

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

June 19, 2013

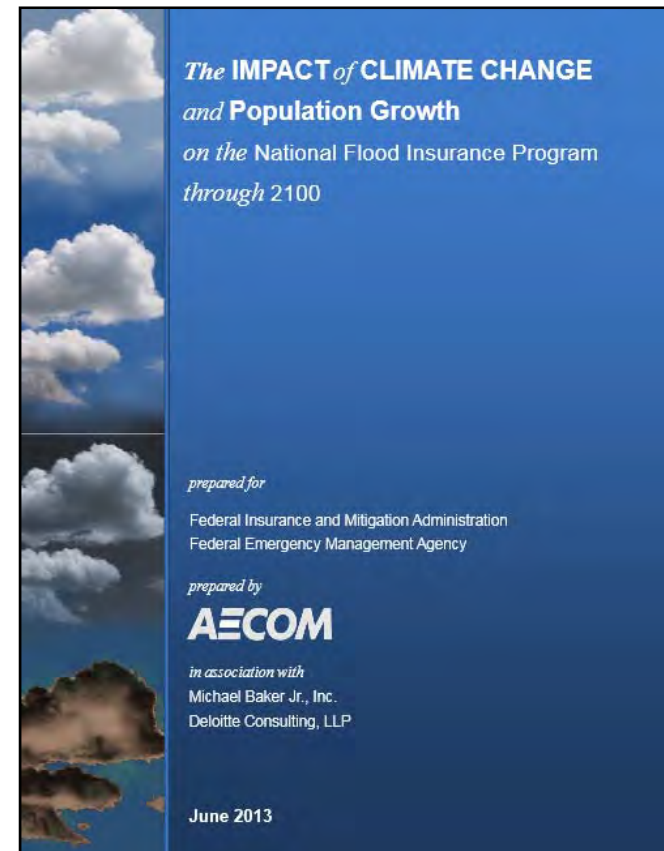
Delaware River Basin Commission
Flood Advisory Committee
West Trenton, NJ

Steve Eberbach, CFM
Michael Baker Jr., Inc.

Baker

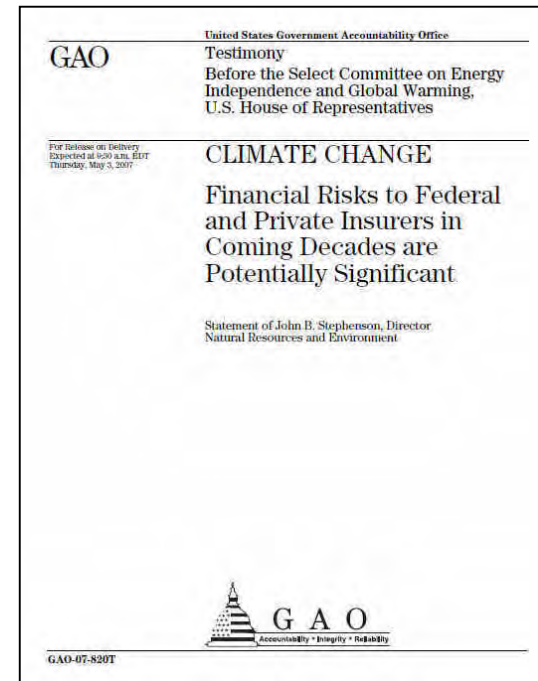
Outline

- Purpose of Study
- Study Overview
- Quantifying Uncertainty: Monte-Carlo Approach
- Example Results
- Key Conclusions
- Recommendations
- Open Discussion



Purpose of Study

- **2007 Government Accountability Office (GAO) report titled: **Climate Change — Financial Risks to Federal and Private Insurers in Coming Decades are Potentially Significant.****



- **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

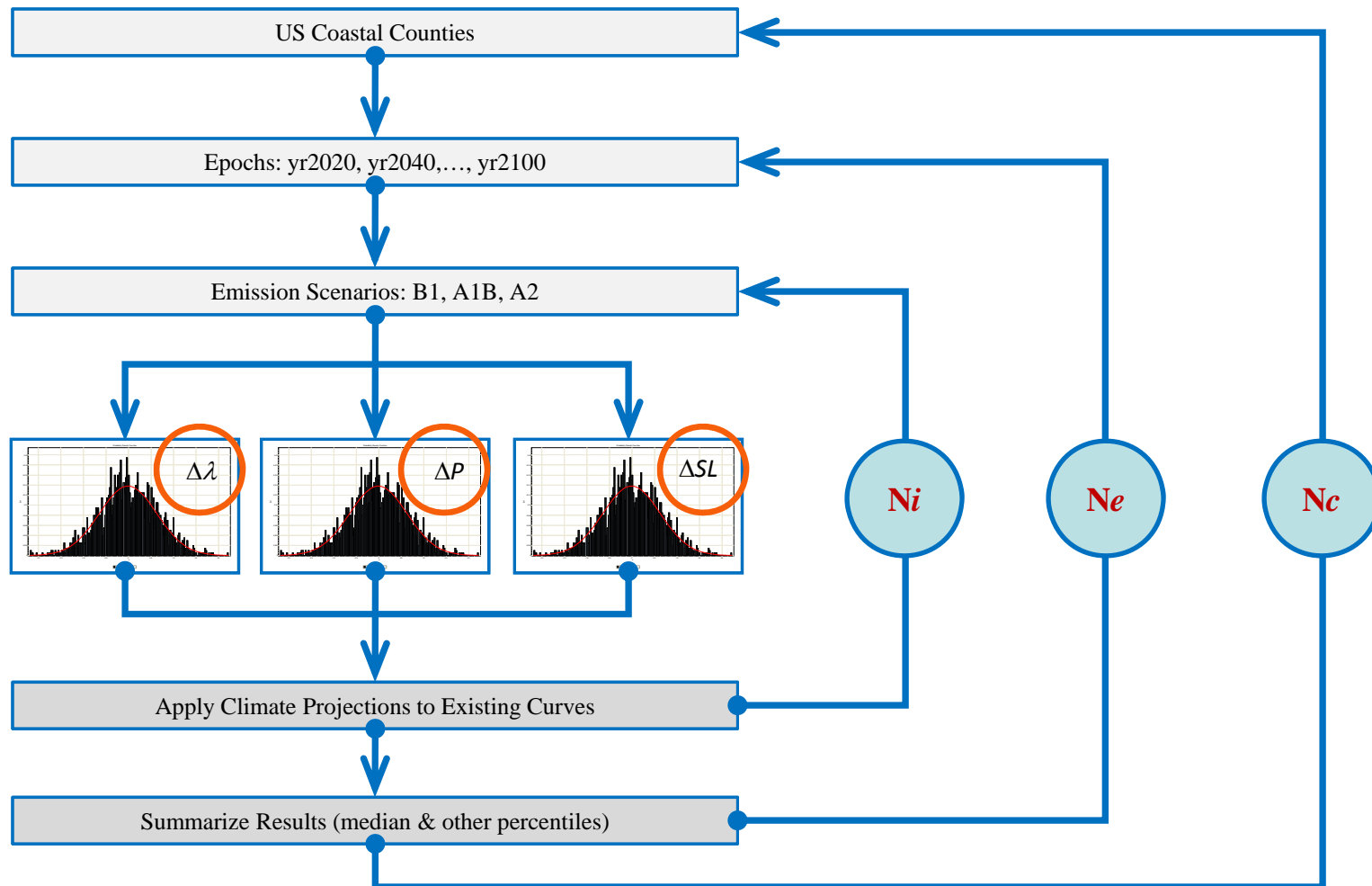
■ Estimating impacts to flood hazard area and flood elevation due to:

- **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

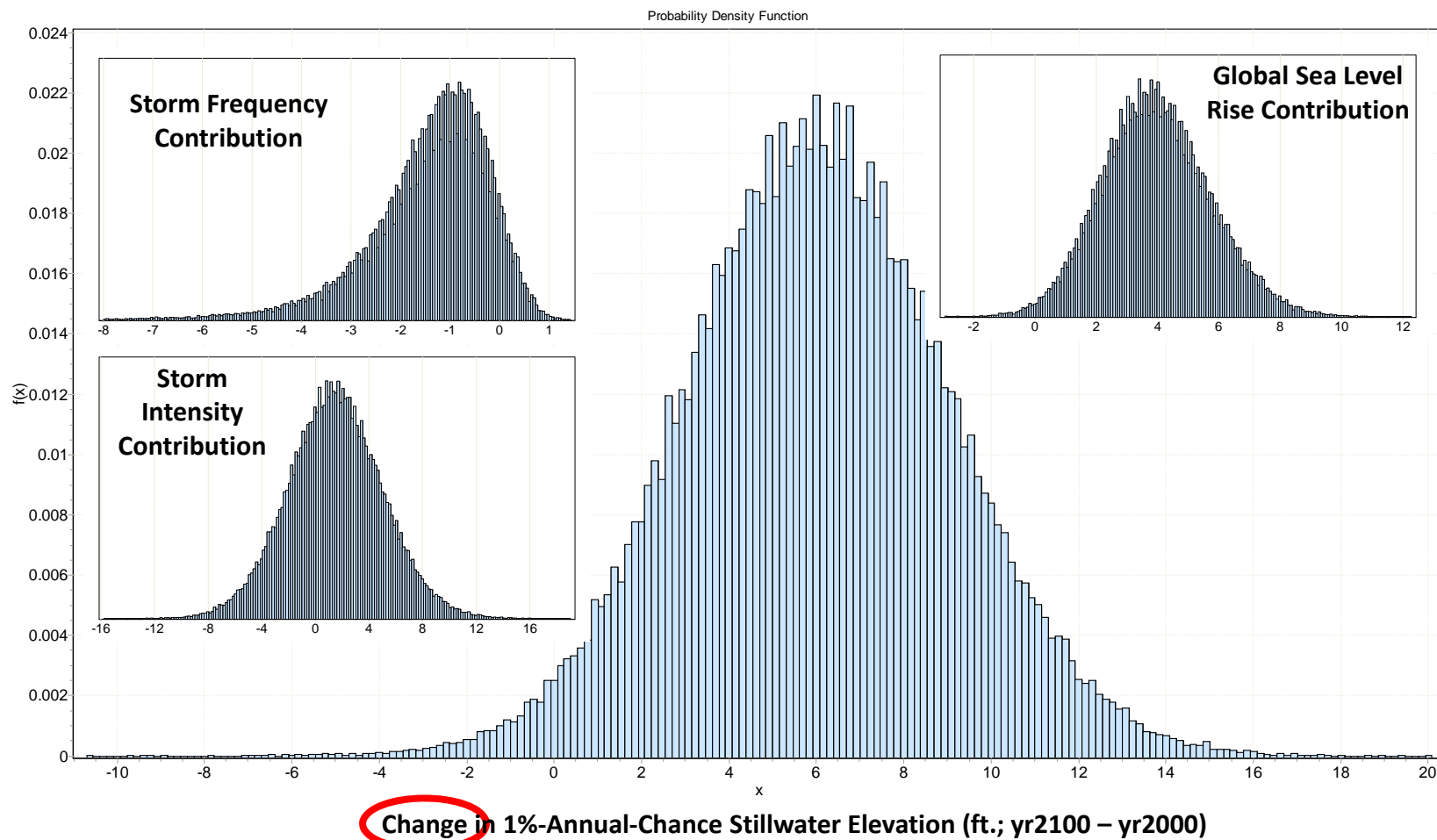
- **Time Horizon:**
 - Results through 2100 at 20-yr intervals
- **Key considerations:**
 - Nationwide study
 - Areas of inference (e.g. Great Lakes, Pacific Islands)
 - Makes significant simplifications, but effort made to avoid bias
 - Does not provide localized assessment results
 - Is not intended 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

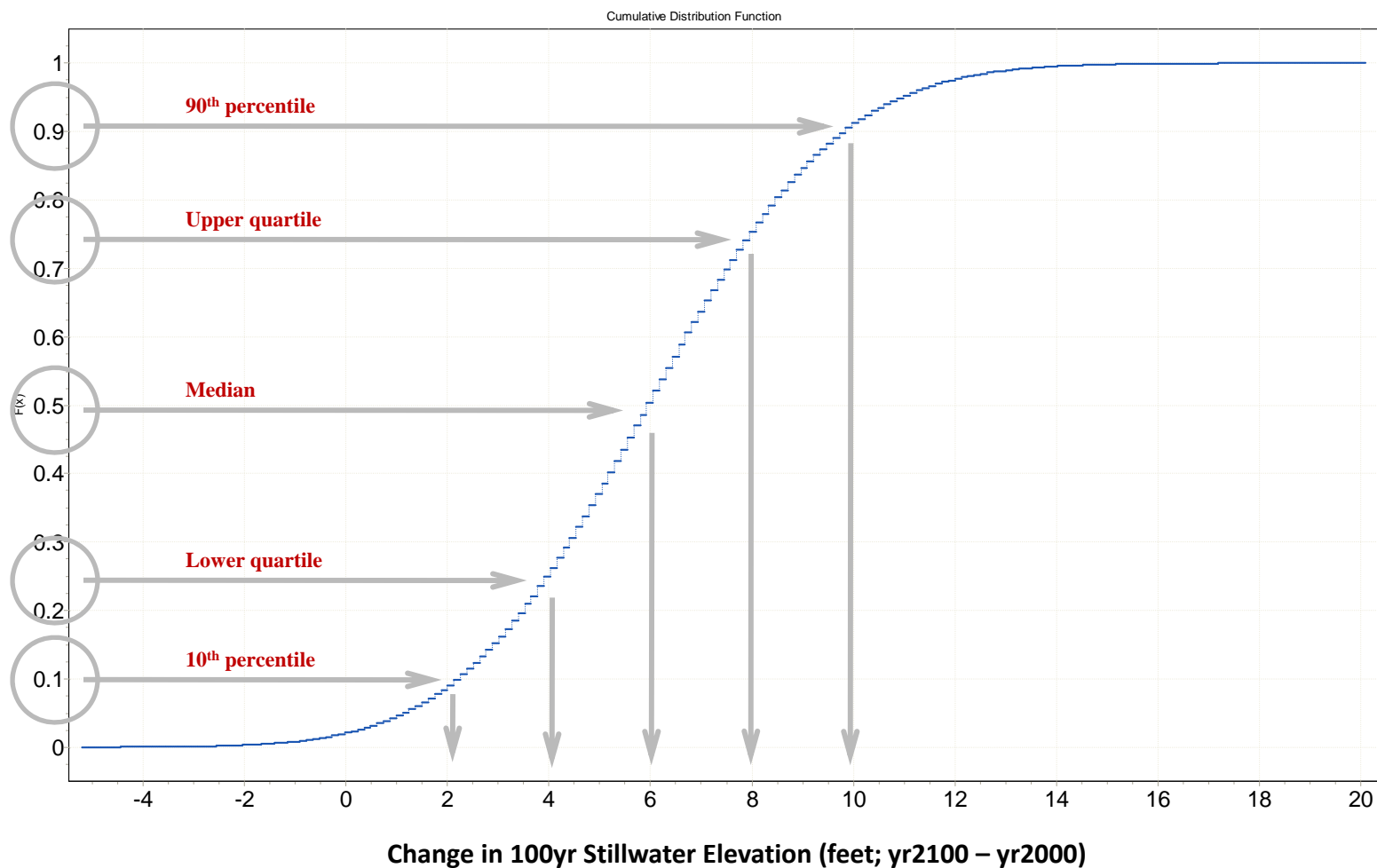


Example Results

Changes in flood hazard...

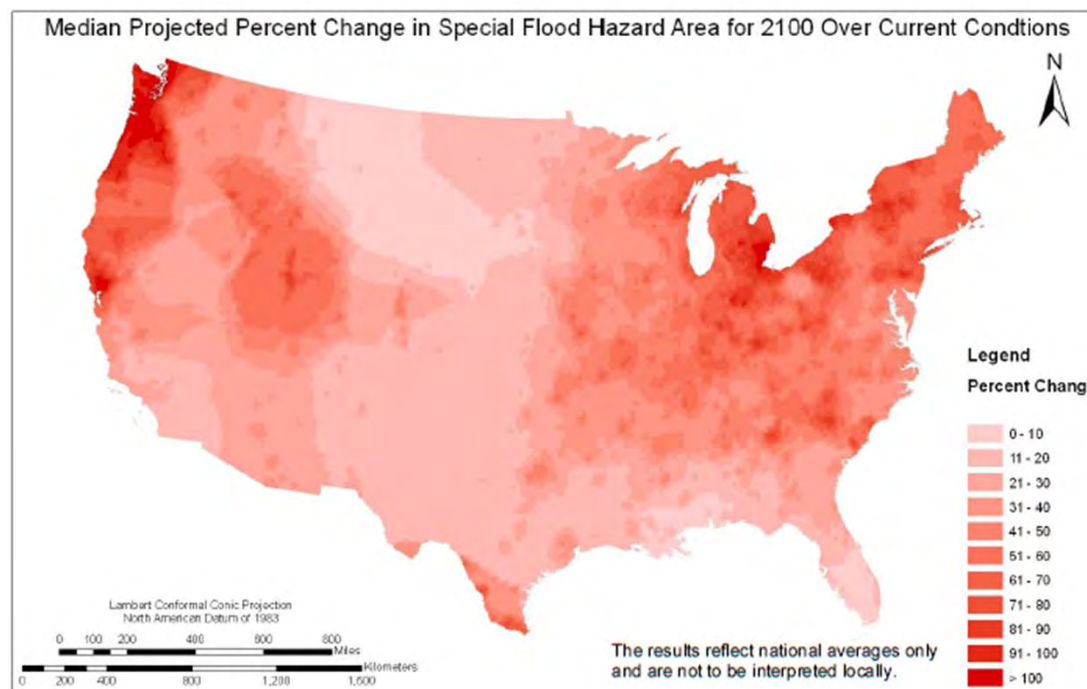
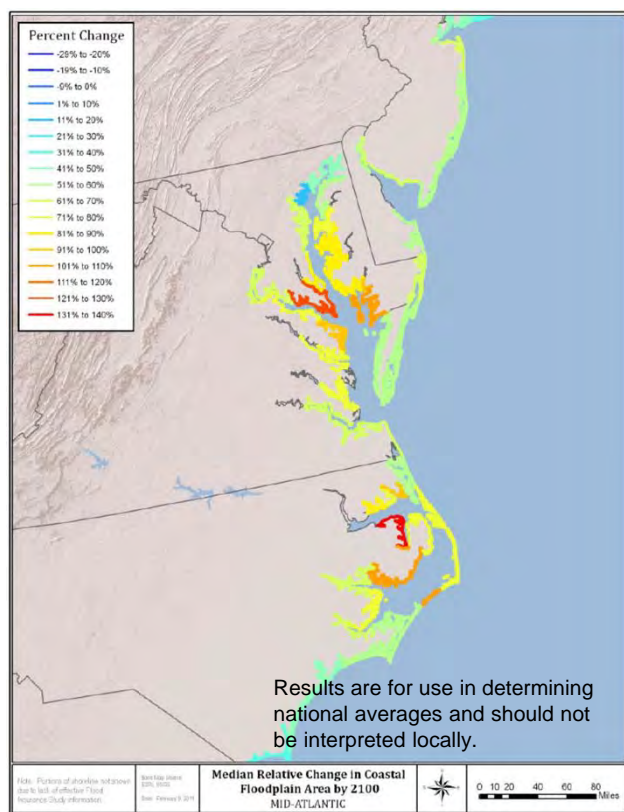


Example Results



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.**



Recommendations

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

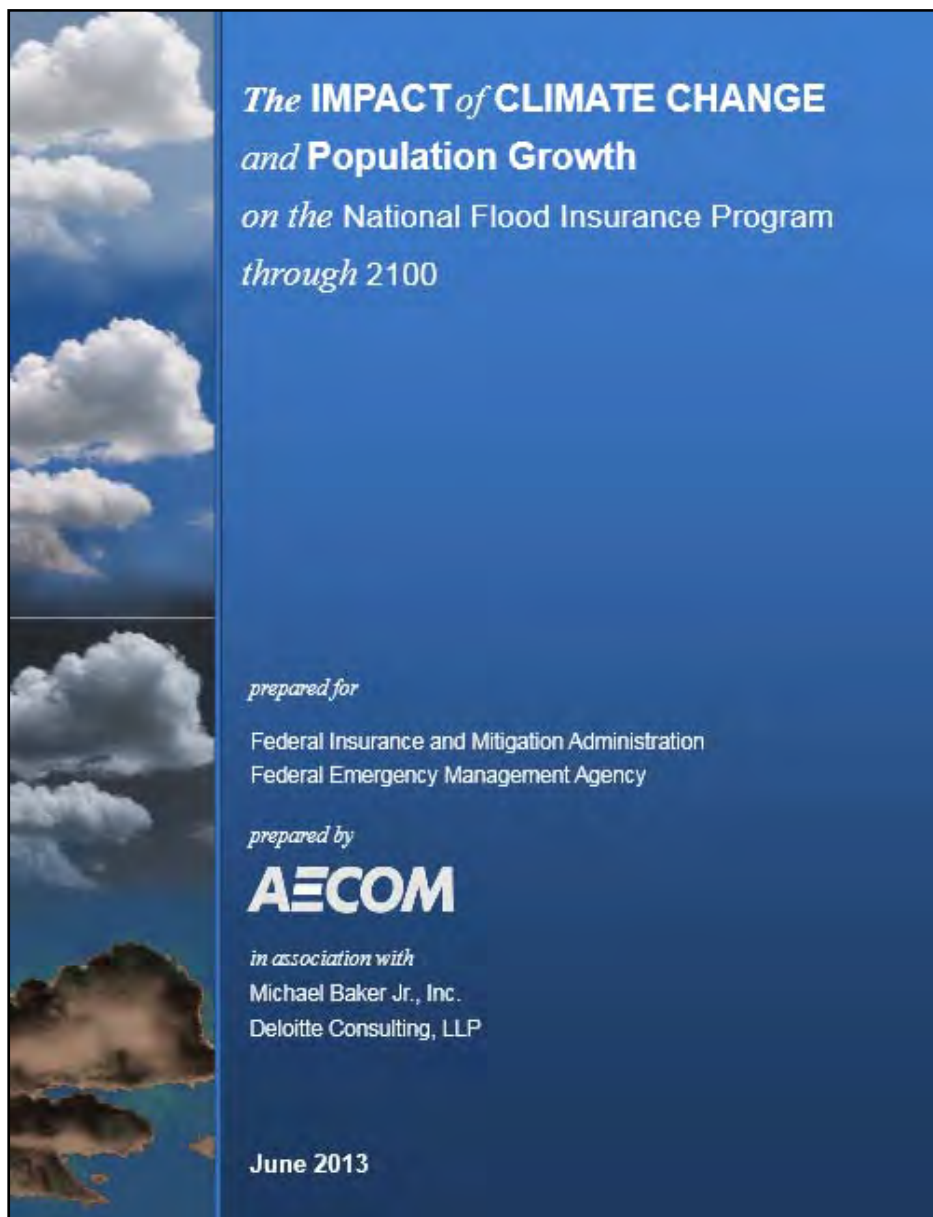
- **11 recommendations ... most notably:**
 - **#2:** Obtain more data – structure locations, elevation certificates, policy/claim data, property types, property values.

 - **#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.

Report is publicly-available...



The **IMPACT** of **CLIMATE CHANGE**
and **Population Growth**

on the National Flood Insurance Program
through 2100

prepared for

Federal Insurance and Mitigation Administration
Federal Emergency Management Agency

prepared by

AECOM

in association with

Michael Baker Jr., Inc.
Deloitte Consulting, LLP

June 2013

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