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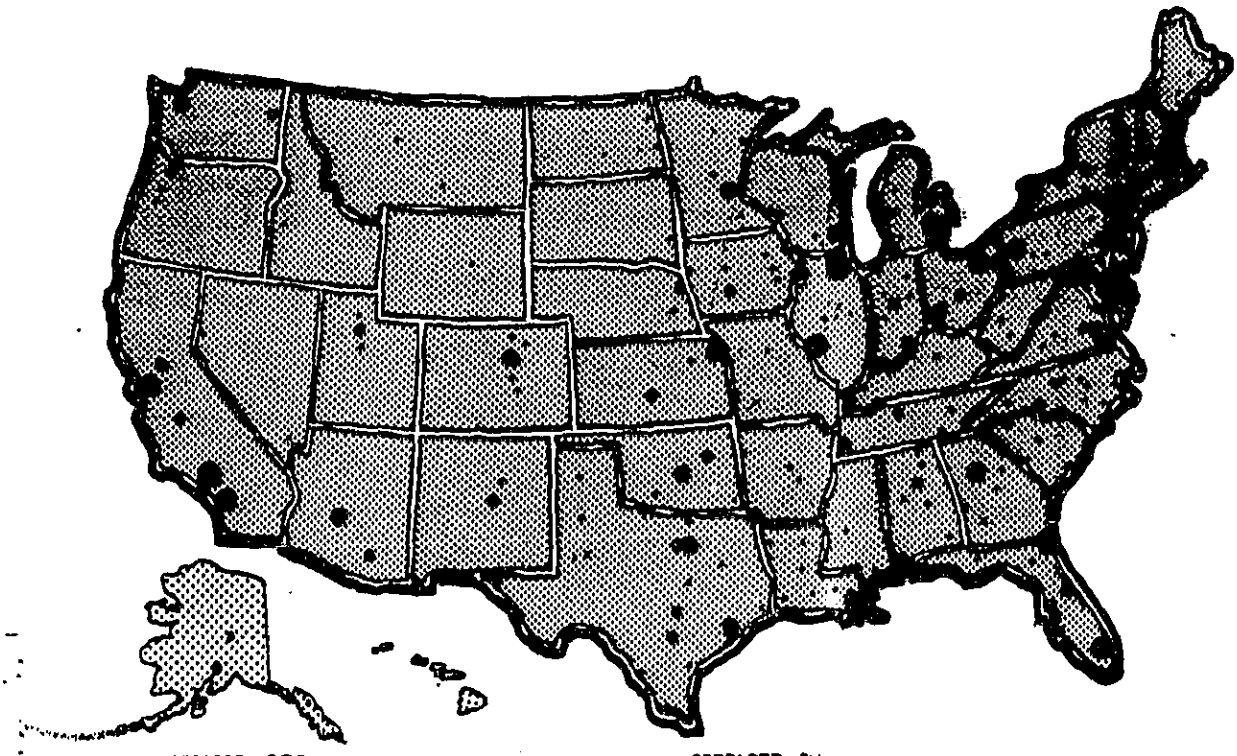
THE STATUS OF NOISE CONTROL IN THE UNITED STATES:

STATE AND LOCAL GOVERNMENTS

APRIL , 1978



PREPARED FOR:
OFFICE OF NOISE ABATEMENT & CONTROL
U.S. ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

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SECTION I: INTRODUCTION

A. BACKGROUND

The purpose of this investigation is to analyze the status of state and local noise control programs in the United States. To achieve this objective involves examining four elements.

1. Public Awareness

A primary incentive to develop an interest in environmental noise legislation, and a subsequent noise program, is public awareness. Such awareness channeled by a constitutency to elected officials is often the catalyst for public action, Furthermore, public awareness, if it is sustained, provides potential continuity to any noise program.

This section of the investigation focuses in on the degree of public awareness in the public sector. To what extent is noise recognized as a problem area? On a comparative basis, how does this issue relate to other issues facing the general public? In addition to the public at large or citizenry, another sector of the public has to be queried. This public is the

professional public or governmental official, responsible for the operation of the government agency. How is noise considered compared to other environmental issues facing an agency of the government? What appears to be the problem areas in establishing legislation, initiating and implementing a noise control program?

2. Legislation

Although the legislative history of noise at the Federal level is a rather brief seven years, states and particularly municipalities have an extensive history. Municipal noise legislation dates back to at least 1852 with the passage of the city of Boston peace and tranquility ordinance. Experiencing a rather slow initial start, the second century of municipal noise legislation has been very active. States started considerably later than municipalities with the passage of the vehicle noise law for the New York State Thruway in 1964.

This section analyzes the development of municipal and state noise legislation. A thorough review of all

legislative aspects of noise is examined, including each noise source provision. Both quantitative (acoustical) and non-quantitative (non-acoustical) noise laws are discussed. Attention is placed upon the extent to which the population is being regulated by noise. The examination of legislation offers an overview of governmental activity, including legislative emphasis.

3. Noise Control Program

The ultimate payoff in noise control is a financial commitment to a noise control program. This means assigning an administrative agency to implement the enacted legislation, and establishing a fiscal budget. Without budgetary support, these state and municipalities have only "paper regulations," regulatory programs that have legal standing and statutory authority, but no resources for their necessary implementation.

In this section, these issues are addressed and a comprehensive analysis of noise control programs are reviewed. These various budgets are compared to populations which

they are supporting. In addition, the role of Federal, state, and local programs to initiate source regulations are examined, and the need for an intergovernmental partnership to combat noise.

4. Recommendations

Based on the findings in these previous three sections, a series of recommendations are presented. These recommendations, although general in nature, are developed to assist and protect the general population, the previously established environmental noise legislation, and the significant expenditures to date.

There appear to be several problem areas that should be addressed before the public's perceived concern for noise is adequately protected. Such protection involves intergovernmental cooperation and coordination to insure that a comprehensive and efficient program is established. Additionally, this requires strong cooperation and support from the private sector, an area which needs to be considerably strengthened in the future.

B. ACKNOWLEDGEMENTS

The preparation of this status report required the compilation, review, and analysis of materials never previously examined. Considerable support was received from the Office of Noise Abatement and Control, U.S. Environmental Protection Agency, including preliminary data from the EPA Environmental Noise Control Program Survey.

In addition, a comprehensive inventory of the Municipal and State Noise Legislative Data Base maintained by the Department of City Planning, Georgia Institute of Technology was performed. This data base is the largest repository of environmental noise legislation within the United States.

C. PERSONNEL

The principal investigator for this report was Dr. Clifford R. Bragdon, Professor, Department of City Planning, College of Architecture, Georgia Institute of Technology, Atlanta, Georgia. There were several other resources that contributed heavily to

the preparation of this document. This included a team of four graduate city planning students, Mark Cameron, Steve Chipok, Gregory Fritts and Howard Osofsky. Additionally, David and Linda Lackey and Carol Cameron were responsible for coordinating the final manuscript.

SECTION II : PUBLIC AWARENESS

Noise as a perceived environmental problem has been well-documented in attitudinal surveys conducted at both the local and national level. The most comprehensive environmental survey involving a national sample has been sponsored by the U.S. Housing and Urban Development, with technical support from the U.S. Bureau of Census.

Since 1973 HUD has performed an Annual Housing Survey in an effort to determine the quality of housing. Included has been a series of questions concerning local neighborhood conditions throughout the United States. Each sample has ranged between 69,337 and 74,005 residences during the years 1973-1976.

As part of this survey, a specific question has dealt with neighborhood conditions including:

1. Noise
2. Heavy Traffic
3. Street Lighting
4. Street Repair
5. Crime

6. Commercial and Industrial Development

7. Litter

8. Odor

9. Deteriorating Housing

10. Abandoned Buildings

Noise has ranked consistently number one as the most frequently mentioned undesirable condition in residential neighborhoods. In every year of the survey, approximately one-fourth of the respondents have mentioned noise (Table 1) as the leading problem. This environmental factor has ranked well ahead of the remaining nine. Noise, for example, was mentioned three times as often as crime during the 1976 Annual Housing Survey (Figure 1). In all four years, noise has obtained nearly the same number of responses as the combined total for the second and third mentioned problems (Figure 2).

Beginning in 1975, additional replies were tabulated concerning the degree to which these neighborhood conditions influenced the respondent's desire to move. Based on these

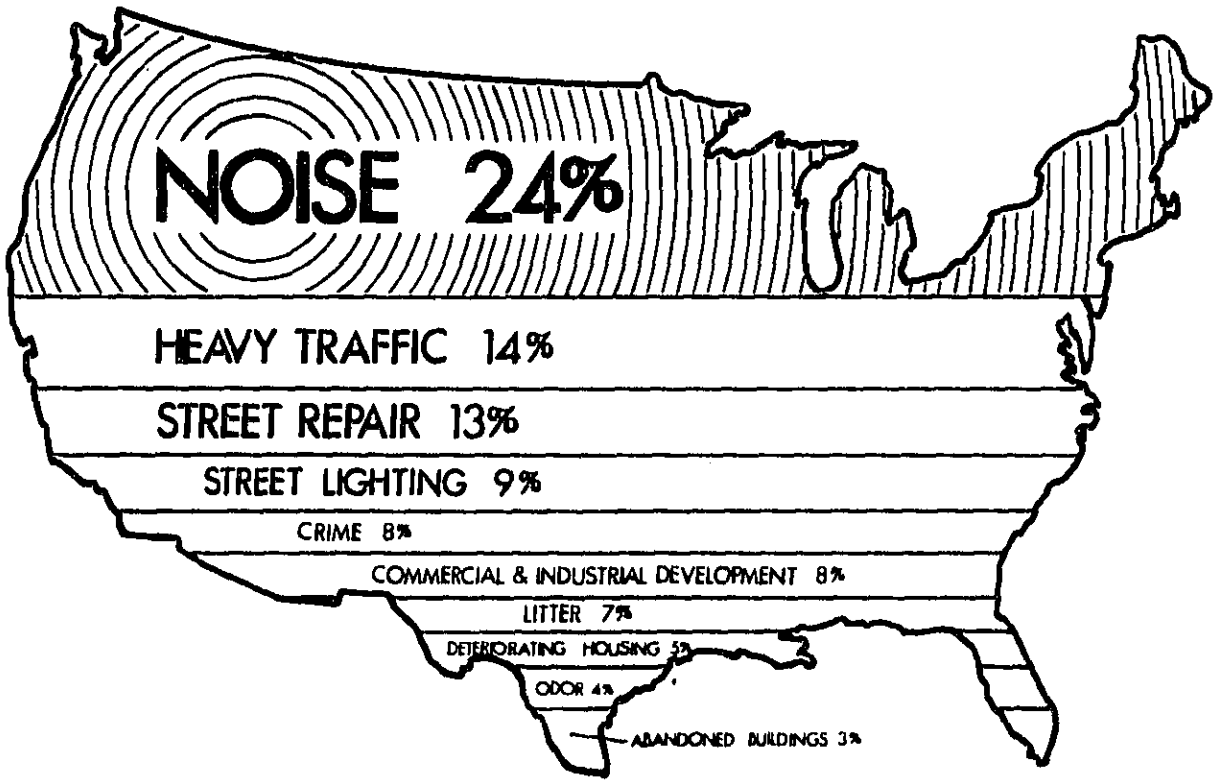


FIGURE 1 **1976**

UNDESIRABLE NEIGHBORHOOD CONDITIONS: UNITED STATES
COMPARATIVE RANKING

HUD ANNUAL HOUSING SURVEY (SAMPLE SIZE 74,005)

TABLE 1: UNDESIRABLE NEIGHBORHOOD CONDITIONS: UNITED STATES, 1973 - 1976

YEAR	NEIGHBORHOOD CONDITION (IN PERCENT)									
	NOISE	HEAVY TRAFFIC	STREET LIGHTING	STREET REPAIR	CRIME	COMM., IND. DE-VELOPMENT	LITTER	ODOR	DETERIORA-TING HOUSING	ABANDONED BUILDINGS
1973	26	17	12	8	8	8	7	7	5	3
1974	25	16	11	10	9	9	7	5	5	3
1975	24	14	12	13	9	8	7	4	4	3
1976	24	14	11	13	8	9	7	4	5	3

Notes:

1) 1973 sample 69,337
2) 1974 sample 70,830
3) 1975 sample 72,523
4) 1976 sample 74,005

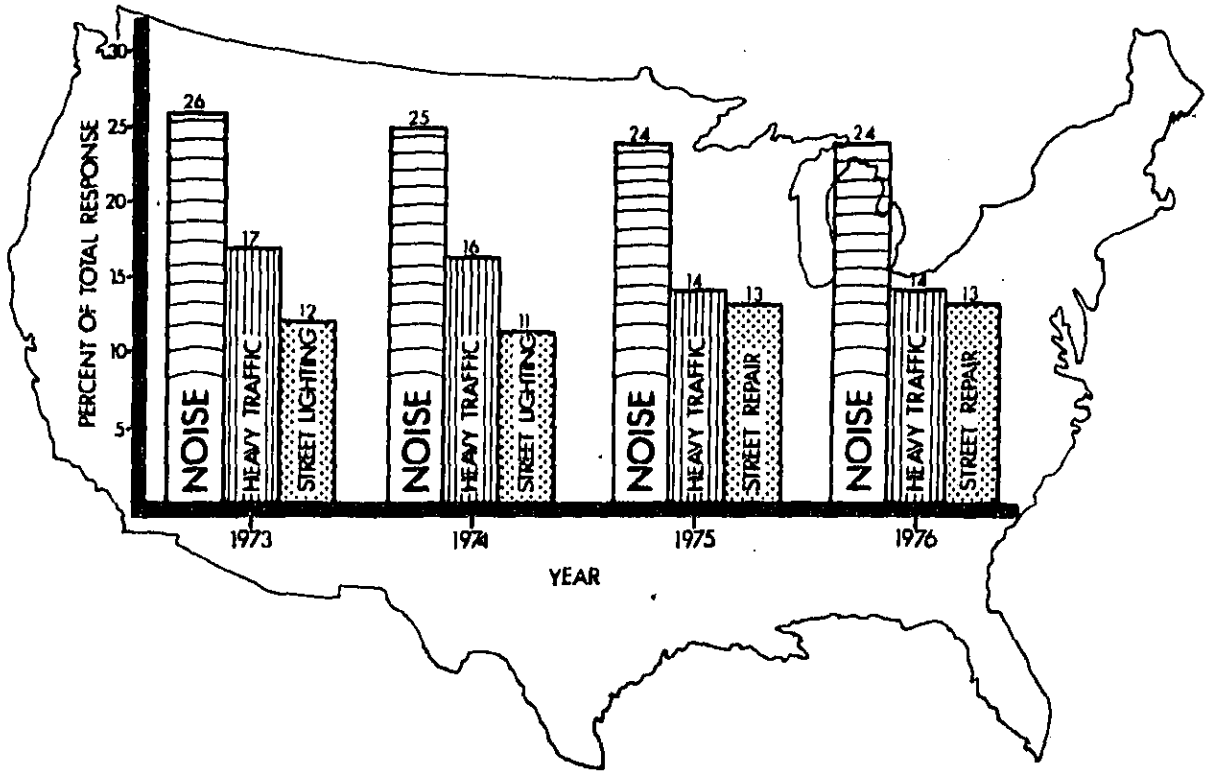


FIGURE 2 **1973 - 1976**

UNDESIRABLE NEIGHBORHOOD CONDITIONS: UNITED STATES

HUD ANNUAL HOUSING SURVEY (SAMPLE SIZE 69,337 - 74,005)

surveys (Table 2) noise was given as the leading reason for moving from their neighborhood, if airplane and street noise is combined. Crime also was considered a major factor for moving, second only to noise. Approximately one-fifth of the respondents were bothered by noise to the extent they wanted to leave their present neighborhood.

In summary, noise appears to be a major environmental factor influencing the quality of the neighborhood. It ranks as the singular neighborhood condition, surpassing crime, street condition, traffic, litter, and deteriorating housing, among others. Noise is not only the most commonly mentioned neighborhood problem, but it is given as the leading reason for residents desiring to leave their neighborhood.

Beside the U.S. Housing and Urban Development Annual Housing Survey, the U.S. Environmental Protection Agency has initiated a survey which contains questions addressing public awareness. Administered by the Office of Noise Abatement and

TABLE 2: UNDESIRABLE CONDITIONS AND DESIRE TO MOVE: 1975 - 1976

DESCRIPTION	1975		1976	
	NUMBER	%	NUMBER	%
TOTAL SAMPLE	72,523		74,005	
NO UNDESIRABLE CONDITIONS	16,609	23	16,844	23
YES UNDESIRABLE CONDITIONS	55,634	76	56,954	76
HOUSEHOLDS WOULD NOT LIKE TO MOVE	47,396	85	48,406	85
HOUSEHOLDS WOULD LIKE TO MOVE	8,050	14	8,445	14
BECAUSE OF: AIRPLANE NOISE	701	4	858	4
STREET NOISE	2,751	16	2,864	15
HEAVY TRAFFIC	2,358	13	2,590	13
STREET REPAIRS	1,283	7	1,418	7
ROADS IMPASSABLE	899	5	928	5
POOR STREET LIGHTING	920	5	1,042	5
CRIME	2,933	17	3,113	16
LITTER	2,034	12	2,243	11
ABANDONED BUILDINGS	670	4	723	4
DETERIORATING HOUSING	1,411	8	1,648	8
COMMERCIAL OR INDUSTRIAL DEVELOPMENT	780	4	767	4
ODOR	736	4	1,461	7

Control, this survey has been sent to all municipalities containing a population in excess of 25,000. Mailed to 870 jurisdictions (state and local governments) the Environmental Noise Control Program Survey has received 356 replies, as of March, 1978.

Two particular questions address the issue of public awareness, even though these questions were posed to governmental agencies. It appears as though noise is an issue of growing concern, particularly in states where 79% replied affirmatively (Table 3). Even though the municipal percentage is less, 57%, noise appears to be a recognizable and growing issue perceived by the public.

One reason for such recognition is the fact the public usually associates noise with the issue of health and welfare. In other words, noise represents an issue of concern because the citizenry believes that environmental noise affects their health and welfare. Again, the State percentage was highest with 89% responding yes, with the municipalities responding yes 52% (Table 4).

TABLE 3: PUBLIC AWARENESS

"Is The Noise Issue A Growing Concern In Your Community?"

JURISDICTION	RESPONSES	YES	%	NO	%
State	26	20	79	6	21
Municipal	330	188	57	142	43

Source: E.P.A., Environmental Noise Control Program Survey, 1978 (Preliminary Data, March, 1978).

TABLE 4: PUBLIC HEALTH AND WELFARE

"Is The Noise Issue Viewed As A Problem Affecting The Health And Welfare of The Citizens In The Community?"

JURISDICTION	RESPONSES	YES	%	NO	%
State	26	19	89	7	11
Municipal	330	172	52	158	48

Source: E.P.A., Environmental Noise Control Program Survey, 1978 (Preliminary Data, March, 1978).

In summary, noise has gained strong recognition among the general population. It is a leading neighborhood problem area that strongly influences residents to relocate into a quieter neighborhood environment. It appears that noise consistently remains to be a leading neighborhood problem. Among government agencies, they also see expressed public concern for noise with a higher degree of concern expressed to state agencies than local agencies.

SECTION III: LEGISLATION

A. STATE

The recognition of noise and legislative activity is relatively new among state governments. Although there are recorded examples of nuisance type noise laws associated with vehicle mufflers dating back to the 1940's, the first quantitative law was enacted in New York. In 1964, New York passed the first motor vehicle law with acoustical emission provisons. It was applied only to trucks, operating at speeds above 35 miles per hour, on the New York State Thruway. State legislative activity did not begin to grow until this decade, with California initiating the first major noise control program in 1971.

The tempo in legislative activity grew rapidly, doubling each year from 1971 to 1974 (Figure 3). Since 1974 this earlier growth has been leveling off. Today 27 states have quantitative noise laws representing 65.5%, or 132,625,867 of the total U.S. population (U.S. Census, 1970), as shown in Figure 4. Although this clearly represents the majority of the population and existing

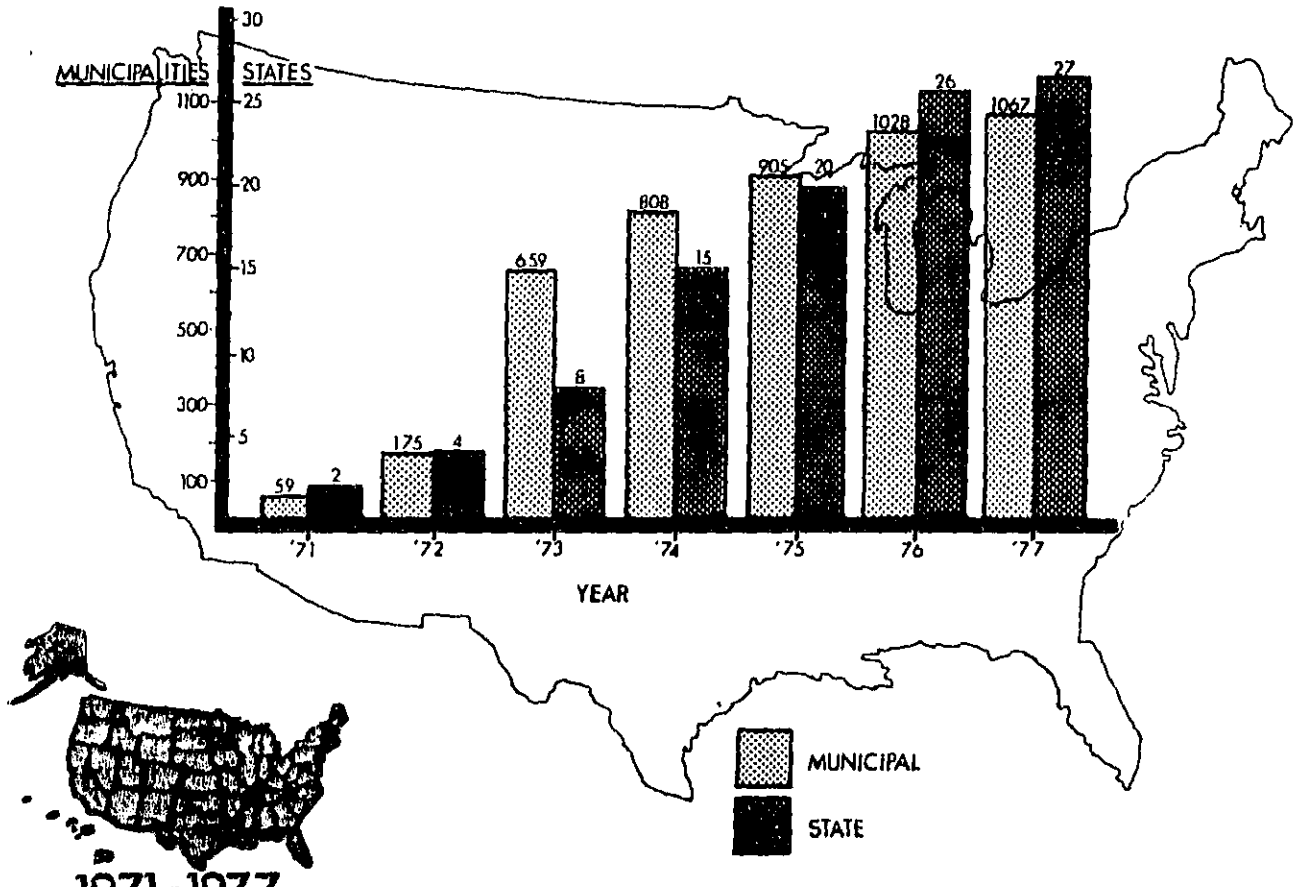


FIGURE 3 1971-1977

STATE & MUNICIPAL NOISE LEGISLATION: TOTALS

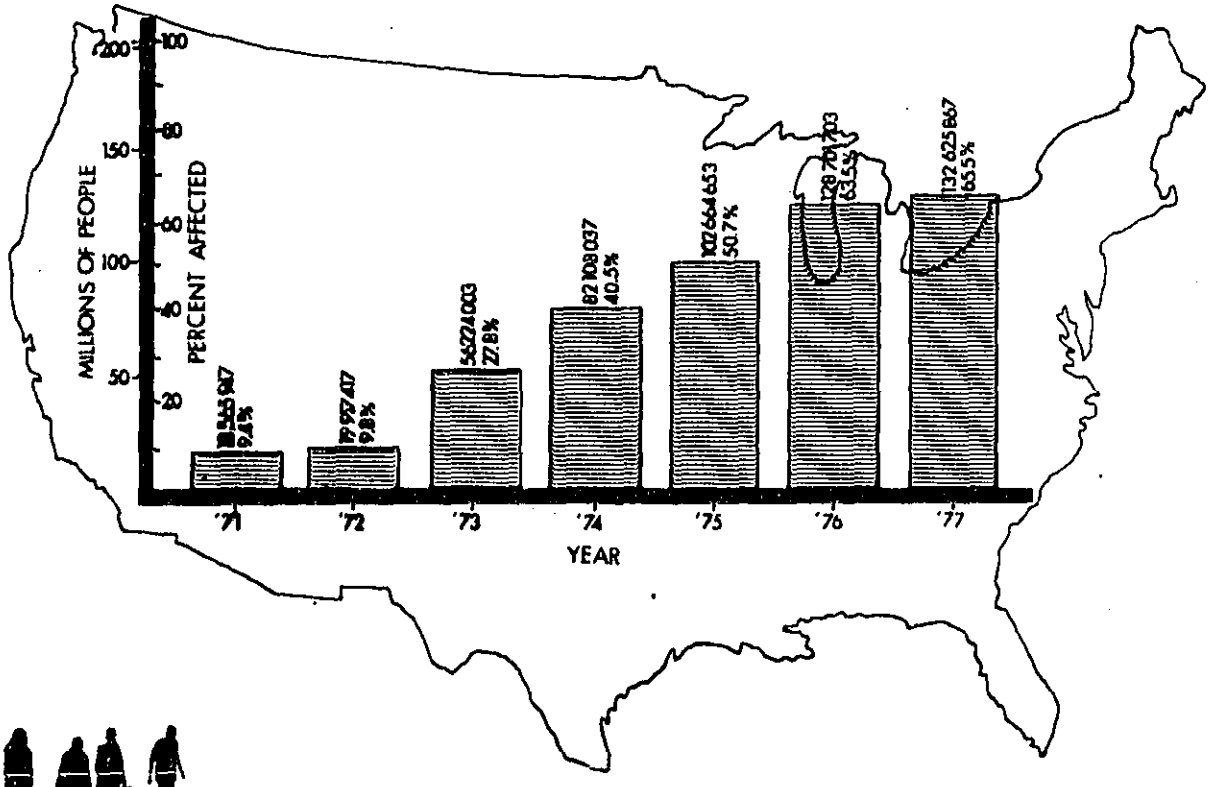


FIGURE 4 1971-1977

U.S. POPULATION AFFECTED BY NOISE LEGISLATION: STATE LAWS

states, a sizable minority of legislatures have chosen not to enact state laws. These states are principally located in three areas of the United States, the southeast, southwest, and to a lesser extent, the middle west (Figure 5).

Although there are 27 state governments involved in regulating noise, most states regulate only a select number of noise sources. Typically, a state has provisions regulating one or possibly two categories of sources (e.g., motor vehicles and recreation vehicles) as illustrated in Table 5. Today, there are only four states containing provisions regulating three or more noise source categories (California, Maryland, Oregon, and Washington).

1. Recreation Vehicles

More states have decided to enact recreational vehicle noise limits than any other single category (Table 5). The initial interest in establishing recreational vehicle limits was in response to the purchase and use of snowmobiles. Consequently,

TABLE 5: STATE NOISE REGULATIONS: 1971 - 1977 ACOUSTICAL PROVISIONS

YEAR	NUMBER OF STATES	POPULATION	CATEGORIES OF REGULATIONS						
			ZONING/ LAND USE	VEHICLES	RECREATION VEHICLES	RAIL-ROADS	AIR-CRAFT	CONSTRUCT. SITES	BUILDING CODES
1971	2	18,565,947	0	1	1	0	0	0	0
1972	4	19,917,417	0	2	2	0	0	0	0
1973	8	56,224,003	2	5	5	0	0	0	0
1974	15	82,108,037	3	10	9	0	0	1	0
1975	20	102,664,653	3	14	12	0	1	1	1
1976	26	128,701,703	7	16	18	0	1	1	1
1977	27	132,625,867	7	17	22	0	1	1	1

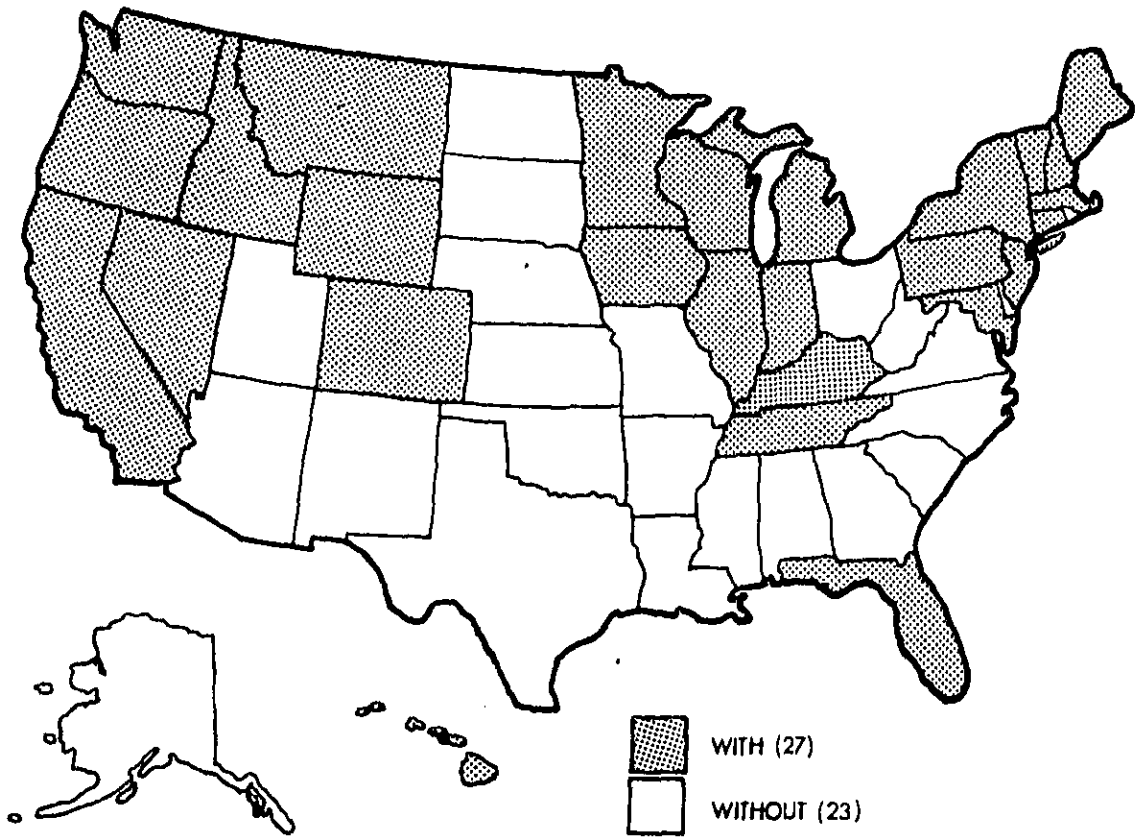


FIGURE 5 **1977**

STATES WITH NOISE CONTROL LEGISLATION

the snowbelt states were the first to begin regulating recreational vehicles. Additional recreational equipment subsequently appeared, including all-terrain vehicles, dune buggies, and engine powered water skis. Motor boats have been the object of regulation most recently. Currently there are 22 different states with quantitative noise emission provisions (Figure 6). In most instances, the levels are expressed as a maximum pass-by, in decibels A-scale (dBA), measured at a perpendicular distance of 50 feet from the source.

2. Motor Vehicles

Motor vehicles were the first source to be state regulated. In most situations, the states regulate three classes of vehicles: trucks, automobiles, and motorcycles, which are generally classified by weight, rather than by name. Since 1973, there have been significant increases in motor vehicle activity (Figure 7).

Today, 17 states have enacted some form of

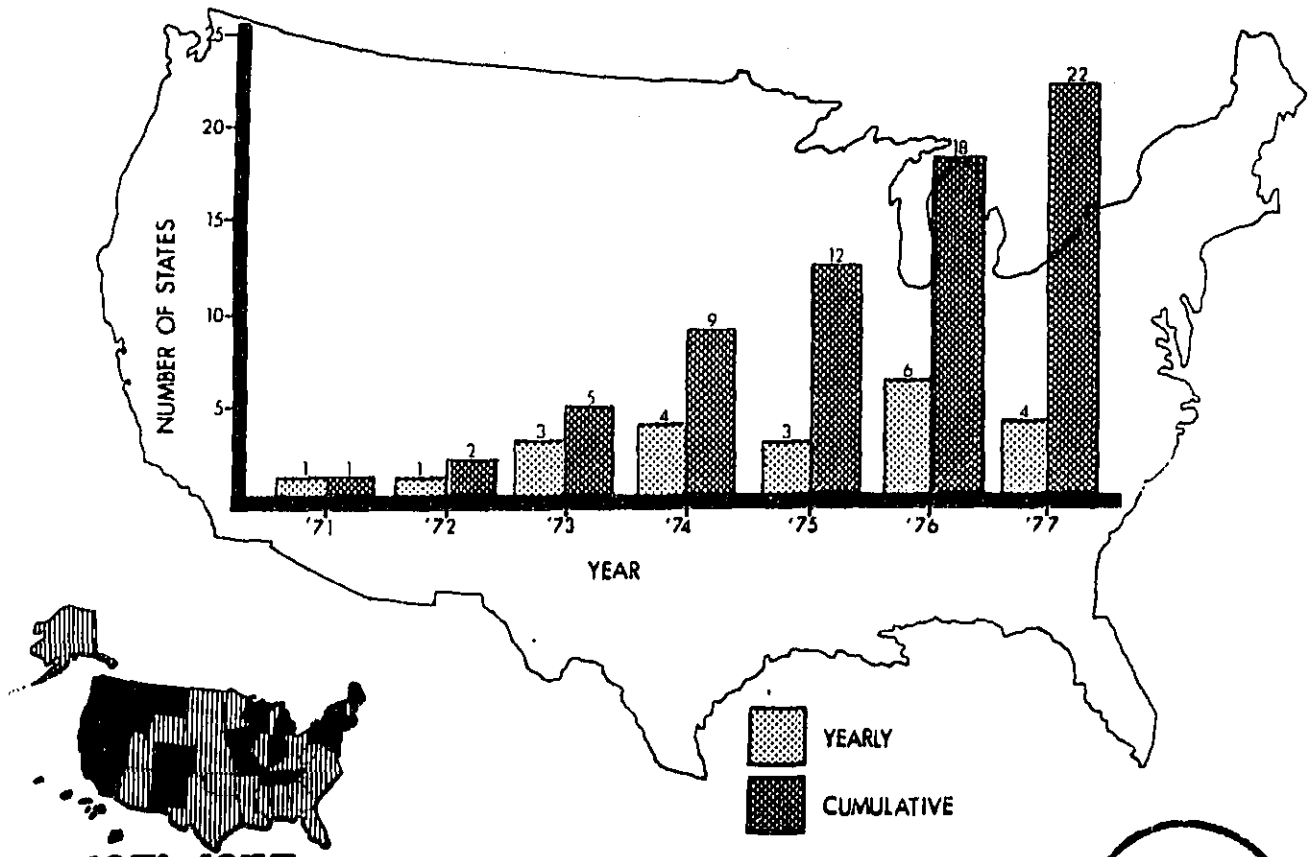
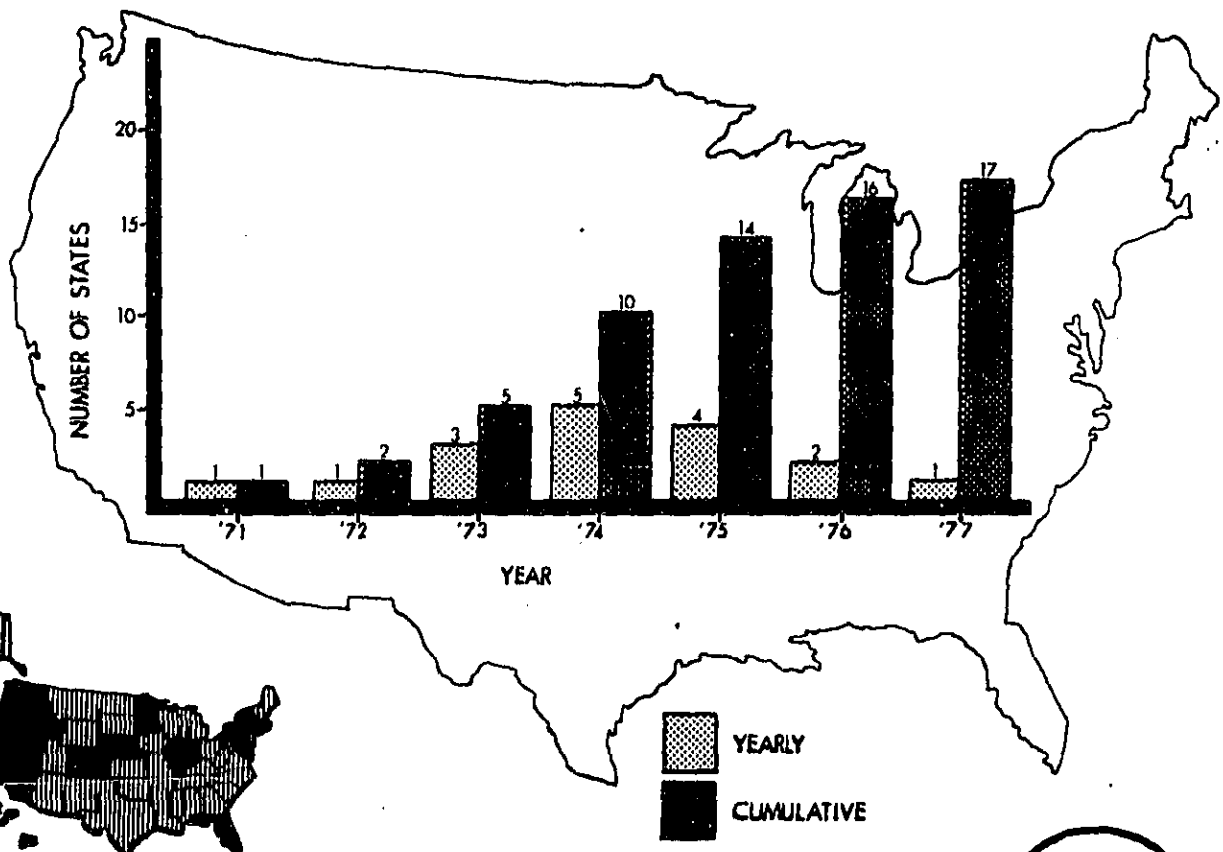


FIGURE 6 **1971–1977**
STATE NOISE REGULATIONS:
RECREATION VEHICLES (ACOUSTIC)



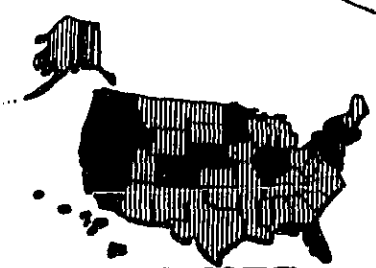


FIGURE 7 **1971–1977**

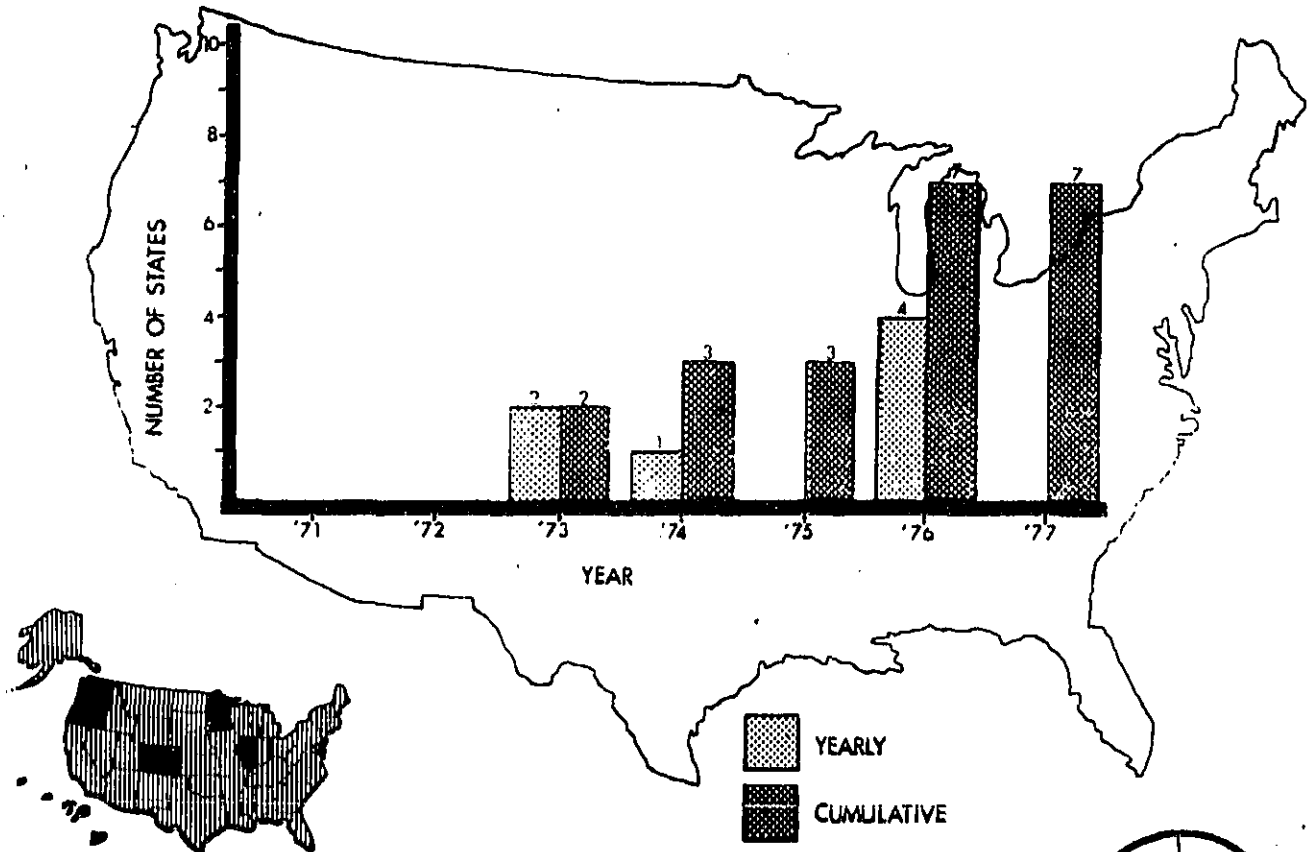
STATE NOISE REGULATIONS: MOTOR VEHICLES (ACOUSTIC)

quantitative noise emission provision. The permissible limits are generally uniform among states regulating trucks. This has been heavily influenced by the EPA enacted Interstate Motor Carrier Regulation. All states with truck regulations (8,000 lbs., gvw or more) have adopted the same noise emission limits as EPA. There is considerable variation among the noise emission levels for sources other than trucks, however.

Similar to recreational vehicles, the permissible noise emission levels are expressed in decibles A-scale (dBA). States regulate these vehicles in terms of point or stationary, and line or mobile noise sources. For moving vehicles, the distance for measurement varies with the permissible noise emission limit. However, all measurements occur from the path of the centerline of the vehicle.

3. Zoning/Land Use

States specifically establishing noise emission levels for categories of land use were first enacted in 1973 (Figure 8). Since that year there has been a slow



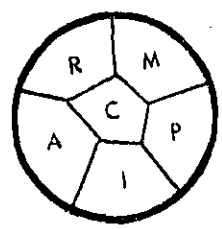


FIGURE 8 1971-1977

STATE NOISE REGULATIONS: ZONING (ACOUSTIC)

but continuous growth until 1976. Currently there are seven states with a zoning or land use provision for noise. In all instances, the states have established three basic categories of land use, which include:

a. Residential and Institution

That land containing residences in varying densities from single-family detached to high rise apartment, and institutional related uses defined as education, health, and religious in character fall into this category.

b. Commercial and Business

Permitted uses include commercial and business enterprises such as retail facilities. In addition, office related uses would be included.

c. Manufacturing and Industry

This category of use includes those activities where there is a production process involving mechanical equipment. Typical examples would be metal fabricating, wood working or extractive industries.

Generally, the maximum permissible noise levels are enforced at the property line, or receiver location. In most instances, these levels apply to stationary or point type noise sources. These states usually apply the A-weighting scale (dBA) as the unit of decibel measurement, however, in certain states, they also include frequency analysis by octave or third-octave band. The permitted level in the majority of states varies with time, the evening and nighttime conditions being the most restrictive period of the day.

4. Aircraft

Only California has established aircraft noise limits (Figure 9). The initial law contained two provisions. One provision established a maximum noise level for each single aircraft flyover, referred to as a single event noise level. The second provision is aimed at regulating the airport, rather than each aircraft flight. This part of the California law establishes a 24-hour maximum noise level for certain sized

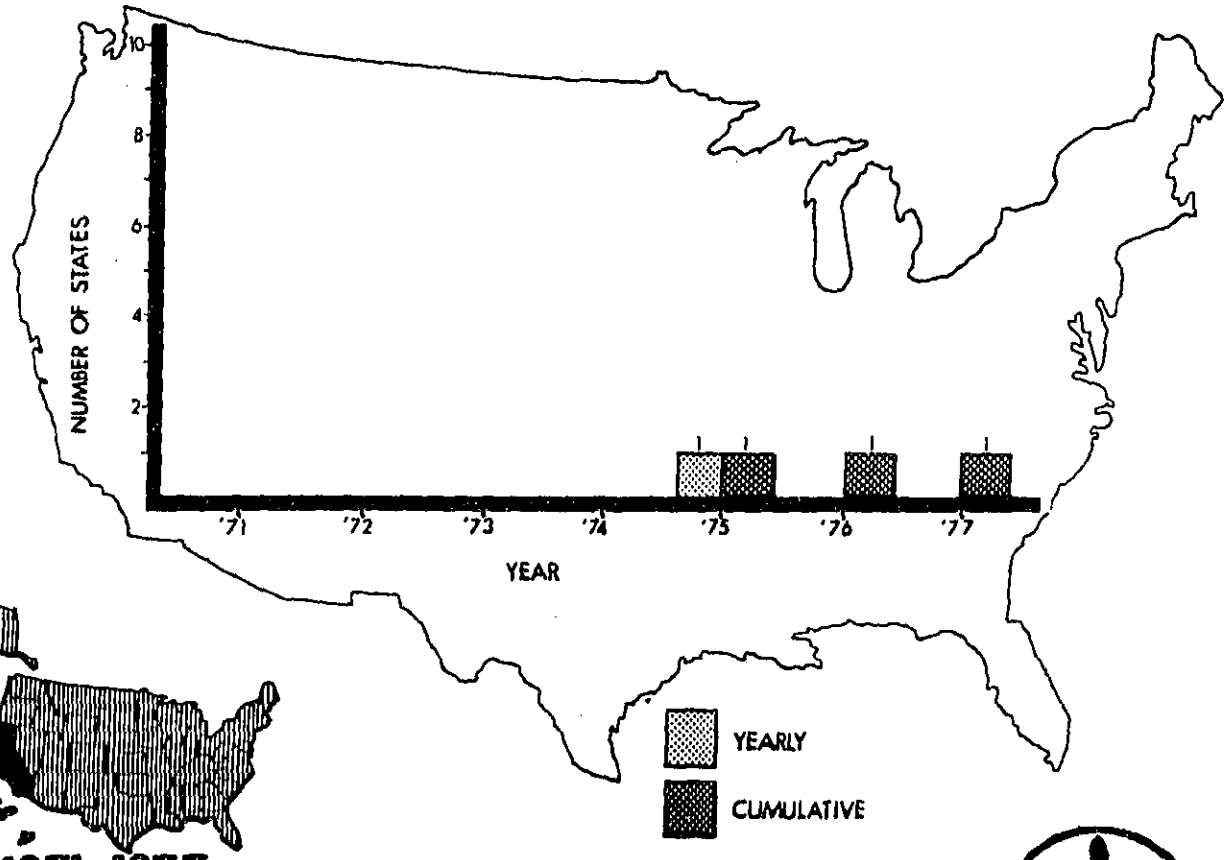


FIGURE 9 **1971-1977 STATE NOISE REGULATIONS: AIRCRAFT** (ACOUSTIC)

airports, based on aircraft operations. Referred to as the Community Noise Equivalent level (CNEL), the airport is required not to exceed a noise ceiling for any given 24-hour period.

Recent court interpretation has upheld the state's legal right to establish and enforce this second provision. However, there is a question concerning the legality of California and the Department of Aeronautics to establish noise emission levels for individual aircraft. This provision has been observed as being in conflict with the F.A.A. Act and the Federal responsibility to regulate navigable airspace. Such a provision may be in conflict with interstate commerce.

Today, those airports operating in California that must comply with the state requirement have established airport noise monitoring systems at selected on and off-airport locations.

5. Construction

Construction site activity can be a major contributor to the overall community noise level (Figure 10).

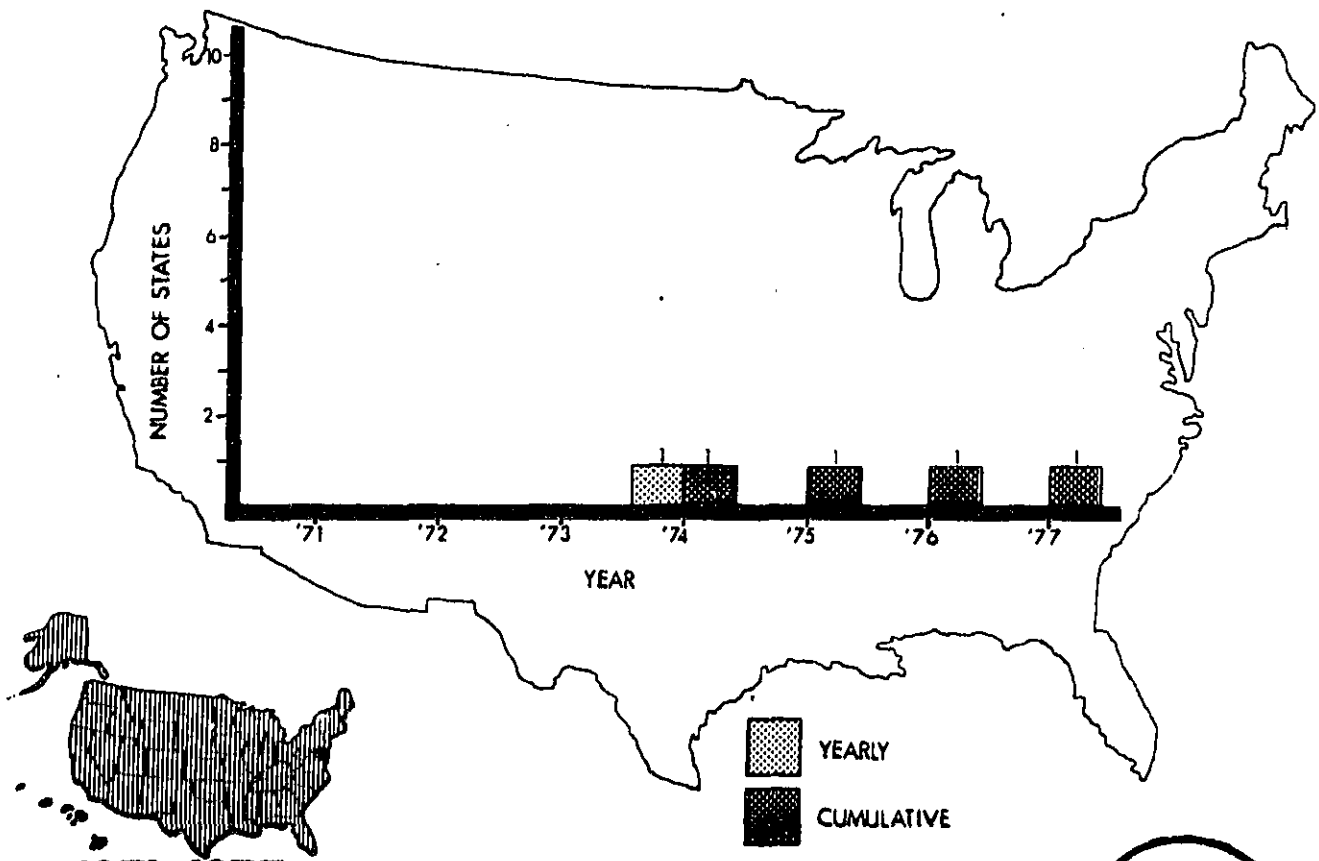


FIGURE 10 **1971–1977**

STATE NOISE REGULATIONS: CONSTRUCTION (ACOUSTIC)

Although the level of this noise is a function of construction activity phase, project size, and construction cycle, only Maryland has a noise provision. The Maryland state law is based on classifying construction as an industrial activity. Any construction occurring is subject to the permissible noise limits for industrial land use.

6. Building Code

California is the only state that has established (Figure 11) a building code with noise limits. This code applies to public buildings that may be affected by instrusive environmental noise sources. Maximum interior noise levels are measured within the receiving building, using the descriptor CNEL (Community Noise Equivalent Level). If the level measured from the external environment exceeds 45 CNEL, then an incompatible condition exists. Under such circumstances, ameliorative action is necessary to reduce the interior level transmitted through the building.

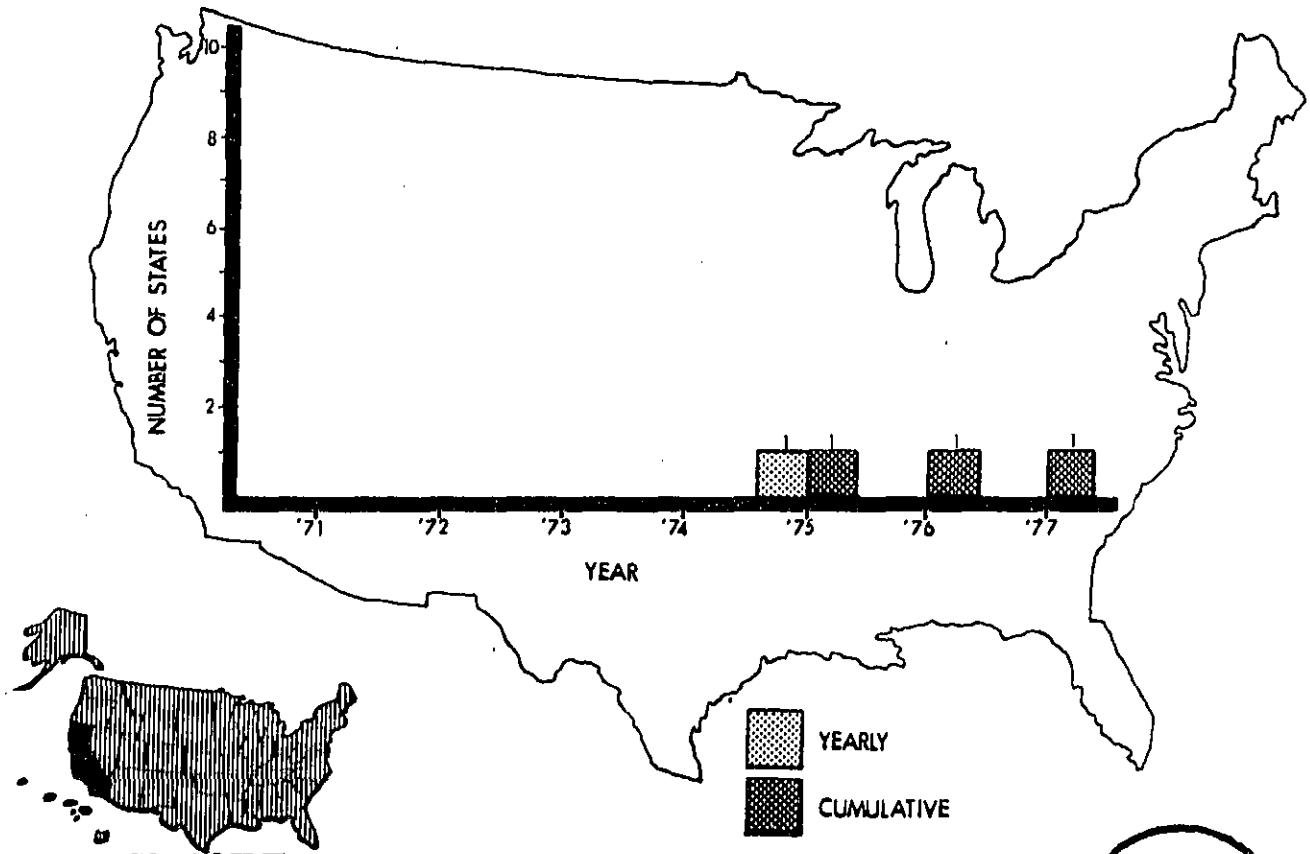


FIGURE 11 **1971-1977**

STATE NOISE REGULATIONS: BUILDING CODE (ACOUSTIC)

A major inventory has been conducted in California to determine the number of presently sited public buildings that may not be in compliance with this code. Most incompatible environments have been particularly concentrated around transportation generators, highways and airports.

B. MUNICIPALITIES

Legislative efforts to control noise first occurred at the municipal level. The earliest municipal experiences in the United States date back to the 1860's. Activity during this time dealt with common law issues of nuisance. This generally concerned peace and tranquility or the personal right for the individual to have privacy from the cacophony of the city. Disturbance of the peace, still a legally supportable concept, gave way to more definable and quantitative measures of noise with advancing technology.

Two major scientific institutions heavily influenced the introduction of quantifiable measures of noise. Bell Telephone

Laboratories advanced technological developments in sound measurement and the Armour Research Institute in the application of quantifiable noise measurements to a municipality. Beginning with the New York City noise survey in 1929, where actual physical measurements of noise were first recorded, the foundation for a comprehensive noise law was established. The final report recommendations became a mode for other jurisdictions to emulate. Over a decade later, the Armour Research Institute began to examine the issue of land use activity and permissible emission limits. This research became a standard for comparison by which other jurisdictions were judged and compared.

Despite all these efforts, even up to 1960, few municipalities (less than 50) had adopted quantitative noise emission provisions. As late as 1971, just 59 local governments had enacted any type of law (Table 6 and Figure 12). However, this decade has experienced a major development of noise legislation, from 59 municipalities in 1971 to 1,067 by 1977. Several key cities

TABLE 6 : MUNICIPAL NOISE REGULATIONS, 1971 - 1977

ACOUSTICAL AND NON-ACOUSTICAL PROVISIONS

Year	Number of Municipalities	Population	CATEGORIES OF REGULATIONS															
			Nuisance		Zoning/ Land use		Vehicle		Rec. Vehicle		Rail-road		Air-craft		Const. Site		Bldg. Code	
			Acoustical Criteria															
			Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
1971	59	17,745,099	2	48	19	4	7	6	0	1	1	3	2	3	5	10	2	2
1972	175	47,208,593	24	124	53	9	15	27	0	1	1	3	7	6	7	23	8	4
1973	659	52,401,919	24	229	466	14	29	57	1	1	1	3	7	7	9	33	11	4
1974	808	62,125,517	66	322	509	17	64	57	2	2	1	3	20	8	11	36	23	4
1975	905	66,294,095	113	359	563	18	117	93	45	17	12	6	26	8	42	55	23	8
1976	1028	67,383,478	158	410	594	22	139	115	50	20	16	9	26	9	45	71	26	9
1977	1067	67,972,178	163	443	602	23	153	129	59	22	16	11	26	9	51	76	29	13

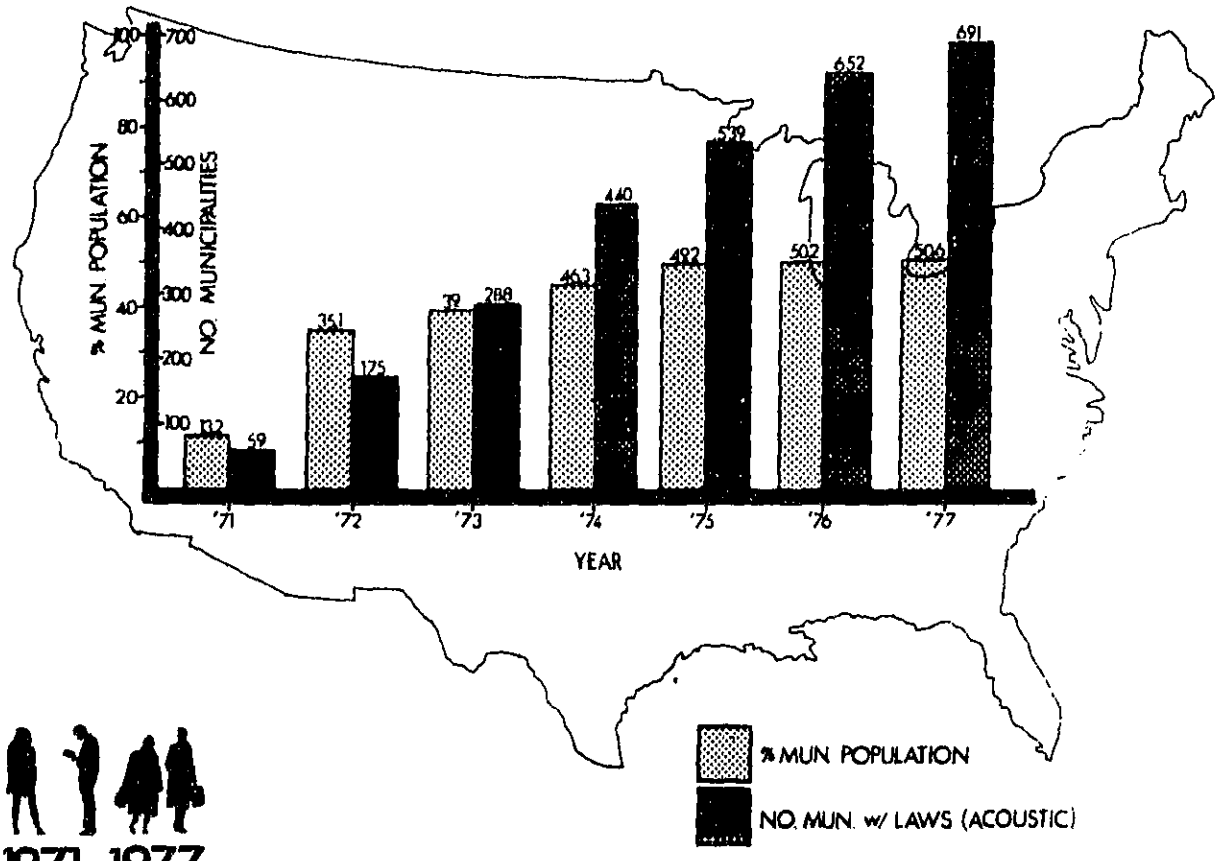


FIGURE 12 **1971 - 1977**

MUNICIPALITIES WITH NOISE LEGISLATION & PERCENTAGE OF MUNICIPAL POPULATION AFFECTED

stimulated this rapid development in legislative noise activity including Chicago, Inglewood, California, and Boulder, Colorado. In addition, the National Institute of Municipal Law Enforcement Official (NIMLO) and EPA, Office of Noise Abatement and Control (ONAC) have provided major guidance. Today, there are now over 50% of the U.S. municipal population regulated by noise, 67,972,178 (50.6%) in contrast to 17,745,099 (13.2%) in 1971 (Figure 13).

Despite this apparent large number, it is important to recognize that very few cities appear to have comprehensive noise programs, where at least three different categories of noise sources are regulated. For example, there are less than 80 cities that appear to have established limits regulating land use, motor vehicles, and construction noise using quantitative or acoustical limits. This figure, therefore, represents approximately 7% of all cities having noise laws.

1. Zoning/Land Use

Land use controls were the first form of

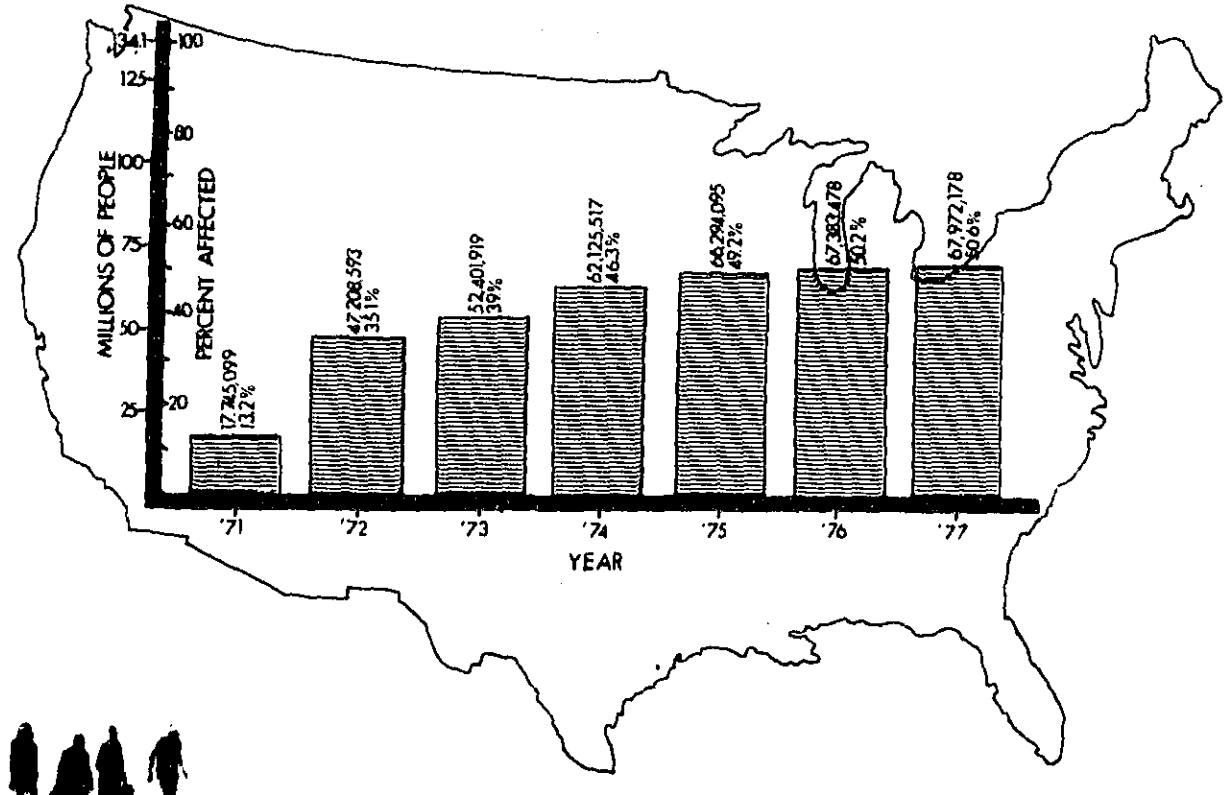


FIGURE 13 1971-1977

MUNICIPAL POPULATION AFFECTED BY NOISE LEGISLATION: MUNICIPAL LAWS

municipal noise legislation incorporating quantitative provisions. This use of the police power represents the most popular form of noise control today. Presently, there are 602 municipalities which utilize this quantitative approach (Figure 14). These provisions are usually contained either in the zoning ordinance, or in the master or in the comprehensive plan. Similar to the state statutes, these provisions generally apply to stationary or point sources, that is, sources fixed to the land such as industries.

The basic categories of land addressed generally include residential and institutional uses, commercial and business, and manufacturing and industrial. Often a more definitive breakdown of land uses are contained in the ordinance which corresponds to the Standard Land Use Classification Manual (SLUCM) or Standard Industrial Classification (SIC).

A major reason for the marked growth of municipal activity between 1972 and 1973 is the State of Illinois

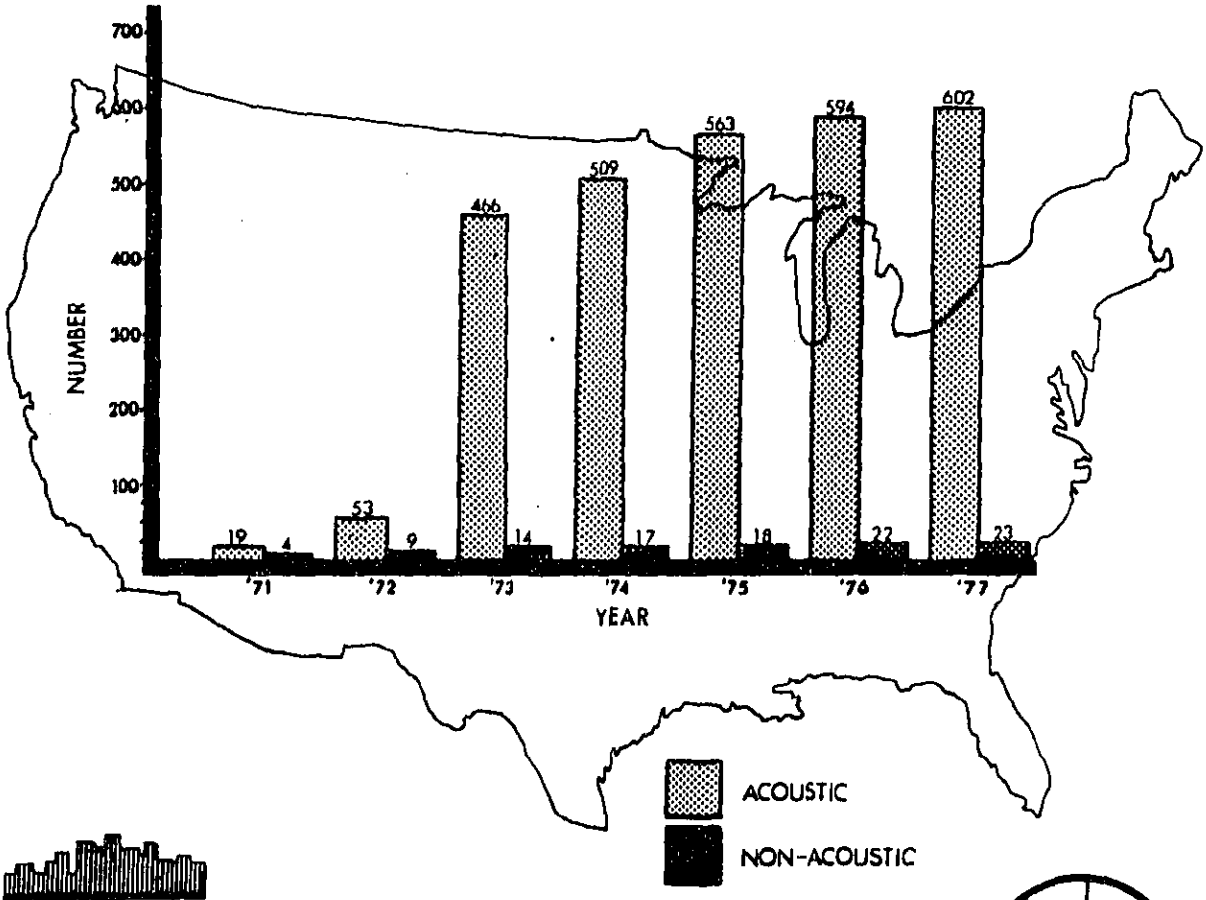
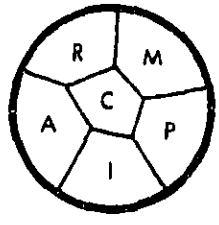


FIGURE 14 1971-1977

U.S. MUNICIPAL NOISE REGULATIONS: ZONING



Environmental Protection Agency, Noise Regulation, adopted July 26, 1973. This land use provision has been interpreted to be applicable to all municipalities in Illinois, which number over 300. Additionally, the Model Community Noise Control Ordinance, developed by EPA in conjunction with the National Institute of Municipal Law Enforcement Officers (NIMLO) has attracted considerable national interest. This in turn has stimulated states to develop model noise guidelines for their respective municipalities.

The majority of these provisions establish a maximum noise level (usually expressed in dBA), without regard for time duration. Typically, these emission limits are enforced at the property boundary of the offending source.

2. Motor Vehicles

Municipal regulation of motor vehicle noise is the second largest category of noise control. Generally, cities regulate three distinctive types of motor vehicles, described in terms of weight, automobiles, trucks, and motorcycles. Currently, there are 153 municipalities which use

acoustic provisions (Figure 15). The rather large number of non-acoustic laws generally apply to mufflers and their performance (e.g., vehicles equipped with unnecessarily loud mufflers are prohibited by law).

Many localities are adopting emission levels comparable to those contained in the EPA Interstate Motor Carrier Regulation. Others, however, remain inconsistent with these Federal noise provisions.

Similar to the States, all these cities utilize the decibel A-weighted scale (dBA) as their noise descriptor. The noise measurement location is usually 50 feet from the center-line of the path of the moving vehicle, although in many instances there are corrections for changing the distance. In a few instances, municipalities are beginning to adopt a stationary test procedure for vehicle noise enforcement.

3. Recreation Vehicles

The interest of cities in regulating recreational type vehicles is decidedly smaller than for over-the-road

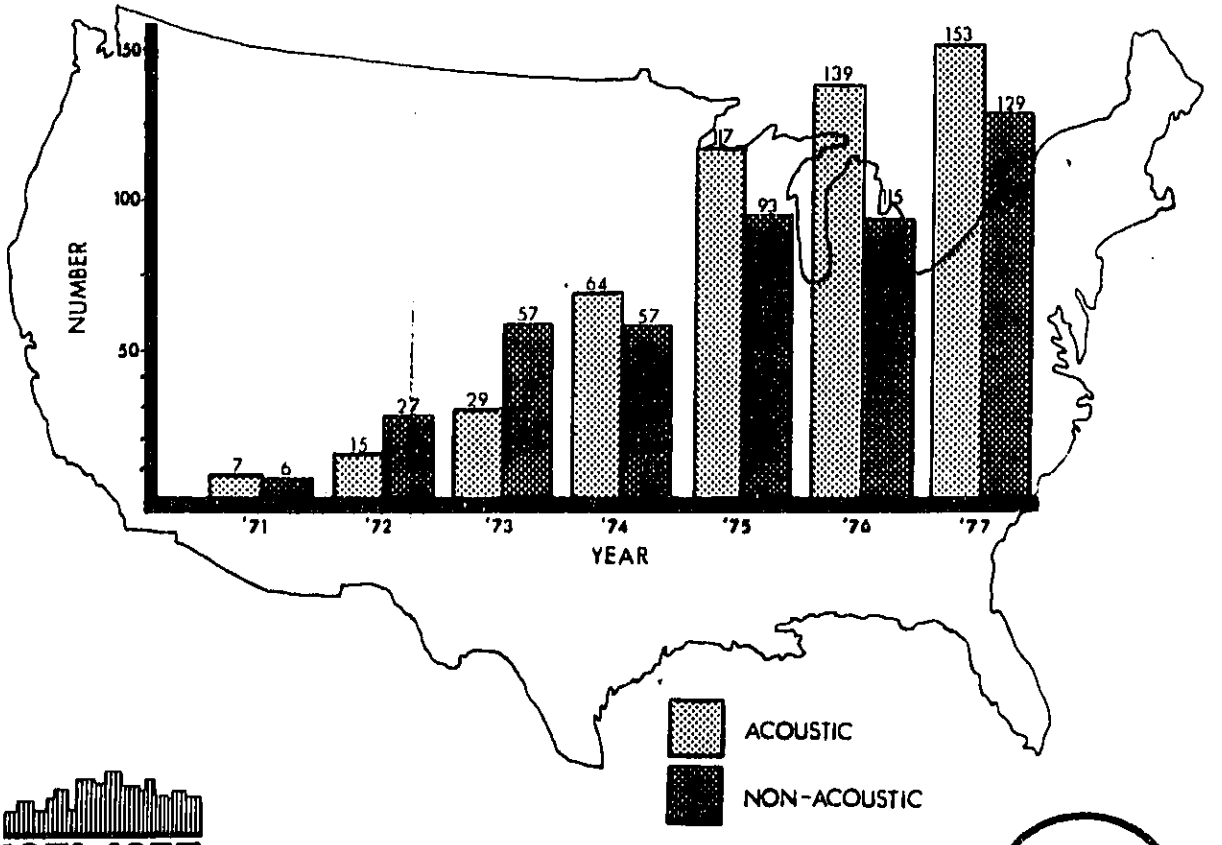


FIGURE 15 1971-1977

U.S. MUNICIPAL NOISE REGULATIONS: MOTOR VEHICLES

vehicles. Today 59, or 39% of the municipalities establishing vehicle laws have some acoustic provision regulating such vehicles as snowmobiles, all-terrain vehicles, trail bikes, dune buggies, and motor boats (Figure 16). Snowmobiles and motor boats with outboard engines, are the most common municipally regulated sources.

In most instances, the A-weighted scale, expressed in decibels (dBA), is selected by the local jurisdictions for enforcement purposes. Most of these laws are enforced in the field with the source operating in a mobile rather than a stationary manner. Usually, the provision contains a minimum distance of 50 feet between the source and the receiver (i.e. acoustical instrumentation). It is interesting to note the lack of legislative activity prior to 1975 (Figure 16). There have been several reasons for this rapid rise since 1974. The reasons include the EPA-NIMLO Model Community Noise Control Ordinance, state legislation, the U.S. Forest Service and the National Park Service, and self-imposed industrial noise limits.

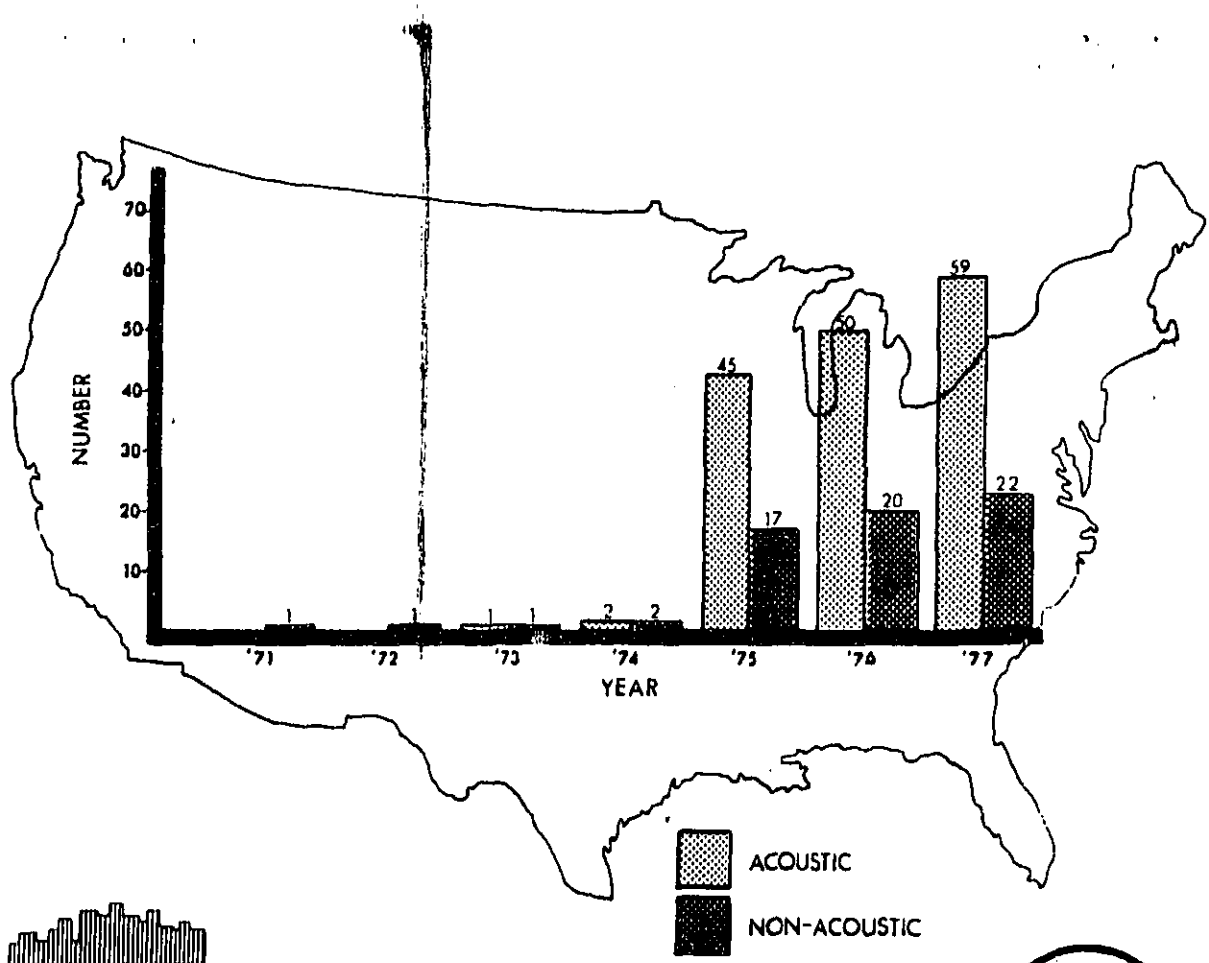


FIGURE 16 1971-1977

U.S. MUNICIPAL NOISE REGULATIONS: RECREATION VEHICLES

It is anticipated that activity in this area will expand rapidly. Beside establishing source specific levels, many jurisdictions are beginning to examine controls over the area where and when recreational vehicles are permitted to travel and operate.

4. Construction

Municipalities have consistently regulated construction noise activity. However, most of these provisions are based on non-acoustic criteria (Figure 17). Usually, they regulate the construction hours of a site, restricting construction to daytime hours (7:00 - 6:00 p.m.).

The types of acoustical criteria vary considerably among municipalities. Often specific pieces of equipment have maximum permissible levels, operating under normal conditions. Typically, the equipment levels expressed in dBA, are measured at a distance of 50 feet. Another group of communities do not restrict the limits of specific equipment, but rather address aggregate or area construction site noise. Some utilize the

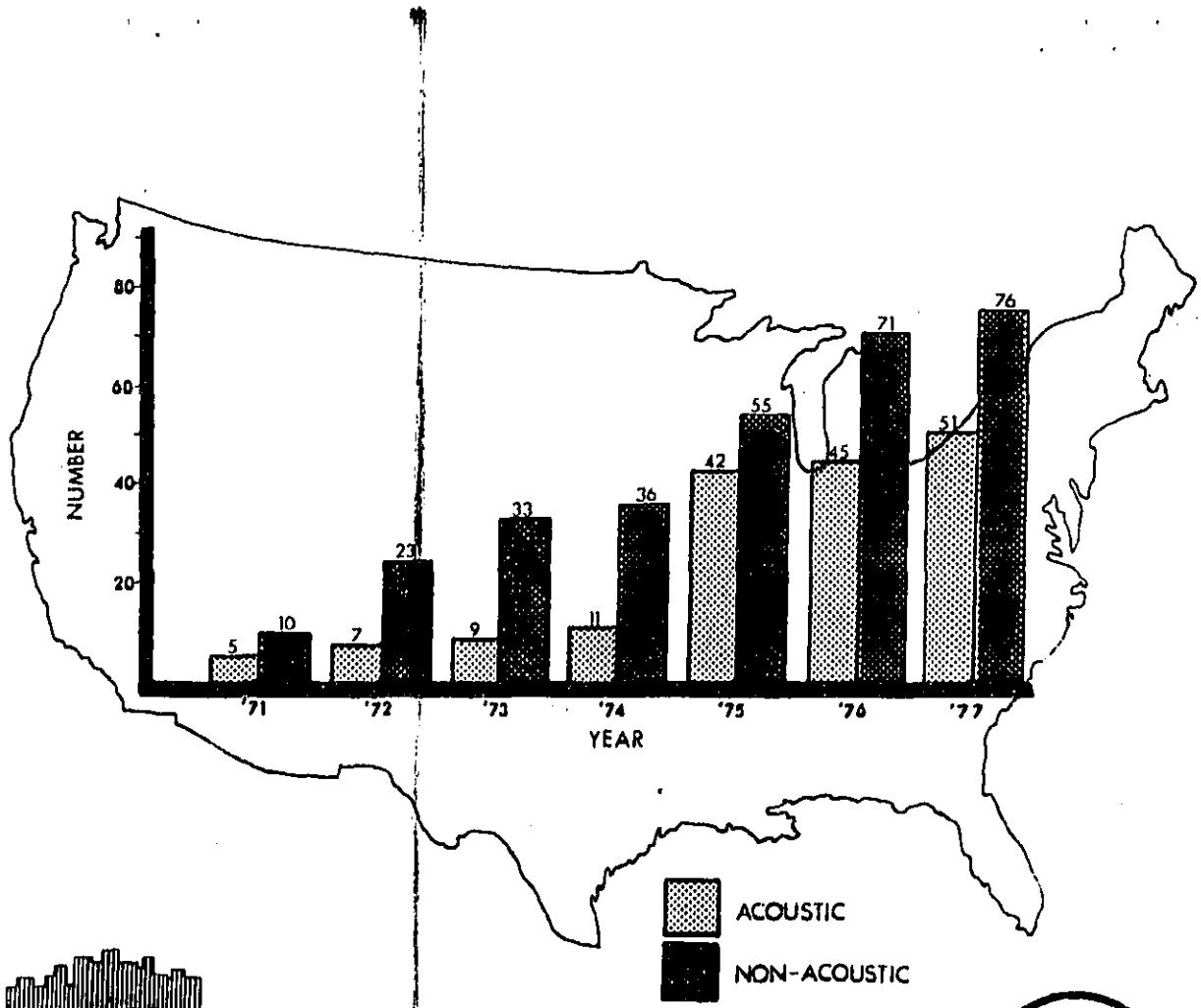


FIGURE 17 1971-1977

U.S. MUNICIPAL NOISE REGULATIONS: CONSTRUCTION

property boundary of impact while other municipalities specify a distance from the construction site which in some instances measures 1,000 feet.

It appears that the EPA Compressor noise emission regulation is beginning to be referenced in several laws of the more populated cities. This regulation is expected to increase the total number of municipalities having acoustic provisions. Compressor noise is only one of many construction site noise problems.

5. Aircraft

Aircraft noise, although a municipal noise problem, is not commonly regulated at the local government level. Usually cities have refrained from enacting legislation because of possible Federal pre-emption and the question of interference with interstate commerce. The area of greatest local interest has involved regulating fixed based operator activities. Specifically, this concerns restricting noise generated by maintenance

and repair of aircraft. This narrow involvement by local governments may be changing as the courts interpret the role of proprietor in airport noise liability.

Today, just 26 municipalities have any type of quantitative aircraft noise emission requirements (Figure 18). A new category of concern are various type of rotary wing aircraft (i.e., police and traffic surveillance helicopters), that use considerable latitude in their height restrictions, thereby impacting residential areas. The only area of anticipated growth in aircraft legislation will involve runup and maintenance, and associated airport land use compatibility planning.

6. Building Codes

Building codes rarely contain quantitative noise emission provisions (Figure 19). Those codes that do exist apply to a select type or portion of a building structure and its associated accessory equipment. To date, there are very few comprehensive building codes. This appears to be changing, since some

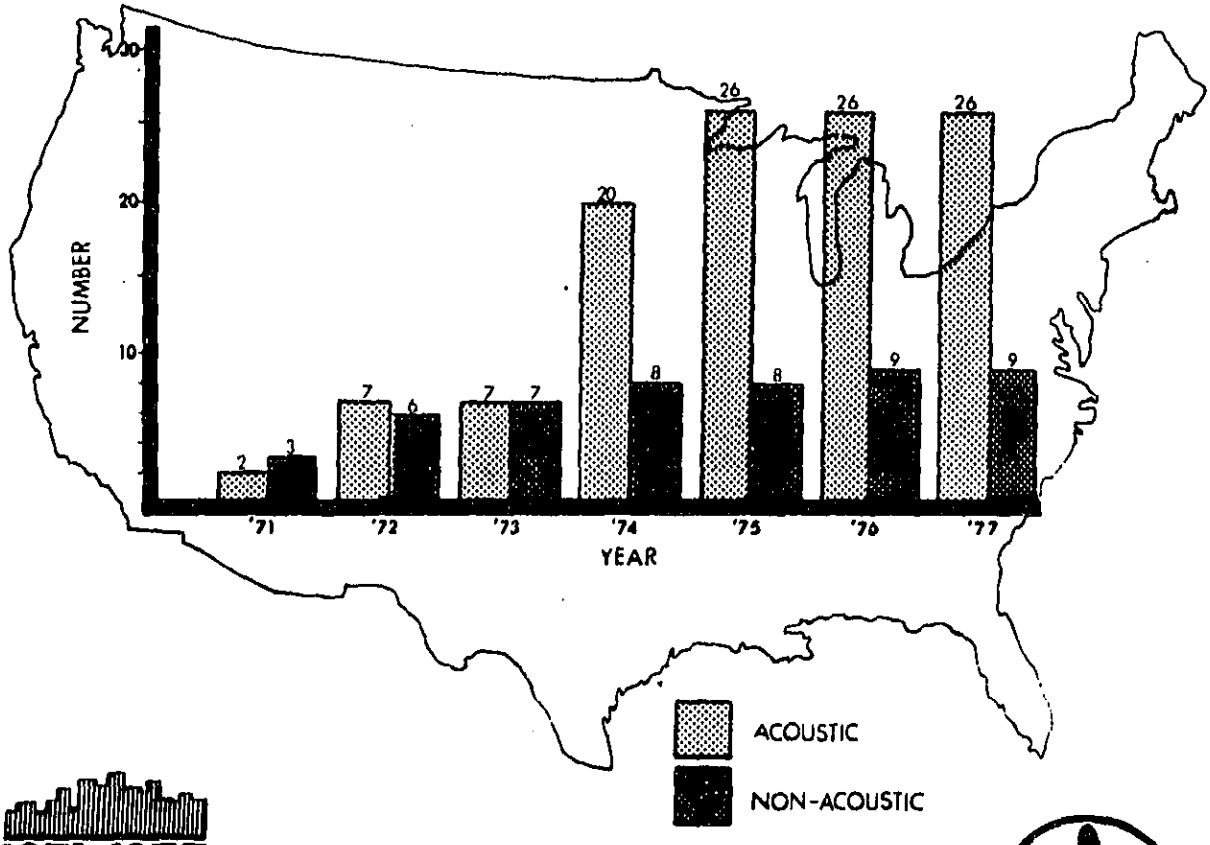


FIGURE 18 1971-1977

U.S. MUNICIPAL NOISE REGULATIONS: AIRCRAFT

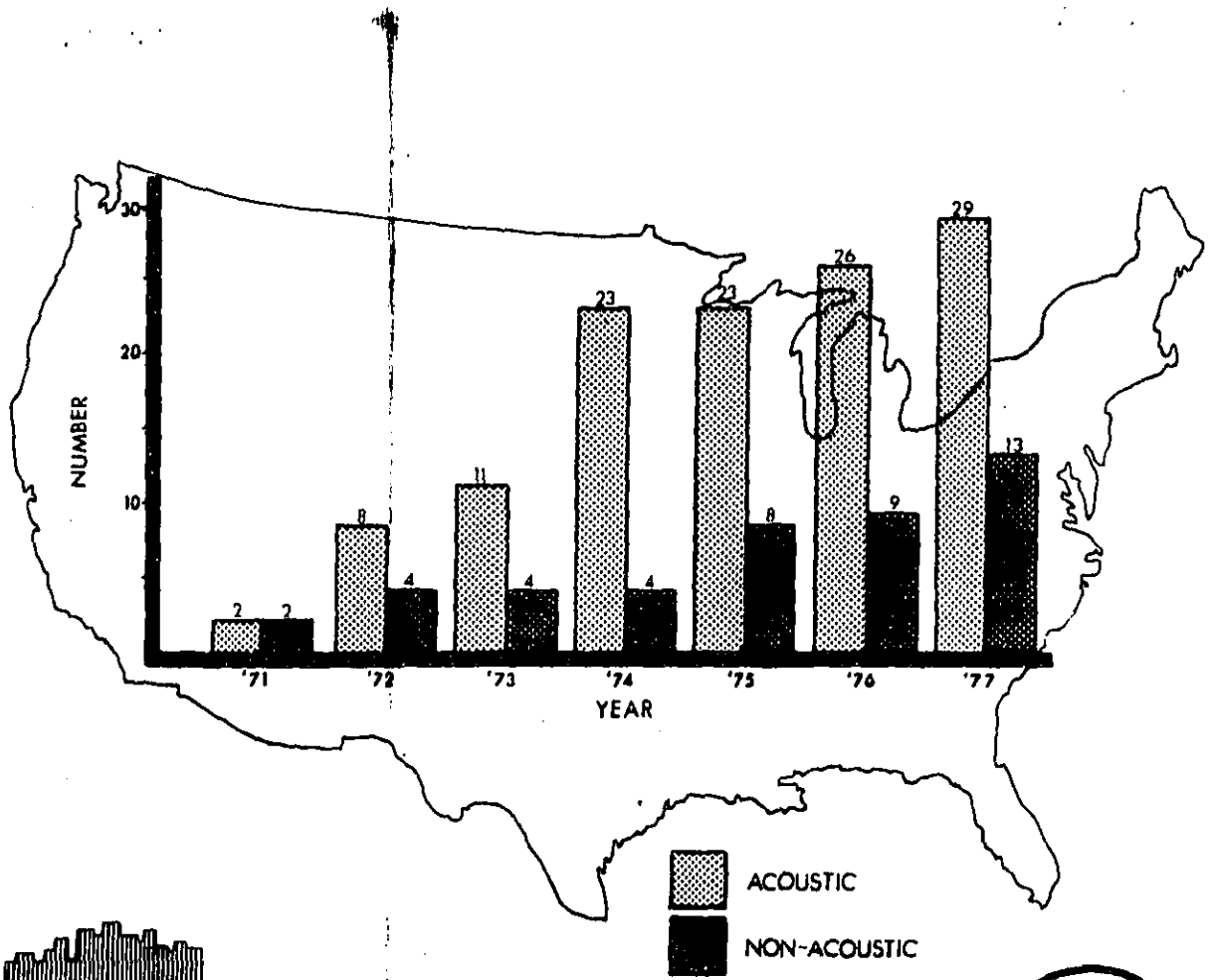


FIGURE 19 1971-1977

U.S. MUNICIPAL NOISE REGULATIONS: BUILDING CODE

municipalities are establishing energy requirements for building construction which have added benefits of reducing sound transmission. Furthermore, model building codes are being revised to incorporate noise provisions.

EPA, in conjunction with the National Bureau of Standards, is developing a model building code that will give considerable impetus to municipally adopted quantitative codes. It is anticipated that a major increase in building code activity will appear.

7. Railroads

Railroad activity is not a usual source of regulation at the municipal level. Only 16 cities have quantitative provisions, as shown in Figure 20. Such laws generally apply to mainline track rather than railroad or switching yards. Cities in increasing numbers are adopting the noise levels established by the EPA for railroads. Occasionally limits are established for particular railroad related sources such as train whistle, refrigerator car and locomotive engine exhaust noise.

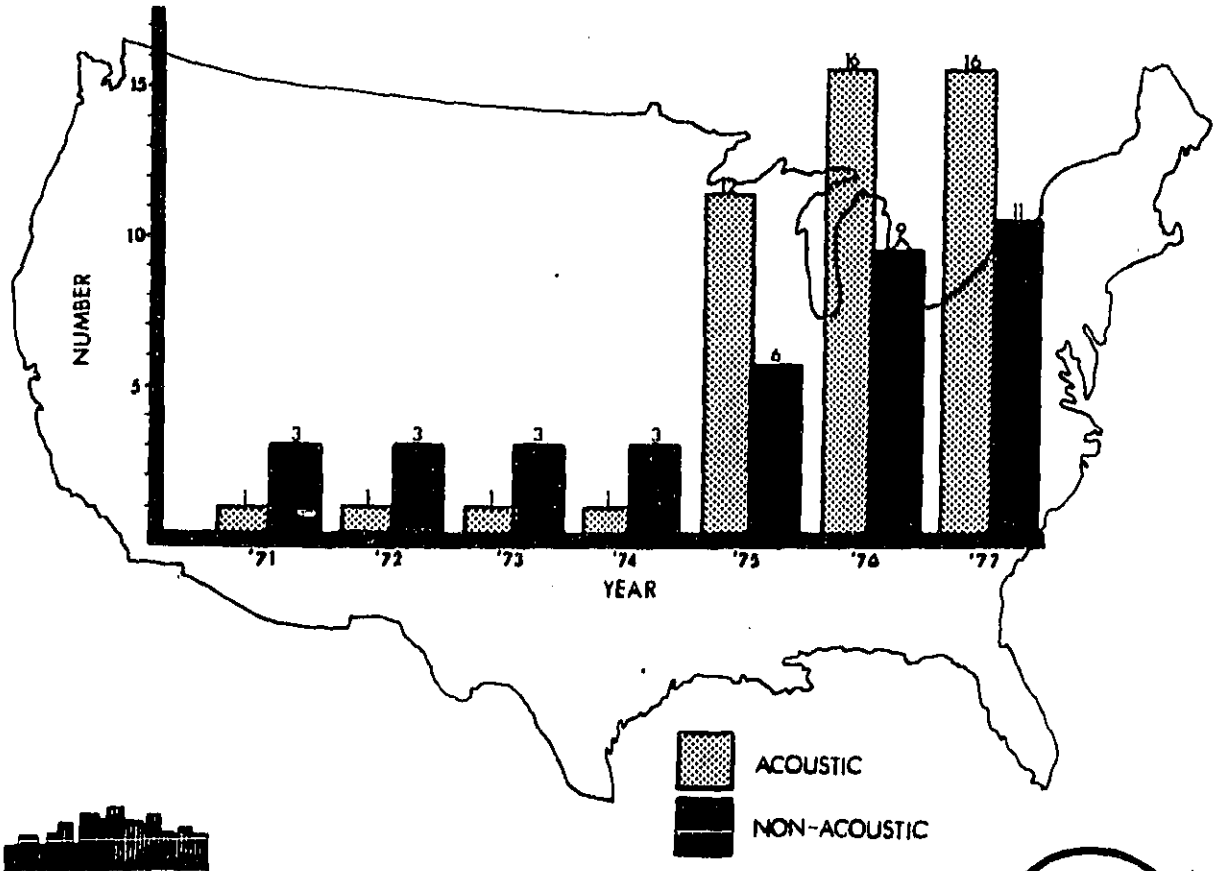


FIGURE 20 1971-1977

U.S. MUNICIPAL NOISE REGULATIONS: RAILROADS

Some cities are regulating railroad activity that EPA and the courts have identified as involving interstate commerce. It is anticipated that municipalities will in growing numbers adopt the Interstate Railroad Regulation by legal reference, thereby reducing their local responsibility for enforcement.

8. Nuisance

The common law classification of noise as a nuisance has been a popular form of noise control. Today, 443 cities have non-quantitative provisons for nuisance defining noise in such general and vague terms as "unnecessarily loud" or that which is "disturbing" (Figure 21).

Despite these limitations, the use of nuisance in noise legislation continues to grow, in part as a way in which an individual's health and welfare can be legally protected. This type of provision has considerable appeal because it can be so broadly applied to any noise source, thereby being a catch-all or non-exclusionary provision. The difficulty comes

where enforcement becomes necessary and it is legally challenged in the courts. Legal proof of a noise nuisance is difficult, due to the lack of a precise definition that can be quantitatively measured. Provisions of this type are not expected to grow relative to the other municipal noise control legislation.

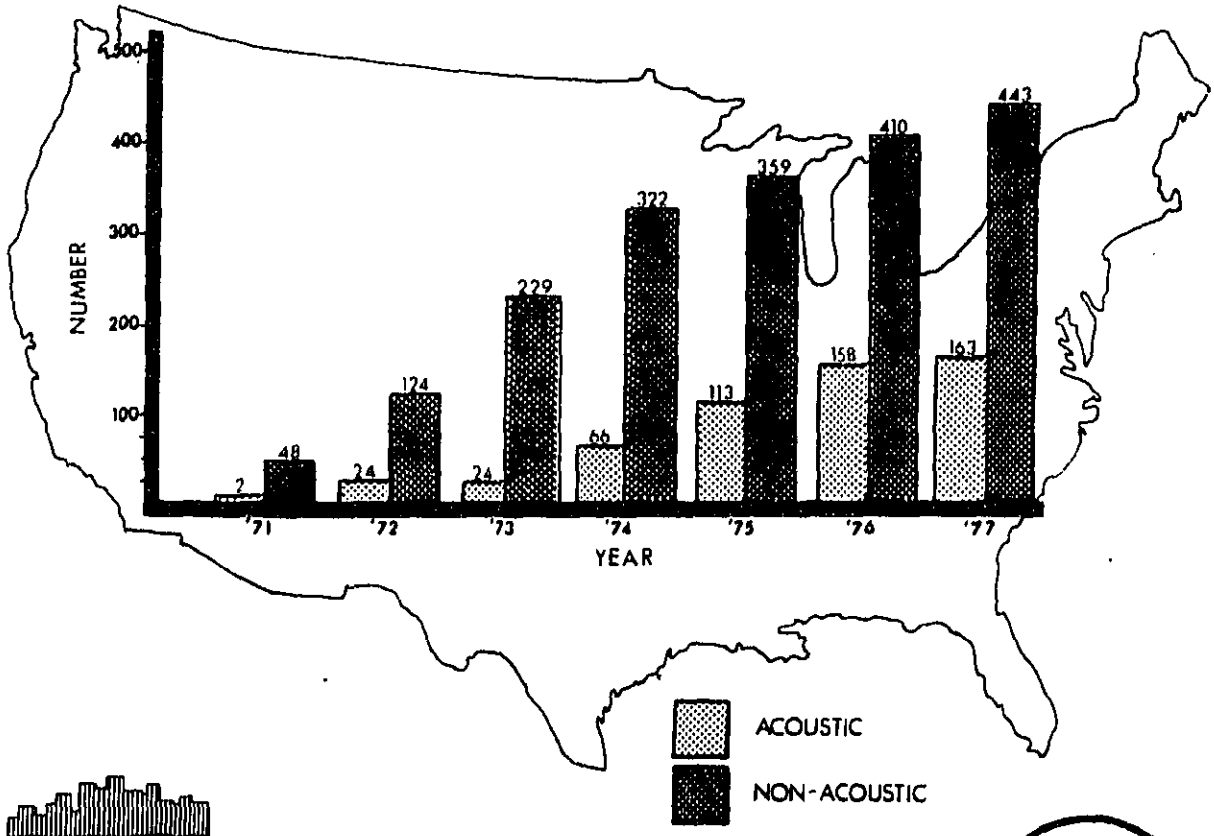


FIGURE 21 1971-1977

U.S. MUNICIPAL NOISE REGULATIONS: GENERAL NUISANCE

SECTION IV: NOISE CONTROL PROGRAMS

The initiation of legislation represents only one step in the process of controlling noise. A subsequent step, once noise legislation is enacted, is the development of a noise control program. Such a program requires establishing a fiscal budget for the necessary resources, including personnel and equipment. An administrative structure must also be developed for organization and management of the program.

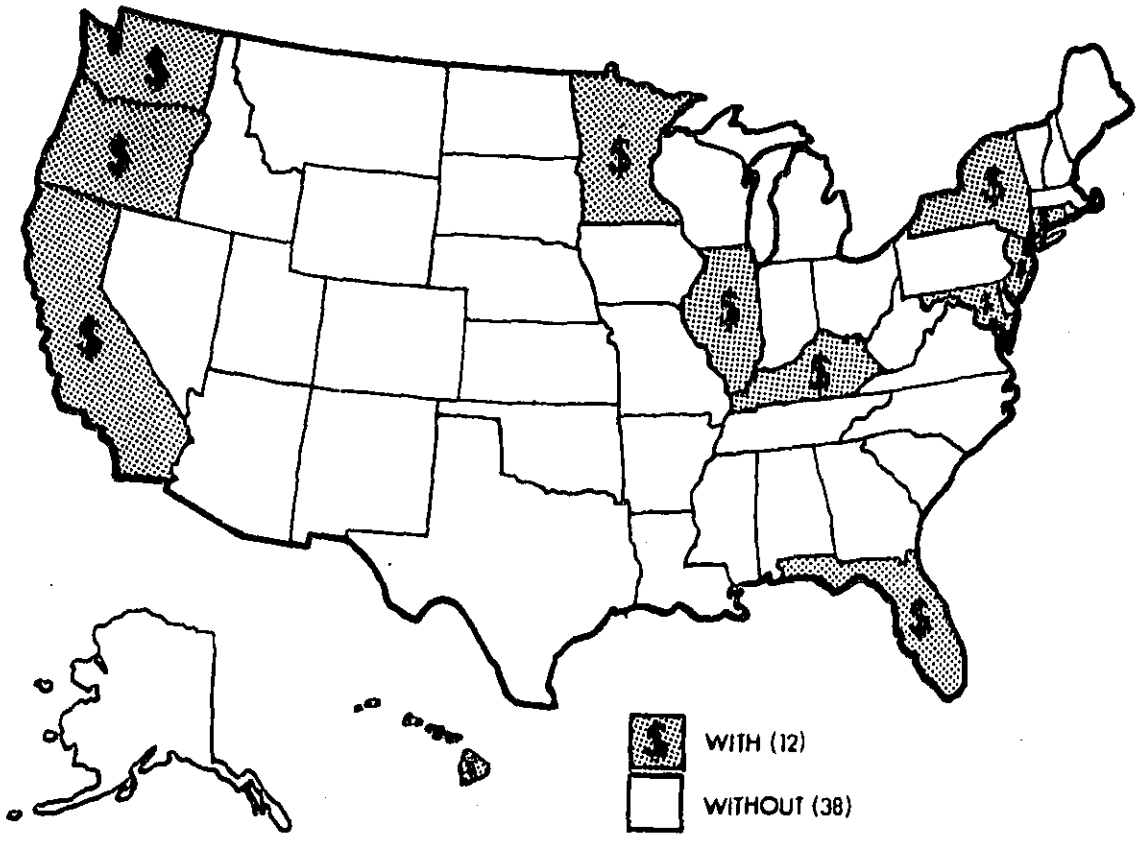
The following is a discussion of state and local noise control programs, with primary emphasis on state governments. An analysis of various governmental noise budgets are discussed along with problems that have been identified by state and local officials questioned in the EPA Environmental Noise Control Program Survey. The data presented on budgets refers to only those classified as line item budgets. This means a budget specifically designated for environmental noise control and is not part of any other program area. Furthermore, the figures that are presented are estimates of budgets covering personnel, equipment but not physical capital improvement expenditures

(e.g., the construction of a highway noise barrier). This budgetary data has been gathered from four basic sources, including: 1973-1974 EPA Non-Occupational Noise Survey, 1978 EPA Environmental Noise Control Program Survey, 1975-1976 State and Municipal Noise Survey conducted by Dr. Bragdon for Sound and Vibration, and personal communication with state noise control directors.

A. STATE

Although the development and enactment of noise legislation represents a major hurdle (27 out of 50 states currently have noise laws), even a more difficult step is establishment of a specific noise control budget. This appears to be the biggest obstacle facing state governments, and therefore jeopardizes the entire legislative intent and enforcement objectives. Despite the fact that 27 states do have some law with quantitative provisions, only 12 states currently have budgets to support this legislation (Figure 22).

This means that 15 states or 55% of those with laws have no fiscal resources committed. These 15 states could therefore



LINE ITEM ONLY

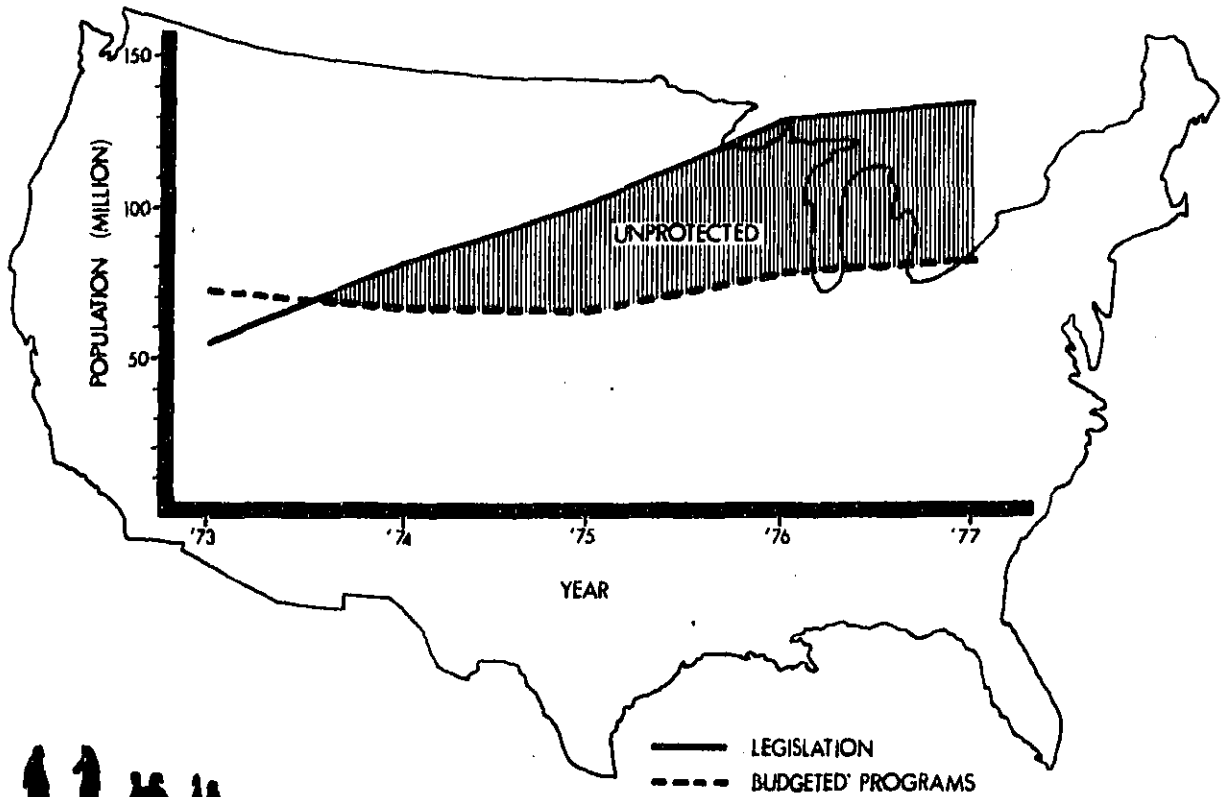
FIGURE 22 **1977**

STATES WITH BUDGETED* NOISE CONTROL PROGRAMS

be classed as having "paper regulations," or those without any capability of being enforced. If these 15 states are added to those without any enacted noise legislation then there are 38 states or nearly 75% of the total without the necessary monetary support for controlling noise.

This lack of support can be also translated into population impacted. The legislation enacted in 27 states in the U.S. encompasses approximately 140,000,000 persons (Figure 23). Since only 12 states do have budgets for noise control, there are just 80,000,000 persons protected in their respective states. This means that a very significant population of 60,000,000, or 43%, are presently unprotected (Figure 23).

The failure to provide these dollars has resulted in giving the population in 15 states a false sense of security. Despite enacted legislation addressing specific noise sources within these states, no program has been instituted for enforcement. The state budgetary track record is a poor one for environmental



LINE ITEM ONLY

FIGURE 23 1973-1977

U.S. POPULATION PROTECTED BY STATE NOISE CONTROL LEGISLATION & BUDGETED* PROGRAMS

noise control, as evidenced in Figure 24. Based on this fiscal year 1977-1978, there have been seven states which have eliminated budgets, four others ar reduced while only one new budget exists, and eight represent an increase over 1976-1977.

Historically, when states did pass noise legislation, there was a similar commitment to fund them. However, since 1974, there has been a growing deficit between enacted laws and adopted budgets (Figure 25). The current trend line does not suggest any positive change with either the elimination or reduction in the number of paper budgets. Consequently, the number of unenforceable programs remains alarmingly high.

The noise expenditure curve has not matched the growth in the number of enacted state laws. Since 1973, there has been an increase of 20 state laws, from 7 to 27, or 28%. In contrast, the total state expenditure has risen only $900,000, from $1.7 million to $2.7 million, or 53% (Figure 26). A conserable amount of this $900,000 increase has been offset by inflation.

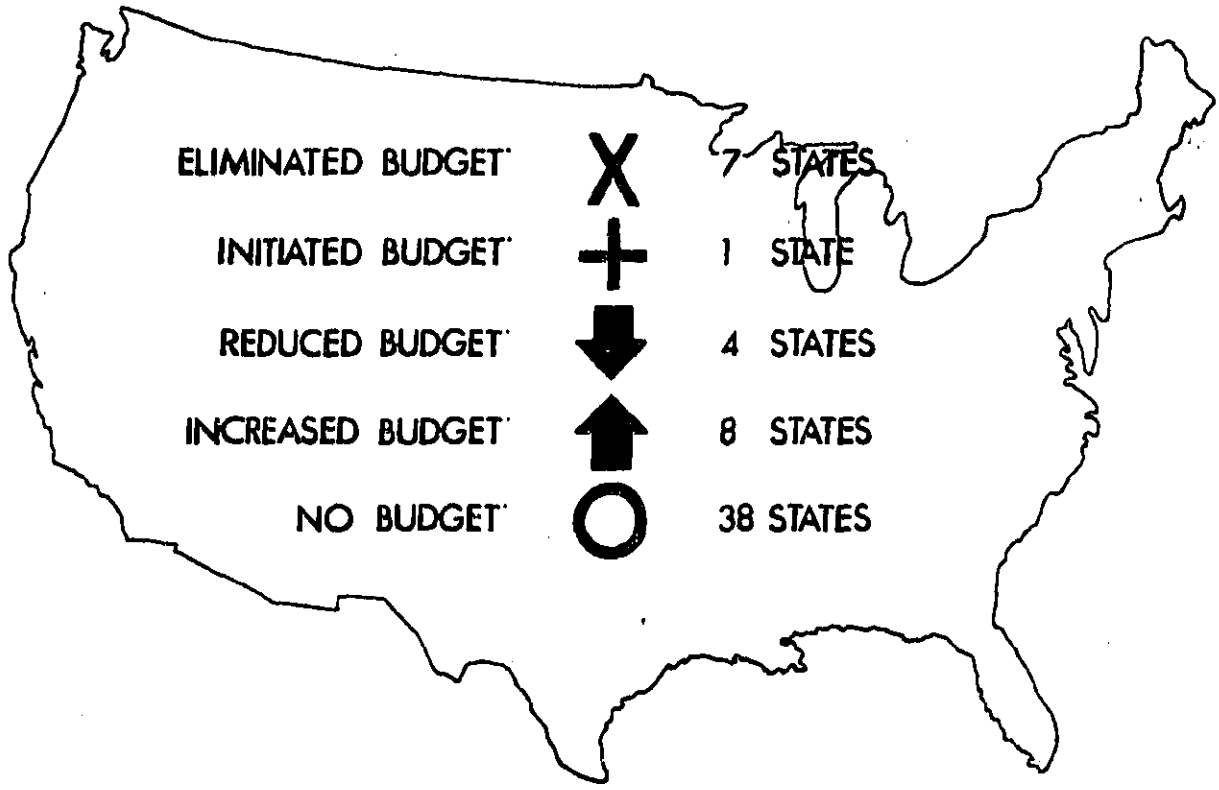


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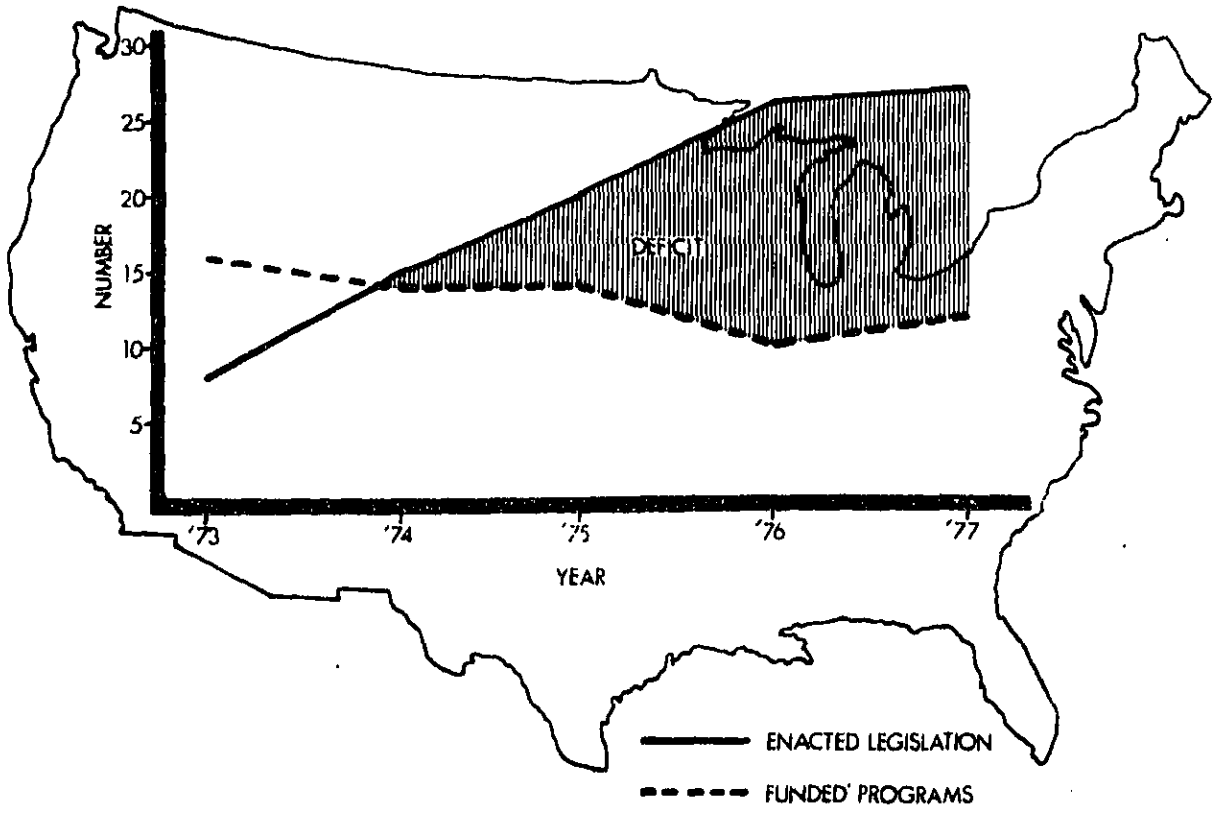
FIGURE 24 1977
STATE NOISE CONTROL PROGRAMS:
BUDGET* CHARACTERISTICS



LINE ITEM BUDGETS

FIGURE 25 **1973-1977**

STATE NOISE LEGISLATION AND PROGRAMS

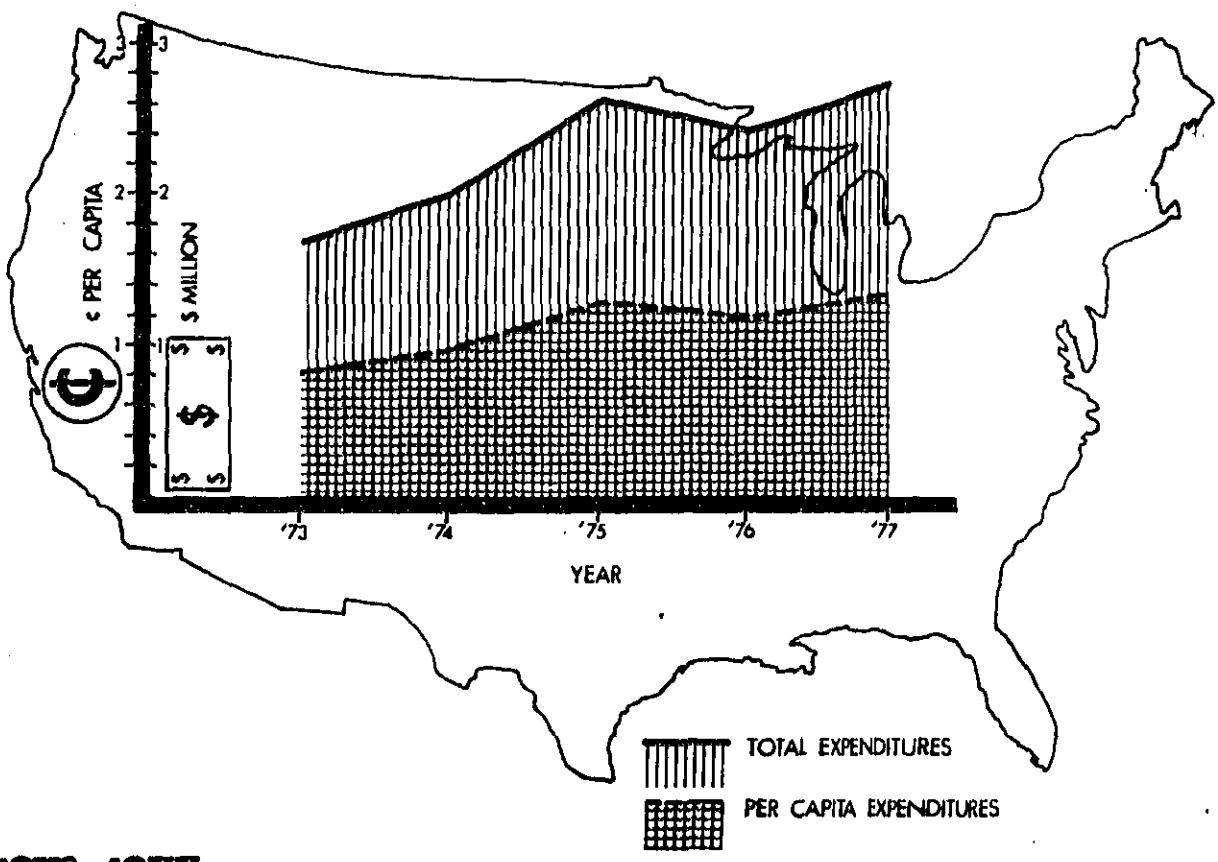


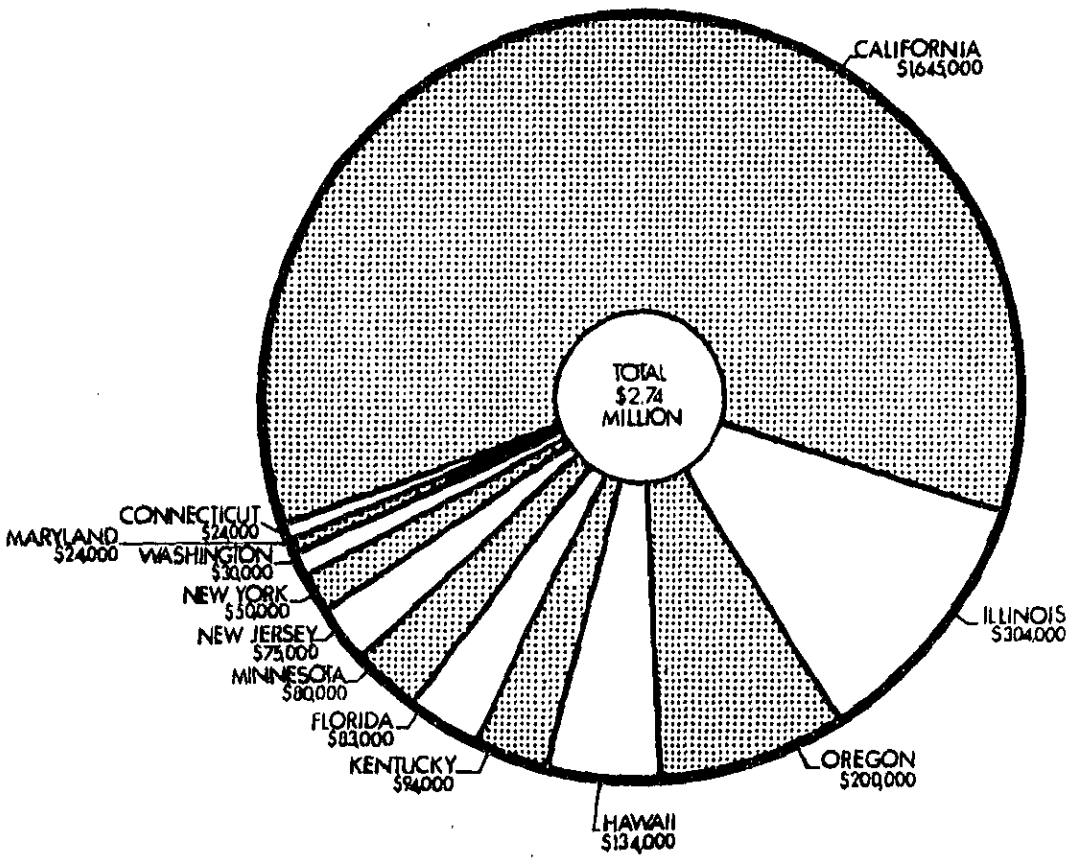
FIGURE 26 1973 - 1977

STATE NOISE CONTROL BUDGETS:
PER CAPITA & TOTAL U.S. EXPENDITURES

Per capita increases have nearly matched the expenditure curve (Figure 26). In the year 1973, approximately 0.8¢ was being spent on state noise control compared to 1.3¢ in 1977. An expenditure of this amount is considered very marginal. To establish an effective program, this per capita figure would need to be raised to 3.0¢ in all delinquent or deficient states as a minimum.

Although there are 12 states with noise control budgets, the actual amount is not distributed equally among the states (Figure 27). There are just four states (California, Illinois, Oregon, and Hawaii) having budgets over $100,000 while the remaining eight are as low as $24,000 (Connecticut and Maryland). The lion's share of this $2.74 million is being spent in three states (California, Illinois, and Oregon). These three represent 78.4% or $2.14 million, of total line item budgeted noise programs for 1977 (Figure 28). The remaining small sum of $694,000 is being spent by the other nine state governments.

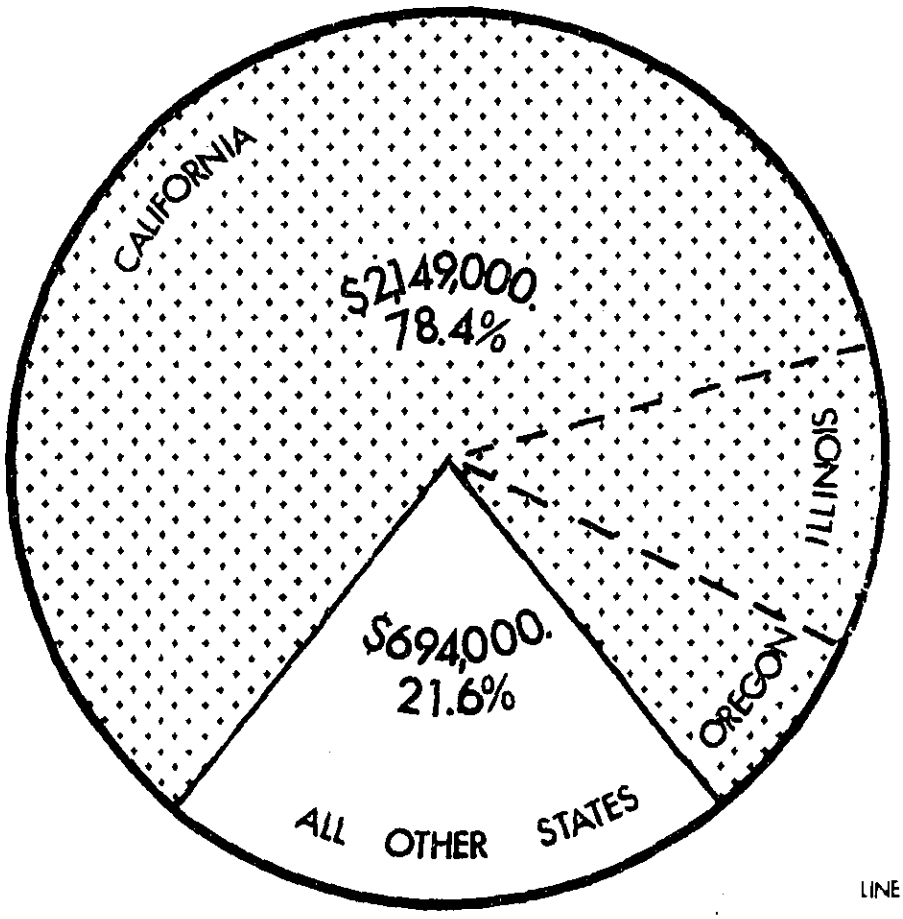
Total expenditures in themselves can be misleading without comparing the budget to a population base. The total U.S. per capita budget for state programs is 1.39¢, however, Hawaii



*LINE ITEM ONLY

FIGURE 27 **1977**

STATE NOISE CONTROL BUDGETS*:
TOTAL EXPENDITURES



LINE ITEM ONLY

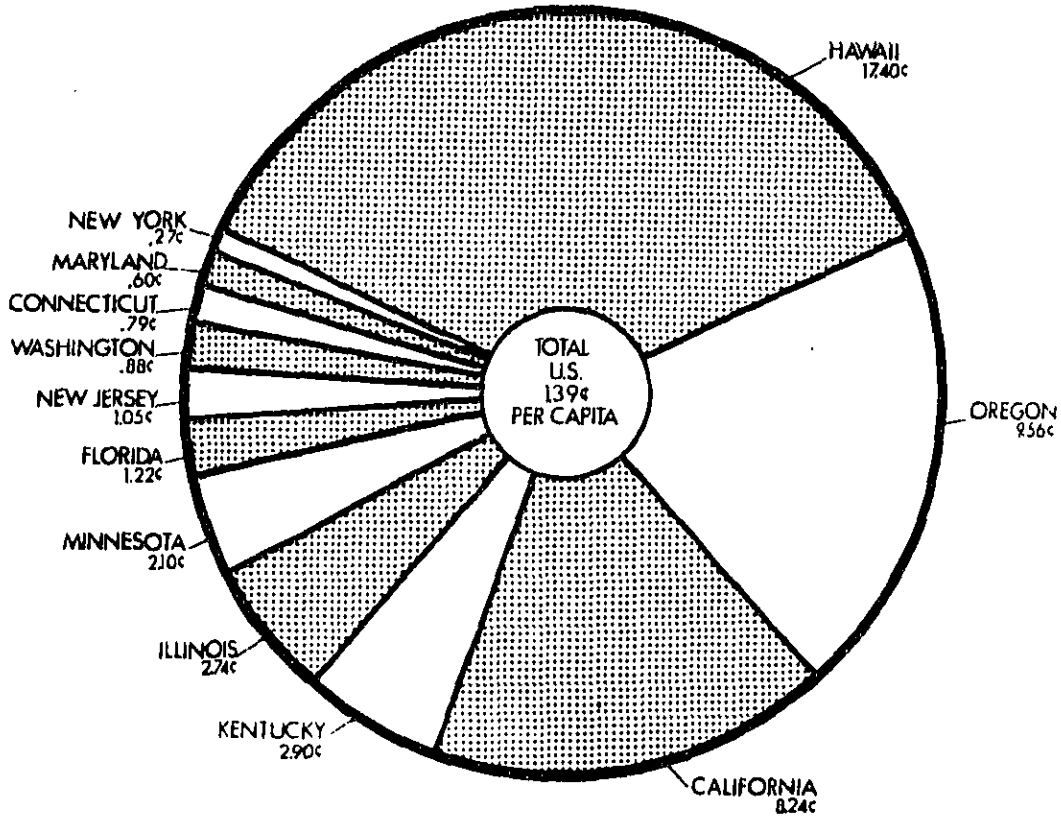
FIGURE 28 1977

STATE NOISE CONTROL BUDGETS*:
A COMPARISON

leads the country with an expenditure of 17.4¢ per person followed by Oregon (9.56¢) and California (8.24¢), as shown in Figure 29. In contrast to California, New York, the second most populated state, spends 0.27¢ per capita. Based on program effectiveness, it appears that as a minimum a figure of approximately 3.0¢ is needed to insure the necessary monetary support that would translate enacted legislation into enforcement action.

These findings are supported by opinions of governmental agencies which have encountered numerous problems due to unavailable resources. Among the states, 46% indicated that the most important problem(s) facing their noise control efforts was "inadequate operational budget" (Table 7). Even more common was the lack of personnel (65%) and lack of political support (58%) which all relate to budgetary problems.

The recognition of and the need for Federal resources to state and local programs is very apparent, if such programs are to continue operating. Technical assistance by the U.S. Environmental Protection Agency is one such strategy. This question "which of the following areas of EPA assistance would be of significant value to your noise control effort in meeting



*LINE ITEM ONLY

FIGURE 29 **1977**

STATE NOISE CONTROL BUDGETS*: PER CAPITA EXPENDITURES

TABLE 7: NOISE PROGRAM EVALUATION

"Please Indicate The Major Problems Facing Your Noise Control Efforts: Most Important".

JURISDICTION	PROBLEM AREA	YES	%
State	Lack of personnel	17	65
	Lack of political support	15	58
	Inadequate operational budget	12	46
Sample (26)			
Municipal	Inadequate operational budget	158	48
	Lack of effective legislation	122	37
Sample (330)	Untrained personnel	115	35

Source: E.P.A., Environmental Noise Control Program Survey, 1978 (Preliminary Data, March, 1978).

legislative and programmatic needs?", was asked among the state officials (Table 8). There were six responses where the percentage was 50% or above.

Personnel training and workshops ranked as the number one response (77%), followed by a tie between effective noise control methods (58%) and noise measurement instrumentation (58%). The remaining three, need for personnel or manpower (54%), public information materials (54%) and noise control program guidelines (50%) all related to assisting in enforcing enacted legislation. This questionnaire developed for EPA did not ask if the political jurisdiction wanted or needed direct Federal support in the terms of dollars. Had such a question appeared, the response would have approached unanimity.

It appears from this analysis that state governments need both direct and indirect assistance. Direct in the sense of fiscal dollars to help fund these programs, and indirect in the sense of technical assistance in all phases of a noise control program to be responsive to their legislative mandates.

TABLE 8: TECHNICAL ASSISTANCE TO STATES

"Which Of The Following Areas Of E.P.A. Assistance Would Be Of Significant Value To Your Noise Control Effort In Meeting Legislative And Programmatic Needs: Most Important".

JURISDICTION	ASSISTANCE AREA	YES	%
State	Personnel training/ workshops	20	77
	Effective noise control methods	15	58
	Noise measurement instrumentation	15	58
	Personnel	14	54
	Public information materials	14	54
	Noise control program guidelines	13	50

Sample Size (26)

Source: E.P.A., Environmental Noise Control Program Survey, 1978 (Preliminary Data, March, 1978).

B. MUNICIPALITIES

The statistical base for analyzing the municipal noise control programs is not as fully developed as the State data. At present, the most current information is for the year 1975, gathered by EPA as part of a Non-occupational Noise Survey and 1970-1973 assessed by Dr. Bragdon in a questionnaire for an article in Sound and Vibration, December, 1973. Neither survey can be considered comprehensive; however, they do give some indication of municipal noise programs and the level of financial resources.

The relative proportion of municipalities with and without noise budgets historically has been lower than state governments. Despite the number of enacted municipal laws containing acoustical provisions (691), it is estimated that less than 10% have line item budgets for noise. In the compilation of municipalities where they have responded to surveys (Table 9), the highest number occurred in 1973 when 46 had specific noise budgets.

TABLE 9: MUNICIPAL NOISE CONTROL BUDGETS: 1970-1975

YEAR	NUMBER OF MUNICIPALITIES	AMOUNT
1970	10	167,000
1971	14	500,000
1972	16	684,000
1973	46	1,904,099
1974	39	1,003,335
1975	33	1,032,582

Approximately $1.03 million had been spent on municipal control for the most current year surveyed, 1975. The total amount today may be slightly higher. However, there has been a major increase in the number of enacted programs (539, 1975 compared to 691, 1977). This means that the expenditure by city has dropped, even though the total number of budgeted programs may have risen.

Municipal support for noise control is therefore financially deficient, more so than at the state level, which is also very inadequate. Even the largest programs, New York, Chicago, and Inglewood (California), have significantly reduced their noise budget. New York, for example, had budgeted $950,000 in 1973 has now an amount under $100,000. There are also more extreme cases such as Baltimore which had budgeted $178,000 in 1973 and today has eliminated their budget.

This unhealthy condition is reflected in the EPA Noise Control Program Survey. The leading problem facing municipalities is the response "inadequate operational budget" (Table 7). Some

48% of the 330 cities listed this answer as the most important problem. The remaining areas frequently mentioned included "lack of effective legislation," due to the common reliance on nuisance type provisions, and "untrained personnel" largely because of insufficient fiscal resources.

Cities felt there were many areas of potential assistance from EPA that could strengthen their local problems. The list is very similar to the state officials responses (Table 10). Education via personnel training and workshops appeared as the number one assistance area (54%). Finishing a close second (52%) was technical assistance in developing effective noise control methods. Other areas of assistance were closely grouped including noise control program guidelines, noise measurement instrumentation, noise assessment guidelines and enforcement procedures.

It is very apparent from these replies that a broad based, large scale technical assistance effort is needed to translate municipal legislation into an action plan. Again,

TABLE 10: TECHNICAL ASSISTANCE TO MUNICIPALITIES

"Which Of The Following Areas Of E.P.A. Assistance Would Be Of Significant Value To Your Noise Control Effort In Meeting Legislative And Programmatic Needs: Most Important".

JURISDICTION	ASSISTANCE AREA	YES	%
Municipal	Personnel training/ workshops	178	54
	Effective noise control methods	172	52
	Noise control program guidelines	158	48
	Noise measurement instrumentation	155	47
	Enforcement procedures	149	45

Sample Size (330)

Source: E.P.A., Environmental Noise Control Program Survey, 1978 (Preliminary Data, March, 1978).

had a question been asked concerning possible direct financial support, the municipalities would have eagerly responded in an affirmative manner.

Despite these financial deficiencies at both the state and local level, it is important to mention the very innovative plans that have been shaped by many noise control administrators. These administrators frequently have relied on all types of atypical methods to support their programs. Their resourcefulness should be admired and in part emulated by the more financially secure and sometimes less dynamic governmental programs. As a rule, these personnel feel like crusaders who are using all their physical and emotional resources to achieve some improvement in the acoustical quality of their community environment. These individuals are consequently enthusiastic and personally committed to their charge. It is important that this spark be carefully and sensitively supported and the end product will be a strong and enduring effort that will work cooperatively to improve the quality of the acoustical environment.

C. FEDERAL

The primary strategy for controlling noise as part of the Noise Control Act is the regulation of new products which are deemed as potential hazards to health and well-being. There are a minimum of six product noise emission parameters that will significantly influence the achievement of this primary strategy.

Unless these six parameters are fully considered, the primary strategy for controlling noise at the Federal level could be significantly affected. As a consequence, the reduction in urban noise levels would not be achieved. (Figure 30).

1. PRODUCT NOISE EMISSION PARAMETERS

a. Source Maintenance and Use

Although initiating new product noise limits is an essential first step, this alone does not assure that the product will be properly maintained. Without a proper maintenance program through the product's life-use cycle, the intitially noise-controlled product may become increasingly a noise emitter. Comparisons between newly manufactured products and similar products

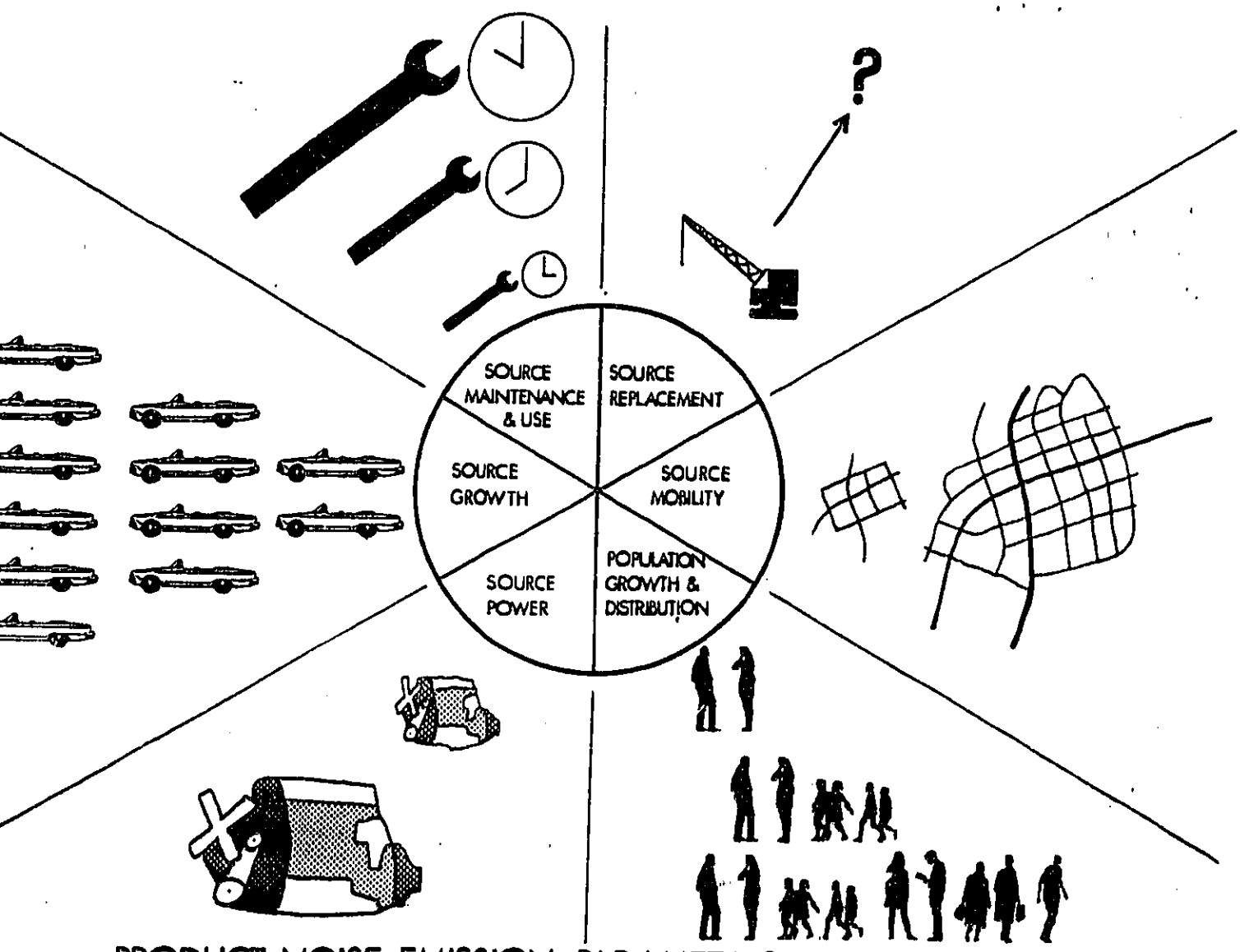


FIGURE 30 PRODUCT NOISE EMISSION PARAMETERS

and similar products tested after periods of extended use indicate reduced effectiveness of the noise abatement technique.

b. Source Replacement

Replacement of existing noise generating equipment with a quieter new product is heavily dependent upon the product's life use cycle. Large scale, high capital cost equipment have an extended life cycle which may interfere with the introduction of a quieter noise product. A product's life use cycle is dependent upon additional factors including: tax depreciation incentives, corporate sales and corporate profits and the general economy.

c. Source Growth

Noise emission requirements are designed to apply to each individual product as manufactured. However, the net benefit can be offset by the absolute growth in numbers of the product or the numbers in use in a particular location. For example, the level of environmental noise can be raised by the increase in the number of registered vehicles.

d. Source Power

The United States is producing and consuming increasing amounts of power and energy. Product noise abatement can be offset by increasing the power output. Between 1940 and 1970, for example, there has been a 900% rise in the total horsepower of all prime movers. Such gains have notably appeared among construction, agricultural, and aircraft.

e. Source Mobility

Although noise emission limits may be applied to a class of products, product use can offset the reduced noise level. Changing patterns of mobility, particularly day/night, may change the level of environmental noise ($L_{d/n}$). Greater non-peak hour transportation activity is increasingly a characteristic of the urban life style.

f. Population Growth and Distribution

The predominant choice of human settlement is urban living. Even though product levels may lower increasing population density and encroachment in the vicinity of noise

generators, urban settlement may increase population exposure. Current trends indicate that by 1980, 75% of the U.S. population will be living on 2% of the land area compared with 70% today.

2. GOVERNMENTAL PARTNERSHIP

An effective noise control strategy requires that these product noise emission parameters be recognized and a program initiated to minimize their influence. Such a program is necessary and it must involve local and state participation. The Technical Assistance Division provides the organizational mechanism to involve non-Federal governments, as well as other Federal agencies. Without this essential intergovernmental coordination and cooperation, the overall noise program objectives will not be achieved.

3. IDENTIFICATION OF PRODUCT NOISE EMISSION PARAMETER CONTROLS

Each parameter should be investigated in terms of the applicable governmental control, legal authority and degree of effectiveness. A general matrix can then be prepared (Table 11).

(1.) Source Maintenance and Use

(2.) Source Replacement

(3.) Source Growth

(4.) Source Power

(5.) Population Growth and Distribution

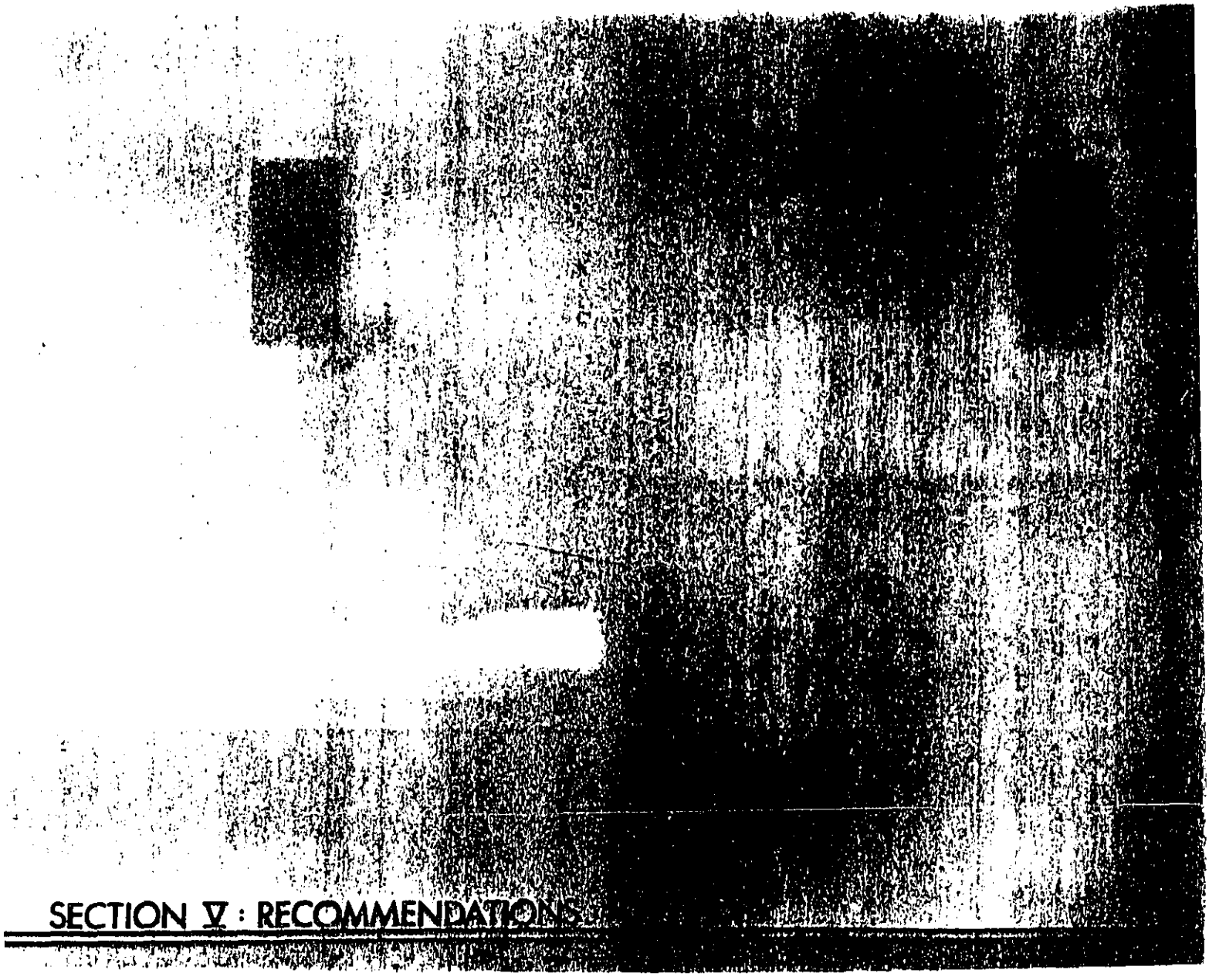
(6.) Source Mobility

TABLE 11. IDENTIFICATION OF PRODUCT NOISE EMISSION PARAMETER CONTROLS

PARAMETER	CONTROL (S)	FEDERAL	STATE	LOCAL
Source Maintenance and Use	1) Inspections 2) Permit 3) Retrofit 4) Recall Program 5) Operational Use Monitoring			
Source Replacement	1) Tax Incentives 2) Operational Use Monitoring 3) Specifications 4) Others			
Source Growth	1) Area Restrictions 2) Licensing/Registration 3) Taxation 4) User Restrictions (Time) 5) Other			
Source Power	1) Taxation 2) Licensing/Registration 3) Conservation/Consumption 4) Area Restrictions 5) User Restrictions 6) Operational Use Monitoring 7) Other			

TABLE 11 : (CONTINUED)

PARAMETER	CONTROL (S)	FEDERAL	STATE	LOCAL
Population Growth/ Distribution	1) Land Use Planning 2) Zoning 3) Capital Improvements 4) Land Capacity 5) Bldg. Code 6) Construction Incentives 7) Other			
Source Mobility	1) Transportation Management 2) Land Use Planning 3) Zoning 4) Operational Controls			



SECTION V : RECOMMENDATIONS

RECOMMENDATIONS

Noise, particularly at the Federal level has been perceived as the step child of the environmental movement. It has been generally neglected in terms of financial support, despite the fact that the public has regarded noise as a leading residential problem. Citizen concern and awareness for noise has not up to this time been translated to the governmental official (Federal, state and local) so that a concerted intergovernmental program with adequate resources can be initiated.

At the core of this problem is the need for a strong technical assistance program that can adequately represent the public's interest in comprehensively addressing the issue of environmental noise. The initiative has been taken by both the states and cities unlike any other nationally identified environmental problem (e.g., water, air quality, solid waste). It is now time that the Federal government participates more actively, recognizing the excellent intergovernmental framework (i.e., local

county and state) presently established. If a strong technical assistance is not established, the previous legislative and program development advancements occurring at the local and state levels will be severely eroded. Such advancements provide the platform for launching more effective efforts in controlling environmental noise.

GENERAL

1. Provide Federal support to insure continuity in the development and enforcement of environmental noise regulations at the local and state level.
2. Develop a strong intergovernmental program, using technical assistance from EPA, that links together local, state and Federal noise control efforts.
3. Establish stronger non-governmental ties with the private sector to support the movement to control environmental noise control. Such ties should include educational institutions, private enterprise, and professional associations.