

Partnerships

The Council recommended that FEMA seek partnerships with other federal agencies, states, and local governments, universities, and private interests to improve both the maps and the mapping processes.

FEMA has begun developing partnerships with other federal agencies, states, and local units of government in the production of Flood Insurance Rate Maps (FIRMs). These partnerships minimize duplication of effort and result in much improved maps at lower cost to the National Flood Insurance Program.

FEMA has actively participated in the Federal Geographic Data Committee (FGDC), which is developing standards for digital mapping. FEMA has adopted these standards for its digital FIRMs, while coordinating its efforts with the U.S. Geological Survey (USGS) in developing standards for FIRMs that will employ USGS DOQ's as the base map. In addition, FEMA is coordinating with the National Geodetic Survey (NGS) of the National Oceanic and Atmospheric Administration (NOAA) to make greater use of Global Positioning Systems in the mapping processes.

FEMA has begun to coordinate with the Federal Energy Regulatory Commission (FERC) to use information generated for licensed hydropower dams in Flood Insurance Studies (FISs). A wealth of hydrologic and hydraulic data has been generated by FERC-licensed utilities that would reduce the costs of FISs.

Perhaps most significant, FEMA has developed partnerships with state, local, and regional governments in establishing a framework to delegate the maintenance of the maps. FEMA's Cooperating Technical Partners (CTP) initiative holds great promise to devolve a major federal responsibility to states and communities that have the resources and the interest in updating and maintaining maps of their flood-hazard areas. Nurturing partnerships with state, local, and regional governments will only be possible if FEMA has sufficient resources to contribute to the process and fulfill its commitments and is able to provide incentives so states and local government to accept the responsibility.

Base Maps

The Council made several recommendations relative to base maps, the part of a FIRM that shows the location of landmark features including roads and buildings, relative to flood-hazard areas. The primary focus of the recommendations was for FEMA to adopt, and adhere to, a minimum base map standard that will result in a FIRM that is geographically referenced, positionally accurate, reproducible, and includes the necessary features and attributes that make maps useful documents.

Base maps form the foundation for Flood Insurance Rate Maps. They significantly impact the usefulness of the maps for flood insurance and land-use regulations. FEMA

is not a mapping agency, per se. FEMA is responsible, however, to provide floodplain information that can be displayed as an overlay onto other existing maps.

FEMA has adopted a base map standard that meets the Council's recommendations. USGS Digital Orthophoto Quadrangles (DOQ's) have become the default standard base map. In order for this standard to be practical, every participating community must be included in a current USGS DOQ. , An increased emphasis on completing coverage in any community where USGS DOQ's have not yet been produced, will be necessary.

Some local governments have invested considerable resources to produce maps for their own use, often with more detail and at a larger scale, than USGS DOQ. Where such maps meet the minimum standards, they can and should be used as the backdrop for a FIRM.

Multiple Flood Hazard

The Council recommended including flooding sources not usually depicted on FIRMs and expanding information about the types and causes of floods. FEMA has concluded that the law only requires the purchase of flood insurance to areas subject to floods that can reasonably be determined as 1%-annual-chance flood events. Consequently very real, and potentially catastrophic, flood events that occur less frequently are seldom shown on the maps. These events should be depicted, if for no other reason than for public awareness.

Tsunamis, caused by undersea earthquakes, create flood events primarily along the west coast, Alaska, and Hawaii. In some areas with very little warning massive waves can flood land 100 feet or more above sea level. Tsunami-induced flooding has devastated entire communities, yet such hazard areas are typically not depicted on FIRMs. There is insufficient data to predict the frequency of tsunamis, but we can reasonably predict which communities are most at risk, and this warning should be made public on the maps.

Dams can cause flooding either by improper operation or a sudden catastrophic failure. The Western Governors' Association, in its report to Congress in 1999, highlighted improper or inadequate operation of dams, and the resultant flooding. The report stated that dam-induced flooding is a significant problem that has been ignored for too long; inadequate operation can be documented and flooding that would result from a sudden catastrophic dam failure can be predicted and mapped and should likewise be depicted on FIRMs. In many instances, studies performed by FERC-licensed utilities are readily available and could be displayed. The data would be crucial in planning and executing emergency responses, and could be used to guide new development away from hazardous areas.

Debris and ice jams cause flood levels to reach heights well above the calculated Base Flood Elevation (BFE). The increases in BFEs caused by debris and ice jams are seldom taken into account when flood studies are planned, even though the study

guidelines provide criteria to be followed to identify the extent of these risks. In scoping FISs, greater attention must be paid to these hazards so that where they have occurred, or are likely to occur, they can be taken into account and properly depicted on the FIRM.

Erosion of coastal shorelines must be addressed and mapped. A study, Evaluation of Erosion Hazards, conducted by the Heinz Center, recommends that coastal erosion is a serious issue that should be depicted on FIRMs, even if for no other reason than to raise public awareness. The Council supported these recommendations.

Rapid and catastrophic erosion of unstable riverbanks should be included when FISs are conducted and areas subject to erosion hazards are mapped. Unless prohibited by state law or local regulations it is currently possible to construct and insure buildings in areas susceptible to high rates of erosion which can damage or destroy the structure in a very short period of time.

Archiving FIRMs

The Council recommended that FEMA create and maintain, in perpetuity, a complete archive of maps produced under the NFIP. The archives must include the supporting background information and studies used to create and update the map products.

FIRMs and their predecessors, Flood Hazard Boundary Maps, have been used for flood insurance and land-use regulation for over 30 years. Decisions regarding building permits and the purchase of flood insurance have been made using maps that, in some instances, are no longer retrievable. It is critical that superseded maps be archived and retrievable in the event questions or legal challenges arise in the future. Compilation of a complete archive of existing and superseded FIRMs is one element of FEMA's Map Modernization Plan.

Modern Mapping Technologies

The Council recommended that modern methods be employed to create and update FIRMs.

When the NFIP was passed in 1968, computers and computer-aided drafting programs did not generally exist. The state of the art in map preparation employed scribing on acetate overlays and photographic reproduction. Computers in almost every segment of the engineering and mapping industry have replaced scribing.

Electronically created maps are more economical to store, update, and distribute. Digital floodplain information would also be far easier to use for other community purposes. Geographic Information Systems that enable users to perform a variety of planning and analysis functions on all types of digital, map-related data, are commonly used in communities throughout the country. The addition of digital floodplain information to these systems would be extremely valuable in planning and designing

flood protection projects, and analysis and enhancement of water quality and riparian habitat.

Conversion of FIRMs from paper to electronic medium is a key element of FEMA's Map Modernization Plan.

Use of Emerging Technologies

In order for the NFIP to remain cost-effective in the future, new technology for the creation and distribution of map data must be employed in a timely manner. Included below are some examples of emerging technology, which hold promise for making flood-hazard mapping less costly and more timely.

Floodplain mapping and the determination of base flood elevations are more useful and accurate when referenced to a common, well-known coordinate system. The National Spatial Reference System (NSRS) has been defined nationwide and should be used as the basis for georeferencing FIRMs and related digital products. Reliance on the NSRS, coupled with advances in use of the Global Positioning System (GPS) and emerging remote sensing technologies, can enable FEMA and its partners to achieve greater efficiency and economy to support Flood Insurance Rate Maps and the mapping process. Working with other federal and local government agencies, FEMA can increase its involvement in demonstrating the applications and efficiencies of GPS and remote sensing for the National Flood Insurance Program.

Advances in photogrammetry and remote sensing, together with the use of GPS, also offer the potential for increased efficiencies in topographic mapping and floodplain delineation. The use of GPS to determine the position of an air- or space-borne sensor, at the time the image or other information is collected, opens the door to real-time or near-real-time development of three-dimensional surface models and orthorectified images. The proliferation of powerful computer hardware and software is also helping to reduce the amount of time necessary for processing and interpreting these data.

One of the new efficient methods to acquire imagery of the earth is Light Detection and Ranging (LIDAR), an active remote sensing system that can be operated in either a profiling or scanning mode using pulses of light to illuminate the terrain. By accurately measuring the travel time of the laser pulse from the aircraft to the ground, a highly accurate spot elevation can be calculated. Depending upon the altitude and speed of the aircraft, along with the laser repetition rate, it is possible to obtain point densities that would likely take months to collect using traditional ground survey methods. Likewise, other developing remote sensing technologies such as synthetic aperture radar and hyperspectral imagery offers the promise of increased mapping efficiencies that can support the NFIP.

Internet-based technology to allow the application and distribution of flood-hazard mapping data is also beginning to become a reality. The Open GIS Consortium, a group of stakeholders from government, academia, and the private sector, has been

working to make it possible to not only access data over the Internet, but to enable network-based applications of mapping data. In addition, the distribution of data over the Internet, even large data sets, is becoming more common and offers an alternative to FEMA to the storage and distribution of large numbers of paper FIRMs and associated information.

Flood Insurance Rate Map Updating and Maintenance

The Council recommended that FEMA update and maintain FIRMs to reflect current conditions, corporate boundaries, and flooding sources. The Council also recommended that, where appropriate, future-conditions hydrologic analyses be used for updating FIRMS. Use of future-conditions hydrology will extend the maps' shelf life and reduce the costs of map maintenance. It will also provide an additional degree of assurance that new structures will be protected from flooding.

Public Awareness and Education

The Council recommended that FEMA expand current public involvement efforts by developing a proactive, long-term, public awareness and educational program that focuses on the need for improved mapping of flood-hazard areas. Funding is needed for a well-designed program to educate the public about the risks posed by flood hazards and the values and benefits of good mapping will foster support for improving and updating maps of flood-hazard areas.

Unnumbered A-Zones

The Council recommended that FEMA take steps to improve the floodplain delineations depicted as Unnumbered A-Zones. Of all the miles of rivers and lakes that have been mapped by FEMA, less than 40% have been mapped using detailed study methods. Detailed study methods provide BFEs and more accurate floodplain delineations than studies done by approximate methods. For some Unnumbered A-Zones supporting technical backup data may be available to explain and support how the floodplain boundaries were determined; that information should be made available to the community. The remaining miles of rivers and lakes have been mapped by approximate study methods that do not result in the determination of the BFE. These rivers and lakes are mapped as Unnumbered A-Zones.

Recent technical innovations, improved computer capability, and the availability of USGS DOQ's make it possible to enhance existing Unnumbered A-Zones and create new and improved maps. Nationwide improvement of existing Unnumbered A-Zones is an objective of FEMA's Map Modernization Plan

Unmapped Flood Hazard Areas

The Council recommended that flood-hazard areas that do not appear on any FIRM be identified, prioritized in terms of the need, appropriately studied, and properly mapped.

There are a large number of flood-hazard areas that have not been delineated, yet which present a serious threat to people who may choose to buy or build within them. The most pressing problems exist in or near communities that are growing, but this is not the only place of concern. The lack of flood-hazard area mapping has major consequences. Without maps that identify all flood-hazard areas, communities cannot properly regulate new development. Continuing unwise development in unmapped flood-hazard areas results in a growing number of properties at risk, thereby escalating expenditures for disaster assistance.

Without maps lenders are not obligated to require that properties be insured against flood risk. Federal regulations require certain loans to be covered by flood insurance, but if hazards are not identified then properties within high-risk areas will likely not be insured. Uninsured property places lenders at risk. Without maps, developers lack necessary guidance to avoid flood-prone areas, increasing the number of buildings at risk, and increasing the demand for disaster assistance. Likewise, the need for flood protection is unknown and proper mitigation is not taken.

All flood-hazard areas need to be mapped in order for the NFIP to fulfill its potential for reducing the rate of flood-related disaster costs.