has been the channeling of industrial development into the towns through which it passes. Residential development has also been stimulated in areas along the highway, particularly near interchanges.

The new tax revenue derived from industrial development on Route 128 has helped towns meet a part of the rising cost of municipal services that would otherwise be borne by home owners.

Route 128 industries have provided job opportunities in excess of those offered at former sites.

The attractive character of Route 128 plants has preserved the residential tone of communities. An up-grading of residential property value is noted in areas near Route 128.

Need for accessibility, land for expansion and modernization, adequate labor market along with the desire for an attractive site, were the most important factors behind the move of companies to Route 128. Regional access, free of traffic congestion so typical of in-town locations, appears as a principal reason for the choice of a Route 128 location in preference to alternate sites.

The progress of industrial development is closely related to both the highway completion schedule and zoning law changes. As the centrally located sites become filled, growth may be expected to spread along the highway. No end to the development appears in sight. New projects on Route 128 are continually being proposed and implemented.

ACKNOWLEDGMENTS

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Our deepest appreciation goes to the management staffs of companies and employees for their fine cooperation in providing the basic information for the [illegible] and travel-pattern phases of the study.

Credit is also due to Russell Larson of the M.I.T. research staff who was responsible for the residential phases of the study.

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