



US Army Corps
of Engineers

U.S. Army Corps of Engineers:

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Non-Structural Alternatives

Flood risk in the United States is increasing despite efforts during past decades to reduce or eliminate that risk. For at-risk communities, planners and flood risk managers often believed that the best course of action was to build, maintain and repair flood control structures – dams, levees, detention basins, channels, diversions, etc. To truly reduce flood risk, more planners and flood risk managers realize the need for their comprehensive floodplain management strategies to include the full range of “tools” in the flood risk reduction “tool box,” which includes both structural and non-structural alternatives and measures. Planners and flood risk managers also realize that the “floodplain” is much larger than the “floodplain” commonly referred as the 100 year. To reduce flood risk, we must consider the holistic “floodplain,” which is any area that can be flooded by even the very largest of floods that are much, much larger than a one in 100 year event.

Purpose of non-structural alternatives

While structural methods reduce flood risk by diverting and/or containing flood waters, non-structural alternatives reduce risk by modifying *susceptibility* to flooding and associated impacts.

Non-structural alternatives reduce flood risk by modifying characteristics of buildings and structures that are subject to floods and/or by modifying practices of people living in or having property in or near floodplains. Non-structural alternatives offer enhanced flood plain management even though they may allow flooding in areas previously considered “protected” by structural alternatives. These additional measures reduce overall flood loss by restoring or sustaining flood water storage in the floodplain, or in the removal or modification of at-risk uses, thus reducing the potential for future damage. Non-structural alternatives also can create wildlife habitat areas providing environmental enhancement



Lincoln Park, a low-lying area in Grand Forks, N.D., was devastated by flooding of the Red River in 1997 (top photo). Its relatively low elevation meant few options to prevent future flooding. After careful evaluation, the difficult decision was made to relocate the Lincoln Park neighborhood to higher ground. The former neighborhood was turned into a recreational area that now benefits the entire Grand Forks community (left photo)..

Non-structural alternatives, such as removing buildings from a floodplain or purchasing floodplain land, can create opportunities for new uses that enhance ecosystems and increase recreational uses. The decision to buy out a floodplain to change how the land is used is a difficult one for any community. However, the chosen non-structural alternative usually provides important benefits beyond reducing flood risk. Many communities that have made decisions that include non-structural alternatives are very satisfied with the results.

Structural alternatives reduce flood risk by modifying the characteristics of the flood, not by altering either floodplain development or the actions of people living in or near the floodplain. Structural alternatives often increase development within a floodplain, a practice inconsistent with reducing flood risk. In fact, structural alternatives can increase flood risk.

Following a catastrophic flood that results in a damaged structure like a levee, the traditional approach has been to repair it to pre-flood conditions as quickly as possible within the authority of the U.S. Army Corps of Engineers' Public Law 84-99 program. Non-structural alternatives are considered at the request of the public sponsor but are rarely implemented because of the desire to restore the damaged structure before the next flood season. Although people within the "protected" levee area assume a repaired levee provides long-term flood risk reduction, history has proven this assumption incorrect. Levees continue to overtop or fail in subsequent flood events. There is no guaranteed future reduction in human hardship and damage, yet the cumulative costs grow higher.

Types of non-structural alternatives

Basic non-structural measures used to develop non-structural alternatives that are generally specific to developed floodplains and buildings include:

- Relocation of buildings from the floodplain to a flood-free location with the acquisition of floodplain land and deed restrictions so no future development would be at flood risk;
- Acquisition/buyout of buildings and property within a floodplain, coupled with deed restrictions;
- Elevate buildings (and roads) above a particular flood elevation;
- Dry flood proofing buildings, which is traditional waterproofing of buildings;
- Wet flood proof buildings, which is basically retrofitting existing buildings with non-flood damage materials below a design flood elevation and allowing flood water to easily flow in and out of the building;
- Small levees, berms and walls that surround one building or a few buildings in close proximity to one another; and,
- Flood warning and preparedness planning and relative equipment installation and plan implementation.

More general non-structural measures that reduce flood risk include:

- Modification of public policy relative to flood risk;
- Changes in floodplain management practices;
- Floodplain regulation; and,
- Restoring natural and beneficial uses of floodplains such as natural floodplain storage, natural river/floodplain interaction, etc.

Other options available are:

- Federal Emergency Management Agency National Flood Insurance Program that includes mapping floodways;
- Watershed management;
- Land use planning;
- Regulation and zoning; and,
- Flood warning systems.

Bottom line

In the end, a comprehensive flood risk management strategy that includes non-structural alternatives accomplishes several important goals:

- Provides a balanced focus of needs and objectives in the floodplain planning process;
- Manages floodplains as components of larger watersheds, including consideration of flowage easements in agricultural areas;
- Emphasizes environmental enhancement and ecosystem management;
- Reduces recurring costs to repair and maintain infrastructure;
- Assures life and properties are optimally protected; and,
- Possibly reduces the risk of flood damage with the least amount of upfront costs.

The Corps' goal for an effective non-structural alternative program is to use as few resources as are needed to accomplish the mission, in a manner that leaves the smallest footprint behind while providing for environmental enhancement where possible.