



PLANNING FOR NATURAL HAZARDS:

Appendix C: Tools

July 2000



Oregon Department of Land Conservation & Development

635 Capitol Street NE, Suite 150
Salem, OR 97301
503-373-0050



Community Planning Workshop

Community Service Center
1209 University of Oregon
Eugene, OR 97403
541-346-3889

Special Acknowledgements to:

This appendix of the Natural Hazards Technical Resource Guide utilizes information from a table included in Raymond Burby's book Cooperating with Nature: Confronting Natural Hazards with Land-Use Planning for Sustainable Communities. The table, entitled *A Qualitative Assessment of the Effectiveness of Land Use Management Tools for Hazard Mitigation* was developed by Robert Olshansky and Jack Kartez and based on a conference of the authors involved with Burby's text. This table has been supplemented with information from Tools and Techniques for Mitigating the Effects of Natural Hazards, a North Carolina Division of Emergency Management document.

INTRODUCTION

This appendix describes various tools and techniques that can help communities reduce risk from natural hazards. A brief examination of the effectiveness and limitations for each tool is included.



Land Use Management Tools	Description	Effectiveness	Limitations
Plans			
<p>Comprehensive Land Use Plans adopted by all Oregon cities and counties and acknowledged by DLCDC.</p>	<p>In Oregon, local comprehensive plans comply with Statewide Planning Goals including Goal 7 – natural hazards.</p>	<p>Local governments are specifically required to address hazards in the context of community's overall land use plan.</p>	<p>Natural hazards element is only one piece of the comprehensive plan. Have historically been overshadowed by other issues (e.g., transportation and housing).</p>
<p>Hazard mitigation plans As of June 2000, approximately 30 Oregon communities have adopted hazard mitigation plans. Many of these are specific to flood hazards.</p>	<p>Specifies actions a community will take to reduce its hazard vulnerability. Assesses community's financial, legal and technical ability to mitigate hazards.</p>	<p>Allows for a substantial amount of decision-making to occur prior to a disaster event. Recommendations can be incorporated into a comprehensive plan and land use ordinances.</p>	<p>Limited funding for mitigation planning. Need to build local support for planning effort.</p>
<p>Public facility plans In Oregon, State-wide Planning Goal 11 requires communities to plan and develop a timely, orderly and efficient arrangement of public facilities and services to serve as a framework for urban and rural development.</p>	<p>In Oregon, this refers to a plan for the sewer, water, and transportation facilities needed to serve a city with a population greater than 2,500. Less specific than a capital improvements program.</p>	<p>Can discourage or reduce the intensity of development in hazard areas. Local governments should consider natural hazards in public facilities planning although not specifically required by Goal 11.</p>	<p>Does not alter the basic spatial pattern of private development in hazard areas. Goal 11 does not specifically require consideration of natural hazards in public facilities planning.</p>

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Building Standards			
<p>Special building standards</p> <p>Oregon has a state building code administered by the state and local jurisdictions.</p>	<p>A set of regulations that govern the construction of buildings and other structures.</p> <p>Building codes may also apply to major repairs and renovations.</p>	<p>Elevating structures in floodplains to prevent building damages is widely used because of the National Flood Insurance Program. Landslide and wildfire standards can help reduce structure damage. Seismic codes can effectively save lives and reduce (but not prevent) chances of building collapse.</p>	<p>Applicable primarily to new development.</p>
Development Regulations			
<p>Zoning ordinances</p>	<p>The designation of allowable uses for a particular area.</p>	<p>Can limit exposure of new development in hazard areas and protect natural values and functions not yet degraded by development.</p>	<p>Cannot mitigate losses to existing development and infrastructure.</p> <p>Requires information identifying geographic extent of hazard.</p> <p>If a community's boundaries are all within high risk areas, zoning may be ineffective. (e.g., zoning may be ineffective for certain seismic hazards)</p>
<p>Overlay zones</p> <p>Many Oregon jurisdictions employ these for floods and steep slopes.</p>	<p>A special zone that is applied "over" or in addition to a base zone.</p> <p>Limit/apply additional regulation to underlying uses.</p>	<p>Allow communities to isolate and protect certain areas or to devise regulations that apply in specific situations.</p>	<p>Requires detailed information on the spatial extent and nature of the hazard to support effective regulation.</p>



Land Use Management Tools	Description	Effectiveness	Limitations
Development Regulations continued			
<p>Bonus and incentive zoning</p>	<p>The practice of allowing developers to exceed limitations imposed by current regulations, such as building height, floor area or density, in return for special concessions.</p> <p>An example could be a developer granting an open space easement in flood prone area in exchange for increased density outside the of hazard area.</p>	<p>Communities can offer bonuses, in the form of increased densities or floor space, to developers who avoid building in hazard-prone areas or who integrate mitigation into design.</p>	<p>Generally limited to metropolitan areas where land is scarcer and the market benefit to the developer is more tangible.</p> <p>May face legal challenges if there is not a clear connection between the concession and the government purpose.</p>
<p>Performance or impact zoning</p>	<p>Sets standards for the allowable effects or impacts of new development.</p>	<p>Allows local governments to set standards such as minimum protections for natural resources (e.g., wetlands protection, stormwater control and traffic access standards).</p>	<p>Performance standards may be difficult to write and administer. Requires time and expertise.</p>
<p>Planned Unit Developments (PUDs), average density, and cluster development</p>	<p>Regulation under which design is a matter of negotiation. The average density of the site remains at or near the allowable limit.</p>	<p>Allows flexible design of developments that are constructed as a unit. Can help shift density away from hazard prone areas.</p>	<p>PUDs must have areas of lower hazard risk available for development.</p>
<p>Subdivision ordinances</p>	<p>Local ordinances that regulate the conversion of undivided land into building lots for residential or other purposes.</p>	<p>The key tool in land use planning where damage can be reduced by design and density limitance. Moves structures, streets and utilities to safest area of site.</p>	<p>Subdivision regulation is not well tied to hazard mitigation objectives in many areas.</p>

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Environmental Management			
<p>Wetlands protection</p> <p>Wetlands provide habitat, water quality benefits and flood storage</p>	<p>Wetlands serve many environmental purposes in addition to flood mitigation. Other programs are in place to prohibit dredging and placement of fill in wetlands.</p>	<p>Prevents development in wetlands that protect areas for flood storage and preserve other environmental benefits. Wetlands regulations and funds to protect wetlands may also be used to support flood-plain management activities.</p>	<p>Evidence from the 1993 Midwest floods found that wetland restoration is effective for small and medium floods, but usefulness in mitigating floods diminished as the size of the flood increased.</p>
<p>Stormwater management</p> <p>New development generally results in an increase in impervious surface, impairing the ability of land to absorb water and increasing the volume of peak flow runoff.</p>	<p>Structural and non-structural measures to control run-off. Structural solutions include detention and retention ponds to store water, and filter strips. Non structural projects include maintaining existing stormwater systems and limiting impervious surfaces.</p>	<p>Measures reduce flooding, erosion and water quality problems. New permit requirements for smaller cities will encourage adoption of stormwater management tools.</p>	<p>Most effective for new development. Hard to retrofit existing stormwater systems to provide better water storage.</p>
Public Facilities Policies			
<p>Capital improvements program (CIP)</p> <p>Used in conjunction with other land use planning measures to ensure that development is not stimulated in hazard prone areas.</p>	<p>A multi-year plan describing how some or all of a community's capital improvements are to be developed. Contains detailed information on technical items (e.g., pipe capacity, for example) and information on projected costs and financing methods.</p>	<p>Can be useful in steering development away from hazard areas by limiting availability of necessary services. Can promote funding for services in lower hazard areas.</p>	<p>Many cities and counties do not have such programs.</p>



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Land and Property Acquisition			
Acquisition of land in high hazard areas.	Local jurisdiction acquires land for permanent open space or low-intensity use (e.g., recreation) in hazard prone areas.	Maintaining hazard areas as open space truly minimizes risks from hazards. Multiple objectives are possible (e.g., recreation, flood mitigation, alternative transportation corridors, and neighborhood redevelopment).	Acquisition is usually expensive. Must coordinate acquisition with overall land use plan. The challenge is avoiding “checker-board” acquisition of property. Must target specific, high hazard areas.
Structural buy-outs	Obtain buildings damaged by natural hazards.	Can be a key component in the relocation of existing hazard area development to new site(s).	Effectiveness depends on what happens to acquired structures and subsequent rebuilding on- and off-site. Most effective if group of structures can be acquired in same area. Expensive, with very high demands for commitment and coordination.
Relocation of existing hazard area development to new site(s)	The removal and relocation of structures to areas with reduced hazard risk.	Removes risk to residents in the hazard area if limits are placed on the property thus precluding redevelopment.	Same limitations for structural buy-outs noted above. In addition, relocations require large investment in new site, with no assurances that former residents will move to relocated development. Timing is a problem because buyouts and relocation are not necessarily at the same time.
Acquisition of development rights or easements	Obtain a right to use property for a specific purpose.	Potentially very effective if funds are available and adequate authority (such as eminent domain) can be employed to target key sites. Property owner still allowed to use site for recreation, agriculture and other activities that minimize risk to people and structures.	Have not been frequently used for hazard mitigation in Oregon.

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Transfer of development rights (TDR) away from hazard areas to safer locations.	Development rights are separated from the land in an area where a community wishes to limit development. Development rights are then permitted to be sold for use in an area desirable for high-density development.	Potentially very effective if there are suitable receiving areas for transferred rights and the program is mandatory, not voluntary.	This is a complex tool for hazard mitigation aims alone. Costs of developing and administering TDR or purchase of development rights programs are significant.
Taxation and Fiscal Policies			
Preferential (reduced) taxation	Taxation is linked with open space or reduced land use intensity of lands in hazard areas.	Important as a possible incentive for easements and other partial-fee transactions to limit development in hazard areas.	Has not been used for mitigation aims. Completely ineffective as a stand-alone tool. Requires state enabling legislation or extension of existing farmland and open-space laws for mitigation purposes.
Impact taxes or special assessments	Taxes or assessments to fund the added public costs of hazard area development.	Can shift costs of future public losses due to developing in hazardous locations back onto the developers and owners. Possible disincentive to vulnerable development.	Has not been used for mitigation, although many other public costs of development are now collected from new development.



Land Use Management Tools	Description	Effectiveness	Limitations
Information Dissemination			
Public information programs	Educational programs for increasing natural hazard mitigation.	Better-informed citizens and consumers can create a political constituency for hazard mitigation when they know about the location and magnitude of hazards.	Generally, programs have a mixed record in building local political commitment for hazard mitigation. Targeted programs providing specialized information have been more effective (e.g., DOGAMI landslide brochure).
Construction practice seminars or builder/developer mitigation	Educational programs aimed specifically at builders and developers.	Essential aspect of effective use of specialized codes and building standards. Can contribute to success of an overall multi-tool mitigation strategy.	It is a challenge to ensure that training is available for all local/state building code officials and that information provided is consistent.
Hazard disclosure	A requirement for disclosing hazard risk in real estate transactions.	Better-informed real estate purchasers should create pressure for limiting some of the worst cases of new development in known hazard locations.	Disclosure typically is perfunctory and is provided too late in the transaction to affect the purchase decision.