Impact of Climate Change and Population Growth on the National Flood Insurance Program

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Delaware River Basin Commission
Flood Advisory Committee
West Trenton, NJ

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Purpose of Study


- Report recommended that FEMA analyze the potential long-term implications of climate change on the NFIP and report the findings to Congress.

- FEMA would use assessments from USCCSP (now USGCRP) and IPCC in conducting the analysis.
Study Overview

- **FEMA Project Officer:** Mark Crowell, FEMA HQ
- **Study Team:** AECOM, Michael Baker Jr., Inc., and Deloitte
- **Senior Review Panel Members**
  - Margaret Davidson, NOAA CSC
  - Maria Honeycutt, NOAA CSC
  - David Levinson, NOAA NCDC
  - Kathleen White, USACE
  - Howard Leiken, retired, formerly U.S. Department of the Treasury
  - Tony Pratt, DE DNREC
  - Robert Dean, University of Florida
  - William Gutowski, Iowa State University
Study Overview

- **Study Timeline:**
  - Initiated November 2008; analysis completed in 2010
  - Since 2010, has undergone interagency review
  - June 2013: Publicly released

- Estimating impacts to flood hazard area and flood elevation due to:
  - **Climate change – riverine flooding:**
    - Changes in precipitation patterns
    - Changes in temperature extremes
  - **Climate change – coastal flooding:**
    - Changes in sea level
    - Changes in frequency / intensity of tropical & extra-tropical storms
    - Long-term erosion & permanent submergence
  - **Population Changes:**
    - Affect of changing impervious area on riverine flooding
    - Impact of population increases in flood hazard areas
Study Overview

- **Time Horizon:**
  - Results through 2100 at 20-yr intervals

- **Key considerations:**
  - Nationwide study
  - Areas of inference (e.g. Great Lakes, Pacific Islands)
  - Makes significant simplifications, but effort made to avoid bias
  - Does not provide localized assessment results
  - Is not intended for regulatory use
  - Is diagnostic

- **Data Availability, Quality, Quantity:**
  - Up-to-date, but there will always be new data!
  - Uncertainty is unavoidable
  - SRES selections: B1, A1B, A2
Monte Carlo Simulations – Coastal Analysis

US Coastal Counties

Epochs: yr2020, yr2040,…, yr2100

Emission Scenarios: B1, A1B, A2

Δλ

ΔP

ΔSL

Apply Climate Projections to Existing Curves

Summarize Results (median & other percentiles)

Ni

Ne

Nc
Example Results

Changes in flood hazard...

Change in 1%-Annual-Chance Stillwater Elevation (ft.; yr2100 – yr2000)
Example Results

Cumulative Distribution Function

Change in 100yr Stillwater Elevation (feet; yr2100 – yr2000)

- 90th percentile
- Upper quartile
- Median
- Lower quartile
- 10th percentile
Key Conclusions

- **By 2100:**
  - Up to 45% national average increase in flood hazard area by the year 2100; approx. 30% of increases due to population growth.
  - Total # of NFIP policies may increase by approx. 80-100%.
  - Wide national variation anticipated.

Results are for use in determining national averages and should not be interpreted locally.
Recommendations

- *Climate change is an evolving science ... changes in climate happen with considerable regional variability.*

- **11 recommendations ... most notably:**
  - **#2:** Obtain more data – structure locations, elevation certificates, policy/claim data, property types, property values.
  - **#6:** Perform regional studies by applying nationwide projections to detailed local hydraulic modeling.
  - **#7:** Refine sea level rise regionalization.
  - **#11:** Investigate non-uniform population distributions.
The impact of climate change and population growth on the National Flood Insurance Program through 2100

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