By Wendy Lathrop, LS, CFM

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Mapping the Zone

In March of 2007, the National Academies/National Research Council (NRC) informed me that I had been provisionally accepted as a member of "the National Research Council's Committee on FEMA Flood Maps: Accuracy Assessment and Cost-Effective Improvements". The first official meeting of the long-titled committee would include a review of any conflicts of interest or ethics for the group of thirteen provisional appointees. We all passed the test, and after shortening the name of our study group to "FEMA Flood Map Committee", immediately fell to work in earnest on addressing the tasks identified in FEMA's contract with the NRC regarding improvement of flood mapping. NOAA's Weather Bureau had joined as a co-sponsor of the report that would address current flood study and mapping methods, quantify the economic impacts of inaccuracies in horizontal and vertical components of flood risk mapping, and provide recommendations fir cost-effective improvements.

After five face-to-face meetings, an avalanche of email correspondence, and numerous drafts within the committee, a draft forwarded to outside reviewers generated 300-plus comments and questions that had to be addressed. This was actually a good thing, as it clarified where we authors had become myopically focused and jargon-laden to the point of leaving out important explanations and detail. The report, entitled "Mapping the Zone: Improving Flood Map Accuracy", is now available as PDF or hardcopy through the NRC website at *http://www.nap.edu/catalog.php?record_id=12573*.

The uncertainties associated with every aspect of flood risk identification formed the basis of our studies; some uncertainties impact the efficacy of the National Flood Insurance Program and the safety of our nation more or less than other uncertainties. After identifying geographical, methodological, and economic factors affecting current study and mapping procedures, five overarching findings form the basis for the report's recommendations (the report contains many more findings beyond these summaries):

- "Topographic data is the most important factor in determining water surface elevations, base flood elevation, and the extent of flooding, and thus the accuracy of flood maps in riverine areas."
- "Coastal flood maps can be improved significantly through use of coupled two-dimensional storm surge and wave models and improved process models, which would yield more accurate base flood elevations."
- "Flood maps with base flood elevations yield greater net benefits than flood maps without."
- "The most appropriate flood study method to be used for a particular map depends on the accuracy of the topographic data and the overall flood risk, including flood probability, defined vulnerabilities, and consequences."
- "FEMA's transition to digital flood mapping during the Map Modernization Program creates opportunities for significant improvements in the communication of flood hazards and flood risks through maps and Web-based products."

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While some may take umbrage at the fifth finding, by no means was the committee impressed by the process of "digital conversions" undertaken by FEMA merely to provide the nation with "digital maps" rather than update old studies with new data. Old bad paper maps merely turned into new bad digital maps, which the Flood Map Modernization Mid-Course Adjustment of 2006 acknowledged. It was decided to move on from past mistakes and accept that there are a variety of applications for digital flood data, including the multi-hazard estimation of damages from flooding and integration of the better flood data with other information for a variety of communication and risk-reduction applications.

Speaking of digital mapping, but unrelated to this NRC report, FEMA will no longer distribute paper maps after October 1 of this year beyond a

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single set to each of the participating communities in the NFIP. This means that all users of flood maps and related products should become familiar with the data distribution means available through FEMA's website and the Map Service Center. Now that all maps, both current and historic, are available in digital format, this should cut FEMA's expenses by reducing printing, storage, and physical distribution of paper maps. Besides maps, Letters of Map Change and Flood Insurance Study Reports are also available for both viewing and ordering through FEMA's Map Service Center at *http://msc.fema.gov* under "Product Catalog". Digital versions of these materials can be forwarded on CD or delivered to your "digital post office". DFIRM databases are also available through the Map Service Center where such data is available.

Returning to the NRC report, the bottom line for flood studies is that "elevation matters", and that studies yielding a base flood elevation (as opposed to approximate studies that yield no base flood elevation) are worth the extra expense. The benefit/cost assessments show that benefits transcend the technical advantages and provide advantages to public health, safety, and welfare. Often these social benefits are difficult to measure directly, as is the case with many quality of life issues. Additionally, dollars NOT spent are not easily accommodated by financial balance sheets.

The report is relatively short (less than 200 pages), but packs in case studies and research supporting recommendations regarding partnering to reduce study costs, updating coastal storm surge models, and review of methodology for mapping in flat terrain subject to ponding. One recommendation in particular is likely to affect what data could be more readily available in the future:

"FEMA should require that every flood study be accompanied by metadata identifying how each stream and coastline reach was studied and what methods were used to identify the magnitude and extent of the flood hazard and to produce the map."

For anyone who has struggled to find sense and consistency in flood studies and resultant data, this recommendation is for you.

There may be other mapping changes in our future as well. Heated discussions regarding how well maps do or do not communicate the actual risks of flooding resulted in a chapter devoted to an assessment of mapping and risk communication. One finding in particular should not surprise regular users of FEMA flood data who try to advise non-technical clients about flooding risks:

"The mapped location of buildings inside or outside a SFHA does not adequately convey a sense of flood hazard. Flood risk can be assessed and communicated more effectively in terms of the relative elevations of the structures and facilities in the flood hazard area."

It may be that some of the European flood mapping or inundation mapping by our own National Weather Service and Army Corps of Engineers illustrated in the report could influence future mapping products issued by FEMA.

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