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LAND USE CONTROLS IN FLOOD PLAIN MANAGEMENT*

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ABSTRACT

Flood plain management in the United States today is changing. In the Nineteenth Century, the first significant efforts at reducing the damages of floods were begun. The responsibility was primarily a local one; now there exists a complexity of individual and governmental response to floods. The nation has become more aware of the limitations of "flood control" measures and more receptive to suggestions about land use management. It is the purpose of this paper to examine the changing approaches to flood plain management, especially land use controls, and to highlight the need for a stronger national effort to this end.

INTRODUCTION

One cannot overemphasize the fact that floods are a *natural* occurrence, as natural as snow and rain. A flood plain is land that is flooded or could be flooded when the stream channel is unable to accommodate the runoff from its watershed. Many rivers overflow their banks every few years, others do so only seldomly, but all can be expected to do so eventually. Floods cause damage to man only after man has settled in the pre-existing flood plain.

Flood waters once found their way unhindered to lakes or to the sea in their natural channels and over their natural flood plains. Obstructions such as bridge piers, sewer outlets, transportation

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routes, and pipelines now restrict many of these channels. Flood plains are often occupied by varied uses including highways, houses, and factories. Many people have not fully realized that there is no absolute assurance that future floods will not exceed the capabilities of control measures; people and their activities occupy flood plains, often at considerable risk, both of person and property [1]. In fact, human occupation of the flood plain may often increase the power of floods by altering and restricting the natural pattern of water flow.

EARLY HISTORY

Many of man's first cities may have been created in conjunction with the twin problems of floods and droughts. The irresistible attractions of a waterfront location—agricultural productivity, access to drinking and irrigation water, and easy transportation—overpowered the threat of flooding. The first great civilizations did not spring up in the Middle Eastern flood plains by chance. The great rivers of that area were utilized as a transportation system as well as a model for the irrigation ditch and canal. The village cultivators were forced to unite to repair the damage of sudden floods of periodic inundations, and to guide the water into their fields via canals to overcome the problems of drought conditions.

> The construction of these utilities demanded a degree of social intercourse, cooperation, and long-range planning that the old self-contained village culture, complacently accepting its limitations, did not need to encourage. The very conditions that made large urban settlements a physical possibility also made them a social necessity [2].

The bounties the Egyptians realized from the annual floods of the Nile are well-known. They realized a favorable benefit-cost ratio by leaving the floods alone. Even today there are some excellent reasons why the flood plain is used so intensely in the face of property damage and personal hazard. The many advantages of location near a waterway operate almost as strongly today as they have in the past. The genuine benefits of economics and amenities derived from flood plain occupance cannot be ignored; the best policy for flood plain management is not a flat prohibition of flood plain usage but a regulation of development for some "optimal" productive use [3].

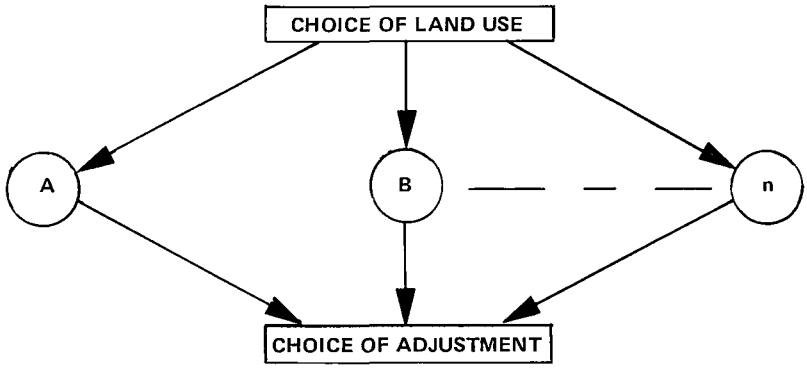
Most large cities are located on a river or coastline and can take advantage of the possibilities such a site offers. Although water-borne transportation is not quite so important as it was a century

ago, there are still many factors fostering flood plain development. There are some activities that must be sited on a waterway: docks, some electrical power plants, and other utilities to name a few. Other activities can locate elsewhere but receive quantifiable benefits from flood plain sites such as farms and some manufacturing firms. Lastly, some residents of the flood plain perceive "amenities" in living in the flood plain. Waterside locations are often desirable sites for reasons of aesthetics and access to recreation opportunities.

TWENTIETH CENTURY AMERICA

It is against this background that twentieth-century American efforts at flood plain management must be viewed. The local, state and national governments were very slow in regulating development of the flood plain, at least partly because there are good reasons not to prohibit development. The Congress and the Executive Branch had moved very reluctantly in creating a strong role for the federal government in flood plain management. The principal national expenditure was directed at levee construction in the nineteenth century and very little else. The Mississippi River Commission, established in 1879, was charged with planning and implementing flood control works on the lower Mississippi. This was prompted by the total failure of the uncoordinated levee systems constructed by private groups and the resulting abandonment of much fertile land.

Hesitant steps toward a broader approach were begun in the early part of this century, but the revolution in the federal role was the enactment of the Flood Control Act of 1936, which declared that there was a federal responsibility in flood control and authorized over 200 construction projects. Both the Corps of Engineers and the Department of Agriculture shared responsibility under the Act. The Act also included a famous provision that limited projects to only those in which "the benefits to whomsoever they accrued exceeded the costs"—the first important federal use of a benefit-cost ratio. One of the problems with this test for project approval has been the implied disincentive for local areas to use non-structural measures in flood plain management. The federal government traditionally has paid part or all of the cost of structural control works, and none of the cost of non-structural controls; thus, local governments see unrealistic advantages in structural works. Other disputes have centered about the method of calculating the ratio itself—about what should be



a. BEARING THE LOSS
b. PROTECTION
c. EMERGENCY MEASURES
d. STRUCTURAL MEASURES
e. FLOOD ABATEMENT
f. INSURANCE
g. PUBLIC RELIEF

Figure 1. Typology of choices in adjustment to floods [6].

included in the calculations, how they should be measured, and what discount rate should be used.

The 1936 Flood Control Act was a bold advance in flood plain management, but it had severe built-in limitations. The only method of solution to the problems of floods the Act contemplated was the use of physical structures to hold back or divert the onrush of high water. Flood plain managers now regularly use an arsenal of weapons against the threat of flood which were not often used or commonly recognized in 1935. The writings of Gilbert White and his associates at the University of Chicago have done much to expand the meaning and application of flood plain management [4]. James Goddard of the Tennessee Valley Authority also proselytized in the cause of a broader conception of flood plain management [5].

White emphasized the importance of a typology of adjustment to floods based on land use. He further suggested that appropriate alternative solutions vary significantly according to the intended land use. Hence, for each possible land use, one must consider an entire range of alternatives as shown in Figure 1.

Goddard suggested a typology based on corrective or preventive measures for reducing flood damage. This approach places an

Table 1. Governmental Involvement in Flood Control [7]

Federal organizations	*Planning*	*Data collection & dissemination*	*Flood plain regulation*	*Technical assistance*	*Other*
Water Resources Council	X	X			X
Environmental Protection Agency				X	X
Tennessee Valley Authority	X	X	X	X	X
Federal Power Commission	X			X	X
Office of Management & Budget					X
Housing & Urban Development	X			X	X
Soil Conservation Service	X	X		X	X
National Oceanic & Atmospheric Adm.		X		X	X
Corps of Engineers	X	X		X	X
Fish & Wildlife Service	X			X	X
Bureau of Outdoor Recreation	X			X	X
Bureau of Reclamation	X			X	X
Park Service	X			X	X
U.S. Coast Guard		X			
U.S. Geological Survey	X	X		X	X

emphasis on flood control as a corrective device and flood plain regulation as a preventive device, while relegating other alternatives to the other preventive or corrective categories. Figure 2 provides details of Goddard's typology.

The legislative task in defining policy in flood plain management has continued to evolve at all levels of government. "Multi-purpose" justification for projects has become common. A complex combination of agencies has become involved in water management and flood control, particularly at the federal level, as shown in Table 1. Many of these federal activities are conducted in cooperation with state or local governments.

The most recent thrust in flood plain management has come under the heading of flood insurance. As a prelude to the passage of the 1968 Flood Insurance Act, Congress passed an authorization in 1956 for a Flood Insurance Administration, but never funded it. In 1966, a presidential task force on floods produced a report, calling for a "Unified National Program for Managing Flood Losses," with specific recommendations. One immediate consequence of the report was the issuing of Executive Order 11296

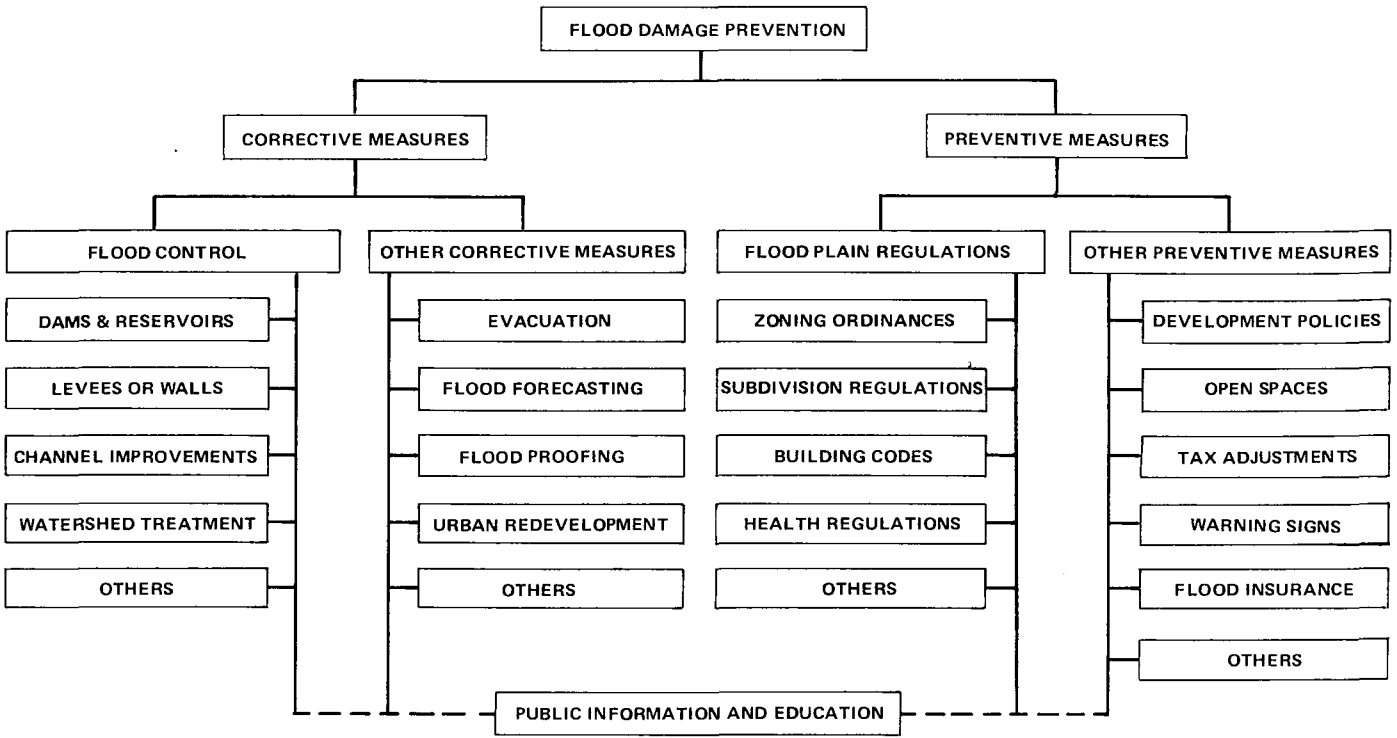


Figure 2. Elements of flood damage prevention [5].

requiring all federal agencies to consider the flood hazard in their operations. A later consequence was the passage of the Flood Insurance Act of 1968. The flood insurance program was revised in 1973 to expand the available limits of food insurance coverage and to impose new requirements on property owners and communities. The 1977 amendments to this act removed some of the restrictions regarding the provision of loans within flood hazard areas.

The complexity of individual and government response to floods is evident. Recent federal and state initiatives have taken a somewhat different approach to those already described. The recent emphasis has been upon flood plain management instead of flood control.

LAND USE CONTROLS

Land use controls are a major element in current programs of flood plain management. Regulating the activities that take place on the flood plain can maximize economic efficiency and productive use while minimizing the hazards of property damage and loss of human life. There are many legal issues involved, but regulation of land in the face of the hazard of inundation is based on well-founded legal principles.

Recent Federal Initiatives

The increasing number of legislative actions encouraging or requiring regulatory management of flood plain uses is partly a result of increasing awareness of the legality of such regulations. The Flood Insurance Act of 1968 and subsequent revisions impose land use controls that would have been nearly impossible thirty years ago, simply because the law that supports them was not well developed, and possibly because adequate public (and political) support was nonexistent. The original act authorizing the federal role in flood insurance granted federal subsidies in flood insurance to flood-prone communities that instituted certain kinds of flood plain management regulations. No community was required to participate, nor were property-owners in participating communities required to purchase insurance when available. The only incentive the original act provided was that the subsidized insurance was available only to prospective purchasers in communities whose flood plain management program met the requirements of the Act.

The Flood Disaster Protection Act of 1973 substantially revised the original act. The limits of subsidized coverage were doubled or

more for categories of insurable property and communities were given more incentives to join the program. Certain federal funds and programs and federal mortgage guarantees would be unavailable to those communities which had not instituted appropriate flood plain management measures. The impact of this act has been mitigated somewhat by the Housing and Communities Act of 1977 which does allow for some funding to communities not participating in the federal flood insurance program.

Other federal laws also have sought to compel consideration of the flooding hazard by communities. The Coastal Zone Management Act of 1972 (P.L. 92-583) facilitates the regulation of land, at least partially, in order to reduce the danger of coastal floods. The Act is a recognition and understanding of the natural and environmental system that exists in the coastal areas of thirty-four states bordering the oceans and the Great Lakes. Congressional intent was directed toward stimulating state and local involvement in the development of coastal resources management programs that were consistent with general guidelines.

The trend is clear. Land use controls are becoming more prevalent in areas of flood hazard, especially under the impetus of federal legislation.

Legal Basis for Land Use Controls

Land use controls which have evolved in our system of law include zoning and subdivision regulation as the major regulatory devices. The authority to exercise land use controls such as these is derived from state or home rule powers. However, most states provide specific authority to engage in land use controls through enabling legislation. Historically, enabling legislation has been influenced by a number of model acts. In 1922, the Department of Commerce prepared a Standard State Zoning Enabling Act and the same department prepared a Standard City Planning Enabling Act in 1927. These two Acts have provided a basic framework for much of the enabling legislation that exists today.

Zoning has become prominent in the last half-century as a means of securing certain public goods necessary to society's well-being by legal means. However, the courts require that there must be a "rational connection" between the regulations and the promotion of the public health, safety, and welfare. The procedural and substantive safeguards included in a legally defensible program of flood plain management protects it both from legal attack and from working injustice to the occupants of the flood plain. The

first extended legal appraisal of flood plain zoning concluded, in 1959, that the police power could be exercised with respect to flood plains for the purpose of promoting the "health, safety, and general welfare."

Subsequent events proved that view to be correct. But flood plain zoning, subdivision and health ordinances, and the other traditional tools of the flood plain manager have not always proven adequate by themselves. Zoning programs are sometimes subject to tremendous political pressure and may represent a very limited and static approach.

Eminent Domain

An alternative to the police power of government is its power to acquire land. Eminent domain is the traditional device used by governments to take property for public purposes. It differs from police power; the principal difference between the two powers lies in the matter of compensation to the owner. Whereas the police power does not allow for taking, it does regulate the use of property in the interest of the public. The power of eminent domain, on the other hand, allows for the taking of private property for public purposes with just compensation provided to the owner.

With respect to flood plain management, it is a thin line between the application of zoning and the utilization of eminent domain. The question is raised: To what degree can we use the police power to control flood plains and to what degree do we have to use eminent domain, that is, pay for it? In the past, courts have objected to those communities that attempted to get something free, and found that they should pay. However, courts are increasingly sustaining broader applications of zoning by placing a greater emphasis on community needs [9].

Easements

Another approach to regulating and/or controlling development is the use of easements—an approach which has been largely ignored. An easement can be used as an alternative to outright purchase of properties located in the flood plain. In other words, a part of the bundle of rights normally associated with land ownership could be purchased to accomplish land use objectives while leaving title with the owner. With the utilization of an easement, the property remains on the tax roll and the owner still retains certain benefits of ownership. The easement approach offers a form

of equity which is not possible through zoning or other forms of regulation by government.

Use-Value Assessment Taxation

Use-value assessment taxation is a form of taxation that is based on the current producing capacity of property. It is to be distinguished from the usual market-value assessment approach which considers the potential for development and the sale price of similar properties. The use-value approach is in reality a preferential assessment whereby certain classes of property are assessed at a use value rather than a market value. A preferential assessment is expected to be administered on a *quid pro quo* basis, i.e., the landowner's taxes are reduced on lands which should not be developed because of the paramount interests of the health, safety and welfare of the community. As a flood plain management tool, the primary objective is to limit the tax burden on property which is in the flood plain and thereby to encourage low intensity development or no development at all.

Model Land Development Code

The frequently demonstrated inadequacy of traditional police power regulations has inspired the creation of unconventional techniques. The American Law Institute (ALI) has proposed, for instance, a Model Land Development Code for the States [10]. The model code would modernize and supplement the Standard Enabling Planning and Zoning Acts of the 1920's. The ALI's recommendation for the proper role of the state in regulating land use is centered around general assumptions:

1. only a minority of land use decisions involve significant state or regional interests and should be subject to state intervention;
2. where there are non-local considerations, the state should make policy and leave implementation and enforcement to local governments with a state and regional oversight process; and
3. land use problems are important enough to warrant legislative or regulative attention even if a comprehensive plan has not been prepared [11].

The model code features state designation and regulation of areas of "critical state concern" and increased state involvement in the issuance of permits for developments of "regional impact."

Both concepts can be used directly for purposes of flood plain management. The intent of the proposed code is to grant the state governments a more active part in preserving and enhancing state resources of multi-county or state-wide value. A curious feature of American politics is the inviolability that cities and counties possess in many matters of more than single-city or single-county concern. Flood plains often reach into many different jurisdictions; obviously a regional strategy for managing them is necessary.

Transferable Development Rights

Another innovation of rapidly increasing popularity is the invention of "transferable development rights." Ownership of property is commonly defined as the possession of a "bundle of rights," including the right to develop the land and the right to sell it. In communities that adopt "TDR" plans, development is restricted in some parts of the jurisdiction but compensation is made in the form of "development rights," which may be sold to property owners in other parts of the community who wish to exceed the usual zoning limits on density. To be legally defensible, the value of the "development rights" a property owner is allowed to transfer by sale must bear a near relation to the full development potential of this property that is denied him by the TDR plan.

The basic purpose of TDR is to provide a mechanism for equitable treatment of those landowners whose rights may be restricted as a result of the inequities that are embodied in zoning. Therefore, the utilization of TDR may be an applicable and rational approach to flood plain management and preservation of environmentally sensitive areas. The TDR technique is also a method that can be used by local governments to restrict development in an area, and yet minimize abuse of the police power. TDR is a land management device based on the underlying principle that the development potential of privately held land is in part a community asset that government may allocate to enhance the general welfare. TDR is an attempt to mesh law, equity and economics in the growth and development process.[1]

CONCLUSION

Flood plain management has gone through an evolutionary process in this country. As urbanization has increased and flood

[1] For additional information on "transferable development rights" see references [12 and 13].

plains have been brought into more intensive use, annual flood damages have increased substantially calling for more effective management of the flood plain. There has been a shift of emphasis from local to federal responsibility, but more recently, the federal government has created incentives for state and local governments to assume a greater role. A major component of state and local efforts is directed toward control of flood plain usage through regulatory measures.

All of the states possess the power to legislatively manage the flood plain, and all of them have passed enabling legislation to do so—although some of them did so reluctantly. Similarly, the response of local governments in controlling use of the flood plain has been mixed. Taken together, the evidence is that management of flood plain uses by government is both increasing and indubitably legal.

The issues are complex, as are the methods to resolve them, but it seems clear that a comprehensive program of flood plain management, involving all levels of government, will be necessary in the future. The issues do not imply building flood control structures at the one extreme or prohibiting use of the flood plain at the other, but rather a total program of flood plain management involving the appropriate mix of structural and/or non-structural measures for any particular situation. As an aid in this process, innovative land use controls offer the potential for more effective flood plain management.

REFERENCES

1. W. G. Hoyt and W. B. Langbein, *Floods*, Princeton University Press, Princeton, New Jersey, 1955.
2. L. Mumford, *The City in History*, Harcourt, Brace and World, New York, pp. 56-57, 1961.
3. G. F. White, Optimal Flood Plain Management: Retrospect and Prospect, *Water Research*, A. Kneese and S. Smith, (eds.), Resources for the Future, Washington, 1965.
4. G. F. White, *Human Adjustment to Floods*, Department of Geography Research Paper No. 29, University of Chicago, 1942.
5. J. E. Goddard, Flood Plain Management Improves Man's Environment, *Journal of the Waterways and Harbors Division*, American Society of Civil Engineers, November, 1963.
6. G. White, *Choice of Adjustment to Floods*, Research Paper No. 93, Department of Geography, University of Chicago, 1964.
7. J. F. Wall, *The Civil Works of the United States Army Corps of Engineers: Program Modernization*, These (Ph.D.), Cornell University, Ithaca, New York, 1973.

8. U.S. House of Representatives, Document No. 465, A Unified National Program for Managing Flood Losses, a report by the Task Force on Federal Flood Control Policy, Washington, August, 1966.
9. W. Whyte, *The Last Landscape*, Doubleday, Garden City, New York, p. 42, 1968.
10. American Law Institute, *A Model Land Development Code*, final draft, Philadelphia, 1976.
11. R. G. Healy, *Land Use and the States*, Johns Hopkins University Press, Baltimore, 1976.
12. J. B. Shlaes, Who Pays for Transfer of Development Rights?, *Planning, 40:*6, July, 1974.
13. J. J. Costonis, Whichever Way You Slice It, TDR Is There to Stay, *Planning, 40:*6, July, 1974.
14. Transferable Development Rights, PAS 304, American Society of Planning Officials, Chicago, 1975.
15. J. Rose, (ed.), *The Transfer of Development Rights*, Center for Urban Policy Research, Rutgers University, New Brunswick, 1975.

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