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REFORMING THE NATIONAL FLOOD INSURANCE PROGRAM: AN EVALUATION OF POLICY ALTERNATIVES

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Executive Summary

The Federal Emergency Management Agency ("FEMA") is engaged in a multi-phase participatory process to review, rethink, and reform the National Flood Insurance Program ("NFIP"). As the primary source of flood insurance and the federal entity primarily responsible for setting floodplain management standards and mapping flood risk, the NFIP has periodically been the focus of public debate since its inception. More recently, a series of unusually severe floods has crystallized long-standing concerns about the NFIP's financial self-sufficiency, as well as the extent to which it continues to appropriately balance various objectives.

In response to these concerns, FEMA established the NFIP Reform Working Group ("Working Group"). Comprised of a cross-section of NFIP staff, the Working Group is undertaking a three-phase process to fulfill its mission to develop, evaluate, and recommend a package of reform policies. In Phase I, FEMA hosted an NFIP Listening Session designed to collect and analyze input from various stakeholders. In Phase II, the Working Group analyzed stakeholder input to develop guiding principles, which were further distilled into a set of evaluation criteria. In Phase III, the Working Group developed alternatives to the current program, with the goal of evaluating those policies relative to the reform criteria.

Commissioned by the NFIP Reform Working Group and conducted by Keybridge Research, this study presents the results of the Phase III evaluation of policy options. Specifically, the study evaluates the merits of five potential pathways forward, including continuing the current program or adopting one of four "pure" policy alternatives. The purpose of the study is to provide an independent assessment of the extent to which each pathway is likely to satisfy various evaluation criteria — thereby informing the Working Group's final recommendations.

The evaluation was performed using both qualitative and quantitative methods. The qualitative assessment leverages the expertise of leading academics in the fields of floodplain management, mitigation, insurance, risk management, and disaster assistance, among others, to provide a comprehensive evaluation of policy alternatives across all eight criteria. In contrast, the quantitative assessment utilizes a combination of public data, private data, and existing empirical research to conduct a more narrowly focused data analysis of the policy alternatives.

When viewed collectively, the results of both the expert panel assessments and the data analysis support four overarching conclusions.

- **Reform is needed.**

The results of the policy evaluation suggest that the current program fails to satisfy several key program objectives — validating stakeholder concerns regarding the current program and confirming the need for reform. The results of the expert panel assessments, in particular, provide convincing evidence that the current program suffers from a variety of challenges, performing poorly on a majority of criteria relative to the alternatives. The results of the data analysis were generally consistent with this assessment.

- **No one pure policy option emerges as the unequivocal best approach.**

Although the results indicate that reform is needed, they are more ambiguous regarding the best path forward. No one policy clearly outperforms all other policies across all criteria — in

fact, no one policy even begins to approach dominant status. The absence of a clear pattern of dominance effectively heightens the importance of criteria weights, which provide some guidance regarding the relative importance of reform objectives. When the criteria weights are considered the NFIP Modified option (i.e., making select modifications within the current programmatic structure) scores better than the other policies, although it is difficult to conclude that the policy's advantage is overwhelming or decisive in all instances.

- **With key modifications, the existing program structure offers a strong platform for reform.**

Although none of the pure policy options evaluated emerge as the unequivocal best approach, the results of the analysis phase suggest that NFIP Modified offers a strong platform for reform. NFIP Modified performs consistently well across the evaluation criteria, as compared to the more uneven performance of the other alternatives. In addition, both the expert panel assessments and the data analysis highlight the fact that Community Based Insurance, Federal Assistance, and Privatization suffer from significant uncertainties. It will take time to fully explore the implications of these uncertainties, pilot test policy designs, and scale those policies to a level at which they could serve as a suitable national program. Thus, as a practical matter, NFIP Modified may serve as the only feasible option for reform in the short and medium terms.

- **Other pure policy options could selectively augment a package of reforms.**

Although the Community Based Insurance, Federal Assistance, and Privatization options are unlikely to serve as foundations for reform in the near term, they have the potential to selectively augment a package of reforms. For example, a voluntary approach to Community Based Insurance that limits implementation to communities that are both willing and able to participate may serve as a valuable complement to a more broad-based policy. The Privatization option offers several potential benefits, particularly with respect to cost and efficiency criteria, and the Federal Assistance option is unique in its potential to address the need for strong mitigation incentives and effective floodplain management standards at a more structural level. Ultimately, the challenge will be integrating elements from one or more of these policies in such a manner that allows them to coexist alongside an NFIP Modified approach and serve those segments of the flood insurance market for which they are best suited.

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Glossary of Terms & Acronyms

ACS: American Community Survey, Bureau of Labor Statistics

ARR: Actuarial Rate Review

AHP: Analytical Hierarchy Process

BFE: Base Flood Elevation

CRS: Community Rating System

FEMA: Federal Emergency Management Agency

FIRM: Flood Insurance Rate Map

Floodplain: Any land area that FEMA has determined has at least a 1% chance in any given year of being inundated by floodwaters from any source.

GSE: Government Sponsored Enterprises

MPR: Mandatory Purchase Requirement

NFIP: National Flood Insurance Program

Post-FIRM: A structure for which construction or substantial improvement occurred after December 31, 1974, or on or after the effective date of an initial FIRM, whichever is later.

Pre-FIRM: A structure for which construction or substantial improvement occurred on or before December 31, 1974, or before the effective date of an initial FIRM.

PRP: Preferred Risk Policy, offered to those structures with a satisfactory loss history not located in an SFHA.

RL: Repetitive Loss, an NFIP-insured structure that has had at least two paid flood losses of more than $1,000 each in any 10-year period since 1978.

SFHA: Special Flood Hazard Area, the land in the floodplain within a community subject to a 1-percent or greater chance of flooding in any given year. An area having special flood, mudflow, or flood-related erosion hazards, and shown on a Flood Hazard Boundary Map or a FIRM as Zone A, AO, A1–A30, AE, A99, AH, AR, AR/A, AR/AE, AR/AH, AR/AO, AR/A1– A30, V1–V30, VE, or V.

WYO: “Write Your Own” insurance company

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I. Introduction

The Federal Emergency Management Agency ("FEMA") is engaged in a multi-phase participatory process to review, rethink, and reform the National Flood Insurance Program ("NFIP"). As the primary source of flood insurance and the federal entity primarily responsible for setting floodplain management standards and mapping flood risk, the NFIP has periodically been the focus of public debate since its inception. More recently, a series of unusually severe floods has crystallized long-standing concerns about the NFIP's financial self-sufficiency, as well as the extent to which it continues to appropriately balance various objectives.

In response to these concerns, FEMA established the NFIP Reform Working Group ("Working Group"). Comprised of a cross-section of NFIP staff, the Working Group is tasked with developing, evaluating, and recommending policies to reform the NFIP and place it on a more sustainable pathway. The Working Group's efforts are guided by a participatory policy analysis framework that is designed to elicit policy recommendations and engage a broad range of stakeholders, including floodplain managers, emergency managers, lenders, the insurance industry, the environmental community, federal agencies, state partners, participating communities, and non-profit organizations.

Specifically, the Working Group has undertaken a three-phase process. In November 2009, Phase I commenced with an NFIP Listening Session designed to collect and analyze input from stakeholders in the public, private, and non-profit sectors regarding the focus and direction of reform efforts. In Phase II, which began in March 2010, the Working Group analyzed stakeholder input to develop a set of guiding principles to underpin its reform efforts, which were further distilled into a set of evaluation criteria. In Phase III, the Working Group identified and developed five policy alternatives, including the current program, with the goal of evaluating them relative to the reform criteria.

Commissioned by the NFIP Reform Working Group and conducted by Keybridge Research, this study presents the results of the Phase III evaluation of policy alternatives. The purpose of the evaluation is to provide an independent assessment of the extent to which the proposed alternatives are likely to satisfy the reform criteria — thereby informing the Working Group's final policy recommendations.

The evaluation process relies on both qualitative and quantitative methods. Specifically, the first method of evaluation utilizes the expertise of leading academics in the fields of floodplain management, mitigation, insurance, risk management, and disaster assistance, among others, to provide a comprehensive qualitative assessment of the policy alternatives across all eight criteria. The second method of evaluation utilizes a combination of public data, private data, and existing empirical research to provide a more narrowly focused quantitative assessment. When viewed collectively, these two approaches offer a firm basis for understanding the relative strengths and weaknesses of the policy alternatives, as well as provide insights as to how they may shape ongoing policy development and reform efforts.

The study is organized as follows. Section II describes the evaluation criteria. Section III provides brief summaries of the policy alternatives, as specified by the Working Group for the purpose of evaluation. Sections IV and V describe the analytical frameworks, methodology, and results for the expert panel assessments and the data analysis, respectively. Section VI concludes with key insights that emerge from a comprehensive view of the results.

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II. Evaluation Criteria

During Phase II of the reform process, the Working Group developed a set of evaluation criteria based on an analysis of stakeholder perspectives and the objectives for reform embedded within these perspectives. Stakeholders' objectives were analyzed and aggregated to form a final set of evaluation criteria, which provide a common yardstick by which to evaluate the merits of proposed policy reforms.

2.1 Evaluation Criteria Descriptions

The evaluation criteria, as defined by the Working Group, include:

(1) Cost of flood is borne by individuals

A national flood policy should encourage individuals to assume the risk of flooding to their property (and secondarily, communal and public resources) commensurate with the level of risk they have taken on through personal choices. When individuals realize these costs, they will rationally account for their flood risk when making decisions. These individual costs are relative to the costs assumed by other taxpayers through federal disaster assistance.

(2) Individuals incur costs of increased risk gradually

Floods are a dynamic and uncertain risk. The actual risk, the assessment of that risk, and ultimately, the cost of the risk, can change. When faced with substantial cost increases because risk has changed, individuals may react by rejecting the assumption of risk. A national flood policy that allows for gradually increasing costs will encourage individuals to voluntarily purchase flood insurance and participate in assuming the cost of their risk.

(3) Assistance is provided to those who cannot afford the cost of flood

Some living at risk of flood cannot afford the cost of protecting themselves from this risk, nor can they afford the cost to avoid the risk. A national flood policy should address the financial needs of this population.

(4) Minimize exposure to flood hazards

Occupancy rates in areas exposed to the flood hazard are increasing. Furthermore, individual and collective actions throughout our nation's watersheds often result in an increase in society's exposure to the flood hazard. A national flood policy should minimize exposure to flood hazards to avoid loss of life and property.

(5) Maximize natural and beneficial functions of the floodplain

Managing water quantity, water quality, and the habitat of fish and wildlife complement activities to reduce flood losses. A national flood policy should maximize natural functions of the floodplains as a means to reduce flood losses and support community sustainability.

(6) Efficiency - Maximize the benefit/cost ratio

Any policy designed to protect the nation's citizens from flood hazards will have economic impacts. A national flood policy should maximize the economic benefits relative to the economic costs.

(7) Administrative feasibility

Administration of the nation's flood policy requires involvement by governments at federal, state, tribal, and local levels. A national flood policy should minimize the complexity of these interactions and the costs associated with the potential transition to and operation of a flood program.

(8) Political acceptability

There are many contradictory viewpoints regarding the solution for addressing flood hazards. A national flood policy must balance and preserve these perspectives to ensure its successful adoption, implementation, and long-term sustainability.

2.2 Evaluation Criteria Weights

Following the development of the reform criteria, the Working Group sought input from its stakeholders regarding the relative importance of each criterion to the reform process. Stakeholders provided their feedback using an online pairwise comparison tool designed to facilitate value comparisons between each of the eight criteria. Incorporating this feedback was particularly important to the policy analysis process, as comments throughout various listening sessions indicated that stakeholders do not consider each criterion equally critical to achieving the NFIP's core mission or to implementing effective reforms.

Accordingly, the Working Group's pairwise comparison tool was designed to determine the set of criteria weights that most appropriately reflects stakeholder opinions regarding the relative importance of each criterion. The online tool was comprised of a series of pairwise comparisons and was used by individual stakeholders from the private and non-profit sectors, state and local governments, FEMA, and other federal agencies to participate in the weighting process. Individual responses to the pairwise comparisons were processed and aggregated at the group level, resulting in a unique set of criteria weights for each stakeholder group. For the purposes of Phase III's analysis, the Working Group elected to average these group-level preferences, giving each stakeholder group equal weight and representation in the calculation of the weights used for the purpose of policy evaluation. As shown in Figure 2.1, this methodology resulted in a single set of criteria weights.

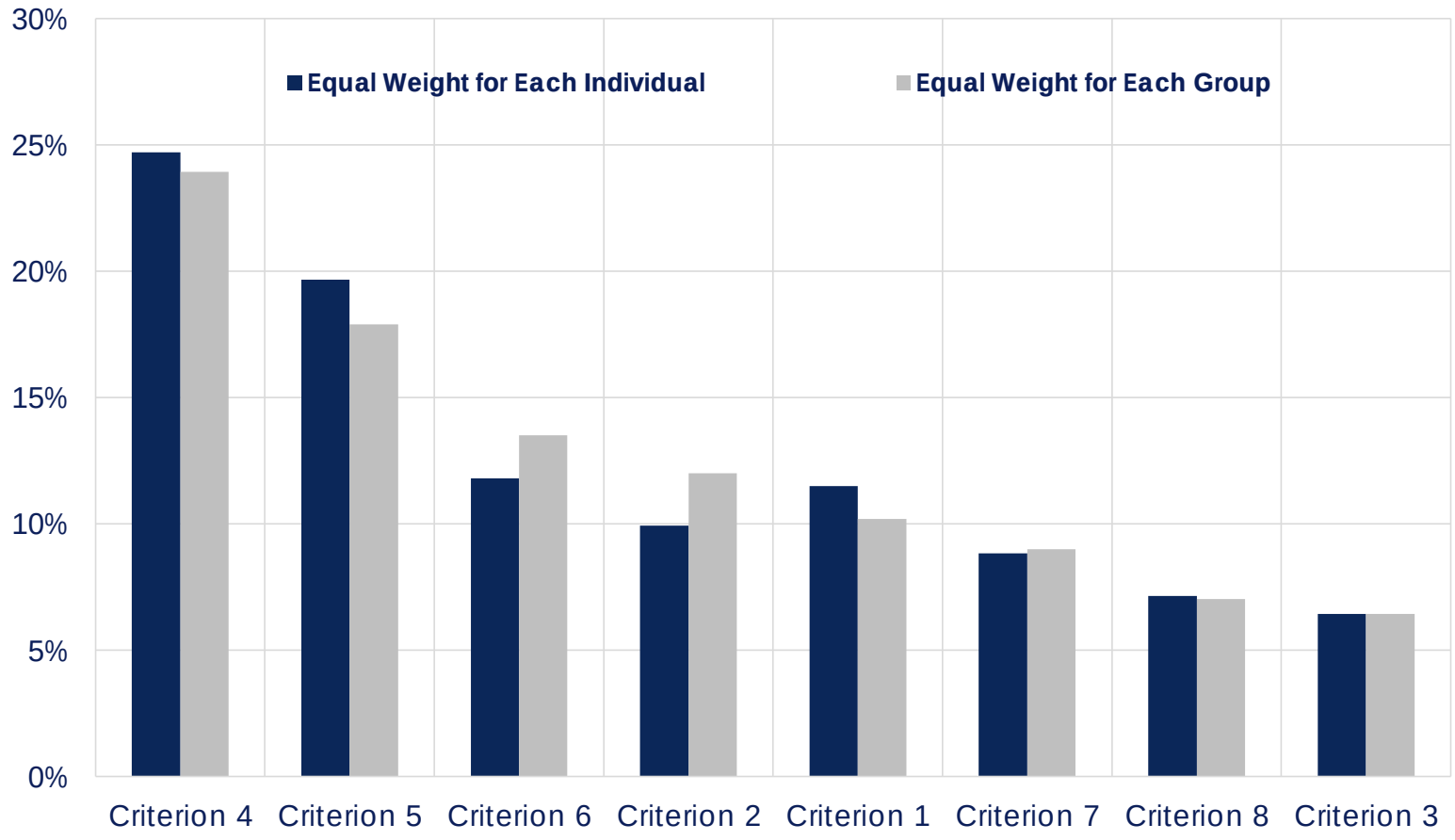
Following the construction of criteria weights, the Working Group conducted analysis around a key point of sensitivity — the method by which weights are aggregated. Based on analysis using alternative aggregation methods, the Working Group concluded that final weights vary minimally depending upon whether individual responses or stakeholder groups are given equal weight in the aggregation process, as shown in Figure 2.2

Figure 2.1: Criteria Weights Analysis

Criterion	FEMA	OFAs	State	Local	Non-Profit	Private Sector	Integrated Weights
Cost of flood is borne by individuals	12.6%	8.0%	11.9%	7.8%	10.7%	9.3%	**10.1%**
Individuals incur costs of increased risk gradually	9.0%	9.7%	10.6%	7.9%	10.2%	13.7%	**10.2%**
Assistance is provided to those who cannot afford the cost of the flood	5.8%	3.1%	4.3%	7.9%	7.9%	8.3%	**6.2%**
Minimize exposure to flood hazards	25.5%	25.6%	27.3%	23.3%	23.7%	21.0%	**24.4%**
Maximize natural and beneficial functions of the floodplain	21.7%	17.4%	21.0%	15.9%	17.5%	15.6%	**18.2%**
Efficiency – Maximize the societal benefit/cost ratio	10.7%	21.7%	11.8%	13.5%	11.6%	14.9%	**14.1%**
Administrative feasibility	8.8%	7.0%	7.9%	13.2%	9.1%	10.7%	**9.4%**
Political acceptability	5.9%	7.4%	5.2%	10.4%	9.3%	6.5%	**7.5%**

Note: Percentages may not add to 100% due to rounding.

Figure 2.2: Criteria Weights Under Alternative Aggregation Methods



III. Policy Alternatives

During Phase III, the Working Group identified and developed a set of four policy alternatives to the current program. These "pure" policy alternatives represent distinct and diverse philosophies regarding the federal government's role in the provision of flood insurance. As acknowledged by the Working Group, they are intentionally provocative and represent a broad range of possible pathways forward.

To enable the evaluation process, the Working Group then distilled these philosophies into a series of policy design decisions. Specifically, the Working Group specified a unique combination of instruments and measures (e.g., the stringency of floodplain management standards, the scope of mandatory purchase requirements, and the approach toward subsidies and other preferential policies) that could be used to achieve the desired effect of each policy alternative. This process resulted in five detailed "policy design frameworks", which served as the basis for evaluation in both the expert panel assessments and the data analysis.

The following sections provide brief summaries of the current program and the four policy alternatives evaluated. The detailed policy design frameworks used in the evaluation are presented in Appendix A.

3.1 Current NFIP

Under the existing NFIP framework, the federal government provides flood insurance in participating communities to cover flood-related losses and damages sustained by residential and commercial structures. Although all flood risk insured under this program is underwritten by the federal government, policies are written and serviced by private Write-Your-Own ("WYO") insurance companies. FEMA dictates minimum floodplain management standards, and also identifies flood hazards by producing Flood Insurance Rate Maps ("FIRMs"). Not all premiums reflect full risk rates; the program provides for some subsidies for structures pre-dating the publication of a community's FIRM. Community participation in the program, and access to federally-backed flood insurance for individual property owners within that community, is voluntary and contingent upon community adoption of minimum floodplain management standards and the FIRM. A mandatory purchase requirement ("MPR") applies to residential and commercial structures that are located in Special Flood Hazard Areas ("SFHAs") and have a mortgage from a federally regulated lender. Enforcement of the MPR is delegated to lenders. Additional provisions under the program are designed to incentivize the adoption of standards and mitigation beyond the federally mandated minimums.

3.2 NFIP Modified

The Current NFIP with Modifications ("NFIP Modified") option outlines modifications to address key weaknesses and build upon key strengths within the existing programmatic structure. Options for program modifications include addressing the actuarial soundness of the program and insurance affordability; improving flood hazard identification and mapping to better identify risk; improving floodplain management standards to reduce risk; addressing environmental compliance issues; and improving incentives to promote better mitigation.

3.3 Privatization

The Privatization option explores ways to expand the role of the private sector in servicing and underwriting flood insurance policies. There are several potential benefits associated with leveraging the private sector, including greater innovation, greater market penetration, and the consistent, actuarial pricing of flood risk. This option also comes with a set of challenges to address, such as ensuring that private insurance companies have freedom to set rates and design their own forms, overcoming adverse selection, and avoiding the risk of insurer insolvency after a catastrophic event. For the purposes of this evaluation, it is assumed that the federal government will retain a residual market for properties that are deemed to be uninsurable by the private market.

3.4 Federal Assistance

Under the Federal Assistance option, federally-backed flood insurance replaces expanded eligibility for disaster assistance. The federal government would provide disaster assistance only in communities that enact flood mitigation and preparedness measures. Failure of a community to enact such measures could result in a significant reduction in federal disaster assistance and ineligibility for pre- and post-disaster grants. The Working Group explored two policy models in this option. Under the first model, the Community Rating Model, more rigorous mitigation and preparedness measures voluntarily enacted by a community are rewarded with a more favorable federal cost share for public disaster assistance, other federal mitigation programs, and individual insurance policies.

In the second model, the Federal-Private Loss Share Model, the federal government covers a greater portion of public and private flood disaster losses for all participating communities. However, with a greater financial commitment for disaster losses, the federal government would also require significantly higher mitigation standards as a condition for community participation. For the purpose of evaluation, it is assumed that the Community Rating Model is implemented and that the distribution of communities along the sliding cost share scale corresponds to the distribution of community ratings in the current Community Rating System ("CRS") program.

3.5 Community Based Insurance

Under the Community Based Insurance option, the federal government continues to back flood insurance contracts in exchange for community adoption and enforcement of minimum floodplain management standards. The federal government would also continue to issue FIRMs and perform structure-based risk assessments. However, under this policy communities — not individual property owners — are the policyholders. The single, community-wide premium would be determined by aggregating the dollar sum of all the individual risk assessments conducted on structures throughout that community. For the purposes of evaluation, it is assumed that participating communities will generally choose to distribute the cost of the premium according to an individual's assessed flood risk, and that non-CRS communities will be either unwilling or unable to participate in the program.

IV. Expert Panel Assessments

The first component of the policy evaluation process utilized panels of academic experts to yield a systematic assessment of policy alternatives relative to all eight evaluation criteria. The expert panel assessments were conducted using the Analytical Hierarchy Process, a widely utilized multi-criteria decision-making method. Experts were selected and organized into five panels, with each panel responsible for evaluating policy alternatives relative to one or more criteria. Following a series of panel discussions, each expert was tasked with completing an online survey designed to elicit their preferences for policy alternatives relative to their assigned criteria. Survey responses were collected, analyzed, and aggregated to generate criteria-level scores, which were used to identify each alternative's relative strengths and weaknesses.

4.1 Process

Expert panel members were selected according to a three-stage process.

- Identification: To assist with the selection process, Keybridge developed an initial list of potential panel members based on an extensive review of literature relevant to the various roles and responsibilities of the NFIP. At the Working Group's request, Keybridge further refined this list to include only those individuals who: (1) are affiliated with a university, think tank, or other organization that primarily engages in academic research and (2) have published research on the NFIP, flood insurance, risk management, floodplain management, or other closely related fields. This process ultimately resulted in a "potential nominees list" that consisted of more than 30 subject matter experts.

- Nomination: A special committee of Working Group members was established and charged with nominating individuals to participate in specific panels. Based on a review of biographic materials, research publications, and areas of expertise of those on the "potential nominees list", committee members ranked each expert on a 1-5 scale for each panel, with "1" indicating "most preferred" and 5 indicating "least preferred". Keybridge then collected and averaged these rankings to produce a preliminary list of nominees for each panel.

- Selection: The special committee reviewed and refined the preliminary list of nominees as a group to ensure diversity across institutions (i.e., only one member from a given institution was allowed to serve on each panel) and limit each expert's time commitment (i.e., individuals were not allowed to serve on more than two panels or evaluate more than three criteria). The Working Group then identified five "primary" and three "alternate" experts for each panel. The final composition of panels was ultimately determined by experts' willingness and ability to participate in panel discussions at the designated times.

Ultimately, 15 individuals participated in the expert panel assessments, with 3-4 serving on each panel.

Figure 4.1: Mapping Between Evaluation Criteria & Expert Panels

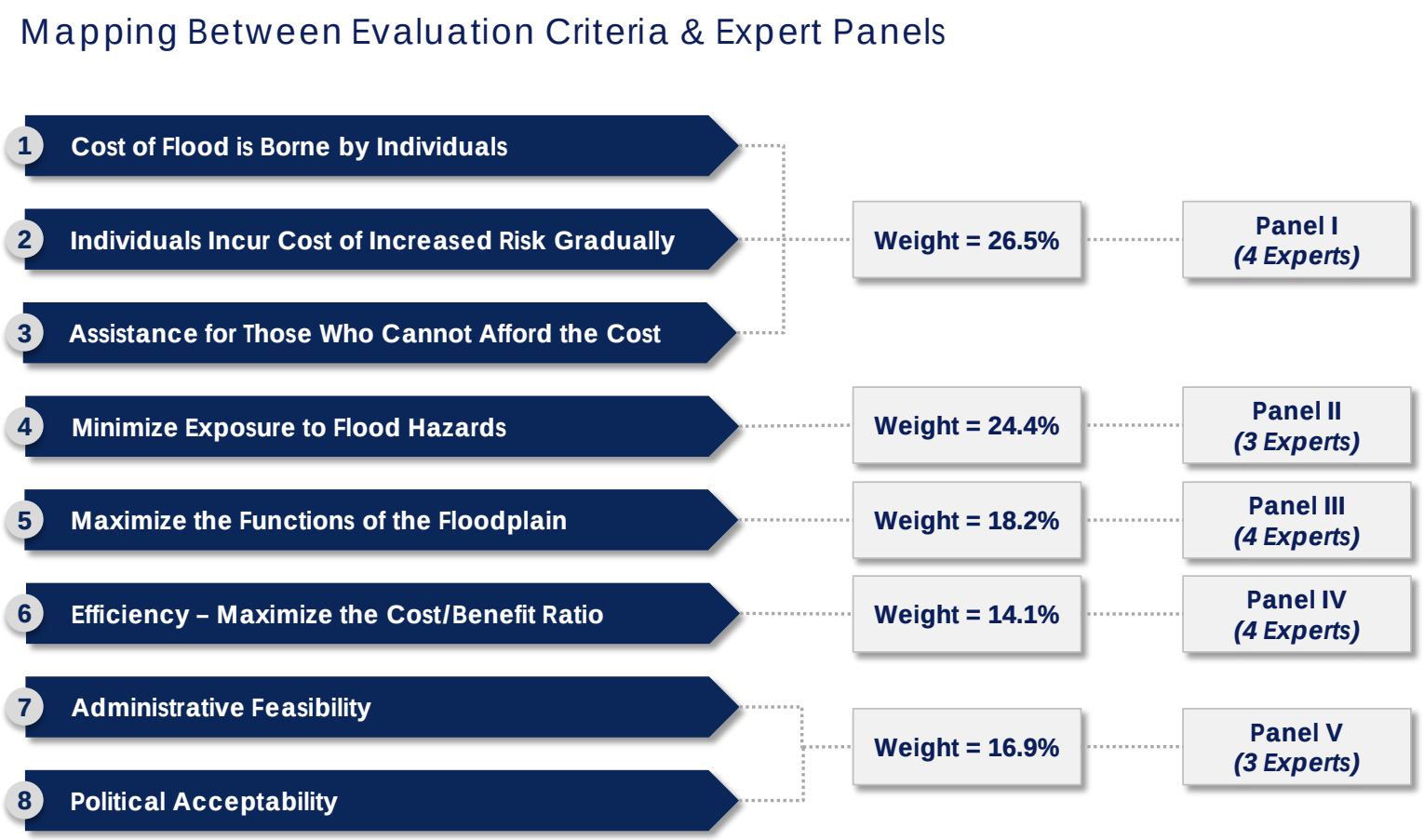


Figure 4.2: Expert Panel Participants

Panel Member	Institution/Affiliation
Samuel Brody, Ph.D.	Texas A&M University
Lloyd Dixon, Ph.D.	RAND Corporation
Robert Freitag	University of Washington
James Holway, Ph.D.	Arizona State University
Robert Klein, Ph.D.	Georgia State University
Carolyn Kousky, Ph.D.	Resources for the Future
Warren Kriesel, Ph.D.	University of Georgia
Howard Kunreuther, Ph.D.	University of Pennsylvania , Wharton School
Tom LaTourette, Ph.D.	RAND Corporation
Erwann Michel-Kerjan, Ph.D.	University of Pennsylvania, Wharton School
Dennis Mileti, Ph.D.	University of Colorado Boulder
David Moss, Ph.D.	Harvard University, Harvard Business School
Ezekiel Peters, J.D.	University of Colorado Boulder
Stephen Polasky, Ph.D.	University of Minnesota
Adam Scales, J.D.	Washington & Lee University

Note: To encourage candid assessments, each expert's panel assignments and individual results are not disclosed. All results are presented in aggregated form and, therefore, do not necessarily represent the views of any one individual or his/her institution.

Panel members were provided with briefing books that included background materials on the current NFIP and the four policy alternatives. For each panel, the Working Group hosted 2-3 hour webinar sessions, which were designed to provide experts with an opportunity to learn more about the policy alternatives, ask clarifying questions, and share their expertise with other panel members.

Following each panel discussion, experts were tasked with completing an online survey of pairwise comparisons, which asked experts to indicate their preference for one policy over another relative to how well it satisfies a given criterion. To eliminate response bias to the extent possible, each panel member was randomly assigned one of two versions of the criteria-based survey(s) for those criteria which they were responsible for evaluating. Surveys also included a comment field through which experts could provide additional observations regarding the reasoning that underpinned their assessments, the design of policy alternatives, or the reform effort in general. These comments were used to supplement the analysis, providing additional context and depth to the scores derived from the pairwise comparisons.

Figure 4.3: Pairwise Comparison Survey Form

Criterion: Cost of Flood Is Borne by Individuals

Thinking of the above criterion, please indicated in each row which policy you prefer, or if you prefer both policies equally.

	Extreme Preference		Very Strong Preference		Strong Preference		Moderate Preference		Equal Preference		Moderate Preference		Strong Preference		Very Strong Preference		Extreme Preference	
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	
Privatization	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Community Based
Privatization	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	NFIP Modified
Federal Assistance	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Privatization
Federal Assistance	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Current NFIP
Community Based	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Federal Assistance
Community Based	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Current NFIP
Current NFIP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Privatization
Current NFIP	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Community Based
NIFP Modified	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Federal Assistance
NFIP Modified	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	Current NFIP

4.2 Analytical Approach

The expert surveys were designed and analyzed according to the Analytical Hierarchy Process ("AHP"), a widely accepted and applied multi-decision criteria method. Developed in the late 1970s and early 1980s, AHP has since become widely used in business and academia to assist decision-makers with evaluating complex problems.[1] It is designed to decompose complex problems into a hierarchy of elements (e.g., criteria and policy alternatives) that can be more easily understood, analyzed, and evaluated. Generally speaking, AHP relies on subjective evaluations that are performed via a series of pairwise comparisons in which the evaluator indicates a preference between two competing elements. The subjective evaluations of each "local" element are converted to numerical scores, normalized, and aggregated to yield a "global" score and ranking for each alternative.

Consistent with the AHP method, data analysis of the expert panel surveys proceeded according to the following process:

(1) Individual survey responses were converted into normalized scores.[2]

(2) Individual normalized scores were aggregated to form criteria-level scores. For example, for the five experts evaluating alternatives relative to Criterion 1, the simple average of their individual normalized scores was taken to produce a score for each policy option.

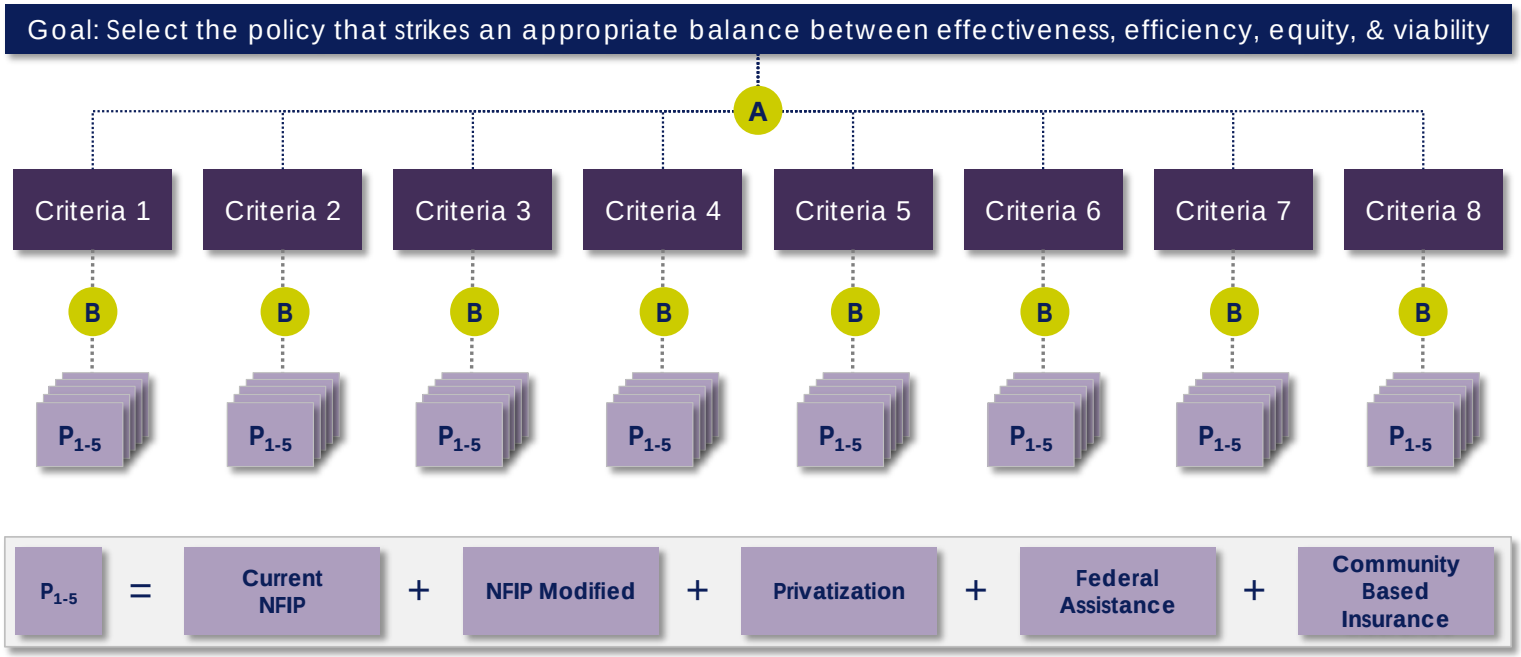
(3) Criteria-level scores were combined with criteria weights, which were developed as part of Phase II of the Working Group's reform effort, to calculate composite scores for each policy.

Ultimately, the expert panel assessments provide three valuable types of information. First, the composite scores for the policy alternatives provide a basis for evaluating their overall performance in the context of all eight criteria. Second, the criteria-level scores provide a more nuanced view of each policy's strengths and weaknesses. Finally, comments submitted by the expert panel members augment the composite and criteria-level scores by placing them in context, clarifying the reasoning that underpins them, and offering additional insights regarding potential improvements to each policy.

[1] Despite AHP's widespread acceptance, the method does have its critics. A discussion of some of the technique's criticisms, as well as the measures this analysis has taken to address those criticisms, is included in section 4.4.

[2] At this stage, Keybridge applied a consistency threshold of 0.20 to the experts' survey responses. Although three expert responses did not meet the threshold, sensitivity analysis indicates that the results of the expert panel assessments are relatively robust to the decision to include or exclude the inconsistent responses. For a more detailed discussion of response consistency, refer to Section 4.4.

Figure 4.4: AHP Decision- Making Methodology



A = Stakeholder evaluation of criteria to determine criteria weights during Phase II.

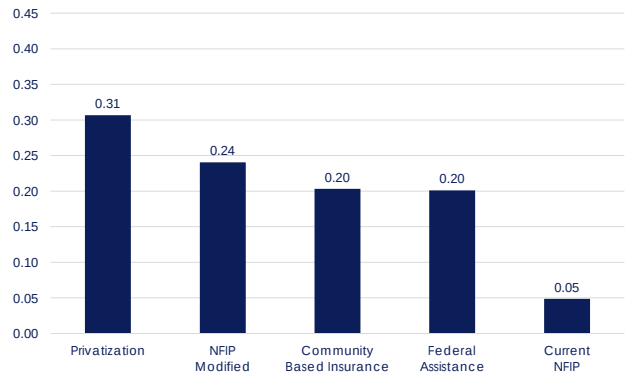
B = Expert panel evaluation of policy alternatives to determine the extent to which they satisfy a given criterion during Phase III.

4.3 Results

4.3.1 Criterion #1: Cost of flood is borne by individuals

Privatization was the most preferred alternative relative to Criterion 1, reflecting experts' belief that greater participation by private insurers could result in premiums that better reflect the full risk of flood. Although panel members generally assumed that private insurers would eliminate subsidies and other discounts for policies in their portfolio, they were quick to note that such outcomes will depend upon several key policy provisions, particularly the presence of a mandatory purchase requirement and rating and form freedoms. To the extent that these conditions are not satisfied, Privatization's performance on this criterion is likely to suffer.

Figure 4.5: Policy Scores for Criterion 1
(Normalized Values)



NFIP Modified was the second most preferred alternative relative to Criterion 1, although Community Based Insurance and Federal Assistance also performed relatively well. This is consistent with the observation that all three alternatives propose to eliminate structure-based subsidies and cross subsidies, though to different degrees and over varying time periods. However, experts noted that under the Community Based Insurance option, there are no mandates or guidelines regarding how communities should distribute their assessed premium among residents. Accordingly, experts expressed some uncertainty about the extent to which each individual would pay for their structure's full risk of flood under this policy.

Current NFIP received the lowest score relative to Criterion 1. A host of factors and policy features may have played a role in experts' skepticism that individuals will fully bear the cost of their flood risk under the current program, including the continuation of subsidies for pre-FIRM structures and discounts for preferred risk policies, as well as restrictions on rate increases.

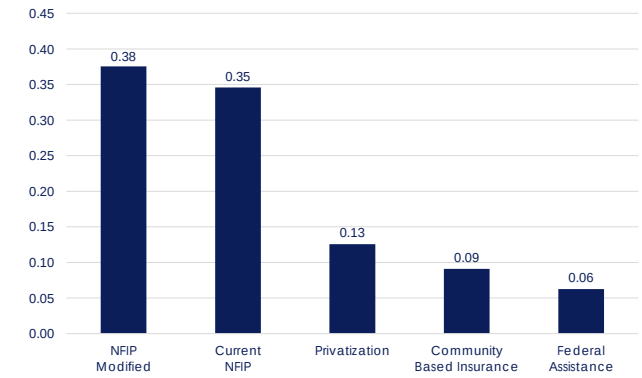
4.3.2 Criterion #2: Individuals incur cost of increased risk gradually

The NFIP Modified alternative earned the highest score relative to Criterion 2. This ranking is consistent with the view that NFIP Modified includes the most provisions for a gradual transition to full risk rates, including the phase out of subsidies upon a structure's transfer of ownership.

The Current NFIP earned the second highest score. This policy would preserve all existing subsidies and discounts, continue the practice of grandfathering, and cap annual rate increases at 10%. Although these policy features may be undesirable relative to other criteria (e.g., ensuring that the cost of flood is borne by individuals), they are consistent with the goals of Criterion 2 in that they limit the extent of rate increases.

Privatization, Community Based Insurance, and Federal Assistance all performed relatively poorly relative to Criterion 2. Although the Privatization option is identical to NFIP Modified in its treatment of grandfathering and pre-FIRM, non-residential subsidies, private insurers may need to raise rates across their portfolio in order to account for costs and margins that current NFIP rates do not currently incorporate. While a federal rating commission may be established to regulate rate increases for privately held policies, experts noted that the existence and functioning of such a commission appear uncertain under a Privatization option. Regarding Federal Assistance and Community Based Insurance, experts' scores are consistent with the fact that all structure-based subsidies and grandfathering would be eliminated immediately and there would be no annual limits on premium increases.

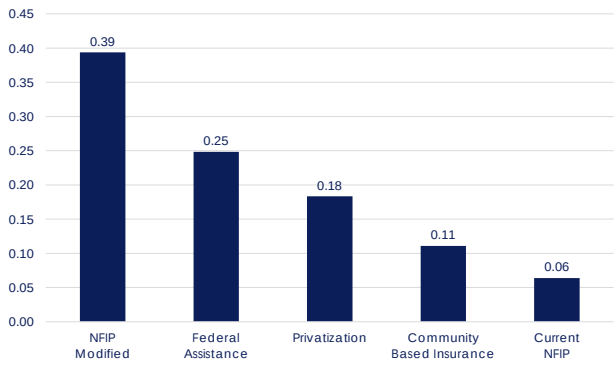
Figure 4.6: Policy Scores for Criterion 2
(Normalized Values)



4.3.3 Criterion #3: Assistance is provided to those who cannot afford the cost of flood

NFIP Modified performed the best on this criterion, despite the fact that it includes a means-based assistance program that is similar to that included in many other alternatives. One potential explanation for this result is that experts viewed "assistance" as including both targeted mean-based assistance and structure-based subsidies, which NFIP Modified phases out in a more gradual fashion.

Figure 4.7: Policy Scores for Criterion 3
(Normalized Values)



The Federal Assistance option also scored well on this criterion, reflecting the fact that means-based assistance would be provided not only to address insurance affordability, but also for mitigation projects. Importantly, the Federal Assistance option is the only policy alternative that provides means-based assistance for both insurance and mitigation.

The Privatization option performed relatively poorly relative to NFIP Modified, despite the fact that both policies propose the same means-based assistance program. Again, this result may reflect the possibility that experts also considered subsidies in their view of "assistance", which are phased out more abruptly under the Privatization option.

Community Based ranked fourth of the five policy alternatives. This is consistent with the observation that, as noted by one panel member, the policy's provision of assistance to "small

and impoverished" communities may fail to adequately address the affordability issue, as a significant number of low-income households do not necessarily live in such locations.

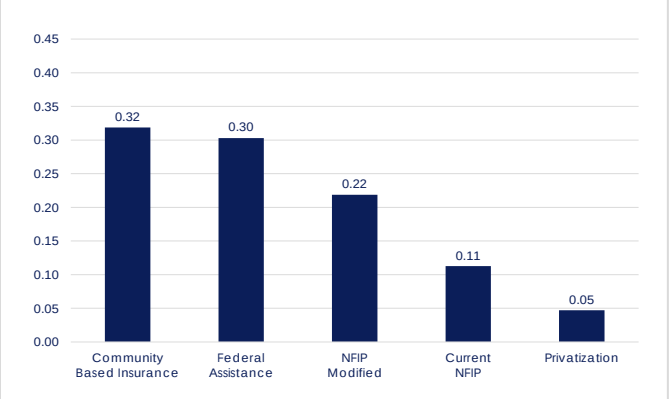
The Current NFIP option performed worst on this criterion. This result is logical given that the Current NFIP does not include any means-based assistance to defray the costs of insurance or mitigation.

In response to a lack of detail regarding the construction and implementation of a means-based assistance program, several experts took the opportunity to propose specific policy features as part of their web-based survey comments. One expert suggested that the program should leverage existing federal aid programs, such as the food stamp program. Another expert suggested that the U.S. Government Accountability Office might conduct a study exploring how a flood insurance voucher system could be implemented.

4.3.4 Criterion #4: Minimize exposure to flood hazards

Community Based Insurance and Federal Assistance both scored well relative to Criterion 4, with experts noting that both of these options propose to fundamentally alter the program's incentive structure to produce more effective mitigation. As reflected in both the expert panel discussions and survey comments, experts were generally optimistic about the extent to which Community Based Insurance might be successful in producing better land use and mitigation decisions by assessing insurance premiums at the community level, rather than at the individual level. However, one expert cautioned that full adoption and implementation of this alternative could be uneven across communities. The Federal Assistance alternative could, depending upon the specific design of the federal cost-share structure, strengthen incentives to reduce exposure to flood hazards by providing incrementally greater levels of pre- and post-disaster assistance to communities who undertake mitigation activities and institute mitigation standards that go beyond the federally mandated minimum.

Figure 4.8: Policy Scores for Criterion 4
(Normalized Values)



Among the other three options, NFIP Modified also performed relatively well. This result may be partly due to the fact that the policy would implement more stringent mitigation standards for new floodplain construction and map residual risk and future conditions for regulatory purposes. Several experts noted that they would have scored the option more highly if it also included a provision to map climate change.

Current NFIP performed significantly worse than NFIP Modified relative to this criterion. According to one expert, although the Community Rating System in its current form encourages mitigation to some extent, it is overly focused on "procedural issues" (e.g., encouraging the

development of a storm water plan) than substantive policy issues (e.g., developing guidelines to ensure that the storm water plan has a net positive impact).

Finally, expert surveys ranked Privatization last on this criterion. Such a ranking is consistent with the view that, relative to the current program, increasing private sector involvement may have a detrimental effect on incentives to mitigate. One expert comment, however, raised the possibility that increased rates offered by private insurers in high risk areas may result in higher building standards for new construction in order to reduce flood risk and reduce premiums.

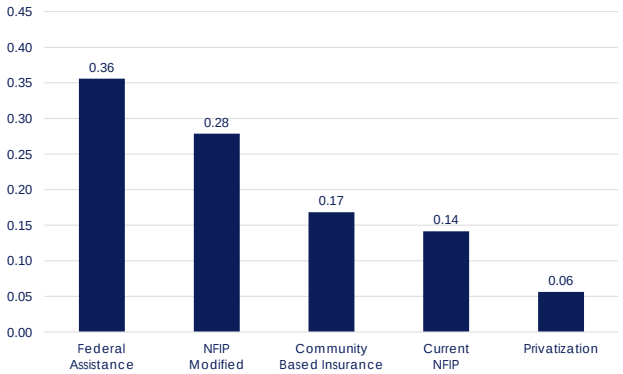
4.3.5 Criterion #5: Maximize the natural and beneficial functions of the floodplain

The Federal Assistance option outperformed all other policies with respect to maximizing the natural and beneficial functions of floodplains. Under this alternative, communities would be encouraged to voluntarily mitigate their flood risk beyond minimum standards in exchange for a larger federal cost-share for pre- and post-disaster assistance payments. Two experts noted that this alternative could incentivize better floodplain management within the context of watersheds and reward communities for undertaking environmental restoration. Another stated that it would give communities greater discretion in managing floodplains and cooperating with neighboring communities.

NFIP Modified also performed relatively well with respect to this criterion, owing to several specific adjustments it would make to the current program's overarching framework. Most notably, it would impose more stringent mitigation standards for new floodplain construction and streamline the application and funding process for federal flood mitigation grants. As one expert stated, "mitigation grants and specific community-level incentives for preserving open space are the main drivers of protecting the natural and beneficial functions of floodplains."

Community Based Insurance and Current NFIP performed less well relative to this criterion. One expert articulated a concern that the Community Based Insurance option could potentially pit adjacent communities against each other, as one community's land use decisions may disrupt floodplain functions or increase the risk of flood in neighboring communities. Other experts echoed this concern, emphasizing the importance of incentivizing planning and floodplain management at the watershed level rather than the community level.

Figure 4.9: Policy Scores for Criterion 5
(Normalized Values)



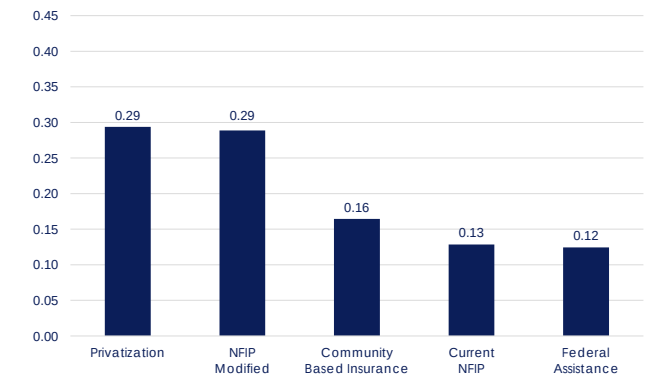
As with Criterion 4, Privatization ranked last among policy options, including Current NFIP. Such a result suggests that, relative to the status quo, Privatization may run counter to the objective of maximizing the natural and beneficial functions of the floodplain. Several experts expressed skepticism that expanding the private sector's role in flood insurance markets would have a positive impact on the environment. Although it is conceivable that, should private insurers

charge higher rates, communities may respond by managing their floodplains differently to reduce their risk of flood, multiple panel members indicated that this effect is likely to be marginal. As noted by one expert, "[the] insurance [price signal] is not the right vehicle to preserve wetlands."

4.3.6 Criterion #6: Efficiency – Maximize the benefit/cost ratio

Privatization and NFIP Modified both performed well on this criterion, placing them in a virtual tie as the most efficient policy option. Both alternatives would move the NFIP closer to actuarial soundness by phasing out subsidies and grandfathering. As one expert stated, "subsidized policies could lead to over-investment in risky areas, [and] as such, policies to phase out subsidies should be efficiency-enhancing." Another expert believed that including future conditions in risk assessments, a policy element proposed by both of these options, could improve decision-making and enhance efficiency. However, Privatization may have scored even higher had it included a firm provision for mandatory purchase requirement, which was specified as an "optional" policy design feature. One expert argued that maintaining the MPR is important because "people seldom buy flood insurance otherwise" and that voluntary insurance for other environmental catastrophes (e.g., earthquake insurance) is not widely purchased. The same expert expressed the view that, "without the MPR, households won't consider the full costs of living in high risk areas, [which would] reduce the cost/benefit ratio."

Figure 4.10: Policy Scores for Criterion 6
(Normalized Values)



The remaining three options performed similarly with respect to this criterion. Community Based Insurance could theoretically improve efficiency by better aligning the insurance price signal with the entity responsible for making land use decision and setting standards. Regarding Current NFIP, survey responses and comments indicated that experts generally viewed the continuation of some structure-based subsidies as inefficient. As was succinctly stated by one expert, "perpetual subsidies are a bad idea." The Federal Assistance option also ranked poorly on this criterion, although expert comments offer no specific insights into as to why.

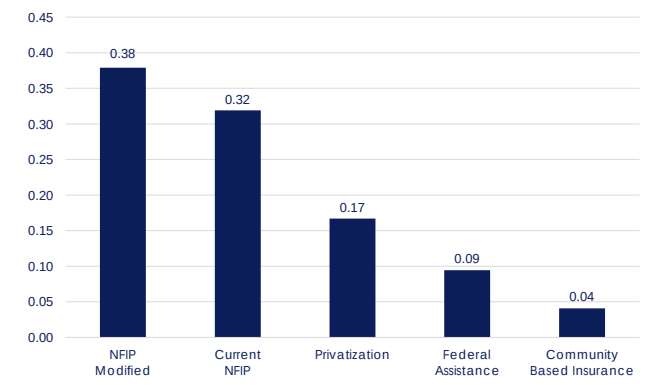
4.3.7 Criterion #7: Administrative feasibility

NFIP Modified and Current NFIP ranked high in terms of administrative feasibility. Interestingly, NFIP Modified performed better than Current NFIP, suggesting that proposed modifications are unlikely to adversely affect administrative feasibility. According to one expert's comments, "the Current NFIP is always the easy choice, but I do not think [NFIP Modified] will be unduly hard to implement."

Experts scored Privatization significantly lower than Current NFIP and NFIP Modified. Survey comments highlighted several potentially significant administrative challenges inherent to

facilitating the development of a private flood insurance market, including establishing a rating commission and the provision and deployment of federal reinsurance.

Figure 4.11: Policy Scores for Criterion 7
(Normalized Values)

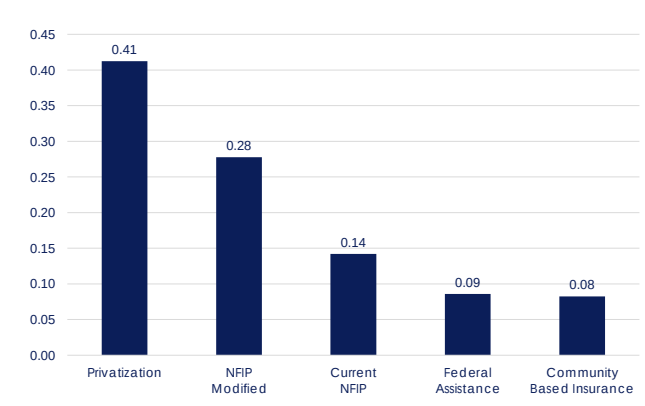


Both Federal Assistance and Community Based Insurance performed poorly on this criterion, with Community Based considered the least administratively feasible by the experts. Regarding Federal Assistance, experts expressed the concern that scoring community and individual mitigation projects to determine a community's cost-share could be administratively complex and burdensome. Similarly, experts were skeptical about the Community Based alternative's feasibility. One expert stated that "it will be very difficult [for communities] to administer premium collection, claims filing, and insurance payments," while another stated that "variance between [special flood hazard areas], political jurisdictions, and 'taxing' jurisdictions [could pose] an impossible coordination problem."

4.3.8 Criterion #8: Political acceptability

Privatization was overwhelmingly viewed as the most politically acceptable policy alternative by the expert panel. According to one expert, as long as rates are allowed to be truly competitive, insurers should be willing to participate. Another expert agreed that Privatization has the greatest potential to be politically acceptable, but suggested that the option be referred to as a "private-public partnership," since this is a more accurate description of the policy's proposed composition of the flood insurance market.

Figure 4.12: Policy Scores for Criterion 8
(Normalized Values)



The NFIP Modified approach was also viewed favorably relative to this criterion, which is possibly a reflection of the fact that it does not represent a significant departure from the existing NFIP policy structure. As noted by one expert, "[NFIP Modified] would be unlikely to generate strong political enthusiasm, but also would be unlikely to generate strong opposition." However, another expert cautioned that mapping residual risks and future conditions may result in political backlash, given that FEMA's flood maps are a somewhat politically contentious aspect of the existing insurance program.

The Current NFIP did not score particularly well on political acceptability. Although expert comments do not offer specific insights, it is likely that panel members are acutely aware that the program is currently the subject of significant political scrutiny.

Both Federal Assistance and Community Based Insurance, however, scored even lower than Current NFIP. These rankings are consistent with the observation that these two alternatives represent the most significant structural departures from the current program. One expert cautioned that political resistance to Federal Assistance is likely, given that it explicitly promises to cover a predefined percentage of local losses with federal dollars. The same expert also noted that the federal cost-share model is susceptible to political skepticism regarding the "scoring" process for those mitigation activities that are rewarded by increased federal assistance. Similarly, Community Based Insurance may also represent a heavy political lift, with one expert characterizing the policy as "the greatest departure from [the current] individual insurance model." Another expert noted that the successful implementation of this option largely depends upon the credible denial of disaster assistance to non-participating communities, which would be very politically difficult to enforce.

4.3.9 All Criteria: Composite Policy Scores

Using the weights specified in Section 2.1, criteria-based scores can be summarized in a single measure to indicate each policy's overall performance. Based on this weighted average approach, the expert panel assessment policy rankings are as follows:

- NFIP Modified emerges as the most preferred policy alternative relative to the full set of reform criteria. This result reflects strong performance across virtually all criteria. Indeed, NFIP Modified ranked first or second on all but one criteria.
- The Federal Assistance option ranks as the second most preferred policy, primarily due to its strong performance on Criteria 4 and 5, which are the most heavily weighted. Federal Assistance ranked fourth, however, on both the administrative feasibility and political acceptability criteria, which suggests that it may suffer from practical limitations.
- Community Based Insurance ranks third, earning the highest overall score relative to Criterion 4. However, this alternative ranked last on both the administrative feasibility and political acceptability criteria. As with the Federal Assistance option, such rankings suggest that Community Based Insurance may suffer from practical limitations.
- Privatization ranks a close fourth overall, with extremely strong performance on Criteria 1, 6, and 8 being offset by extremely weak performance on Criteria 4 and 5.
- The Current NFIP alternative ranks last among all five policy options, though it should be noted that its overall score does not appear to be materially different than the Privatization or Community Based Insurance options. This unfavorable overall assessment reflects the Current NFIP's poor performance on a majority of the evaluation criteria, including Criteria 1, 2, 4, 5, and 6.

Figure 4.13: Expert Panel Policy Scorecard

Criteria	Policy Options				
	Current NFIP	NFIP Modified	Privatization	Federal Assistance	Community Based
Cost of flood is borne by individuals	0.24	0.201	0.203	0.307	0.049
Individuals incur costs of increased risk gradually	0.375	0.062	0.091	0.126	0.346
Assistance is provided to those who cannot afford the cost of flood	0.394	0.248	0.111	0.183	0.064
Minimize exposure to flood hazards	0.219	0.303	0.319	0.047	0.113
Maximize natural and beneficial functions of the floodplain	0.279	0.356	0.168	0.056	0.141
Efficiency - Maximize the benefit/cost ratio	0.289	0.125	0.165	0.294	0.129
Administrative feasibility	0.379	0.094	0.041	0.167	0.319
Political Acceptability	0.277	0.086	0.082	0.412	0.142
Policy Score	0.288	0.214	0.178	0.165	0.156

Note: Scores based on a weighted average of individual responses, using the criteria weights developed by the Working Group. See section 2.1 for a discussion of the weighting process.

Figure 4.14: Expert Panel Policy Rankings by Criteria

Criteria	Policy Options				
	Current NFIP	NFIP Modified	Privatization	Federal Assistance	Community Based
Costs of Flood Borne by Individuals	5	2	1	4	3
Individuals Incur Costs Gradually	2	1	3	5	4
Assistance Provided to Those Who Cannot Afford the Cost of Flood	5	1	3	2	4
Minimize Exposure to Flood Hazards	4	3	5	2	1
Maximize Natural & Beneficial Functions of the Floodplain	4	2	5	1	3
Efficiency	4	2	1	5	3
Administrative Feasibility	2	1	3	4	5
Political Acceptability	3	2	1	4	5

4.4 Sensitivity Analysis

A key potential source of sensitivity in the expert panel assessments is the criteria weights used to calculate the composite policy scores. As described in Section II, the "base" weights used in this analysis were calculated by grouping stakeholders according to their affiliation (*e.g.,* FEMA, other federal agencies, private industry), determining the preferred criteria weights for each group, and averaging equally across groups. Nevertheless, there may be a wide range of stakeholder viewpoints that are not adequately reflected in such an average. Accordingly, sensitivity analysis was conducted using the preferences of each stakeholder group for the criteria weights, as opposed to aggregating preferences across groups. As illustrated in Figure 4.15, policy rankings exhibit relatively little variation across these alternative sets of weights.

Figure 4.15: Policy Rankings by Alternative Stakeholder Weights

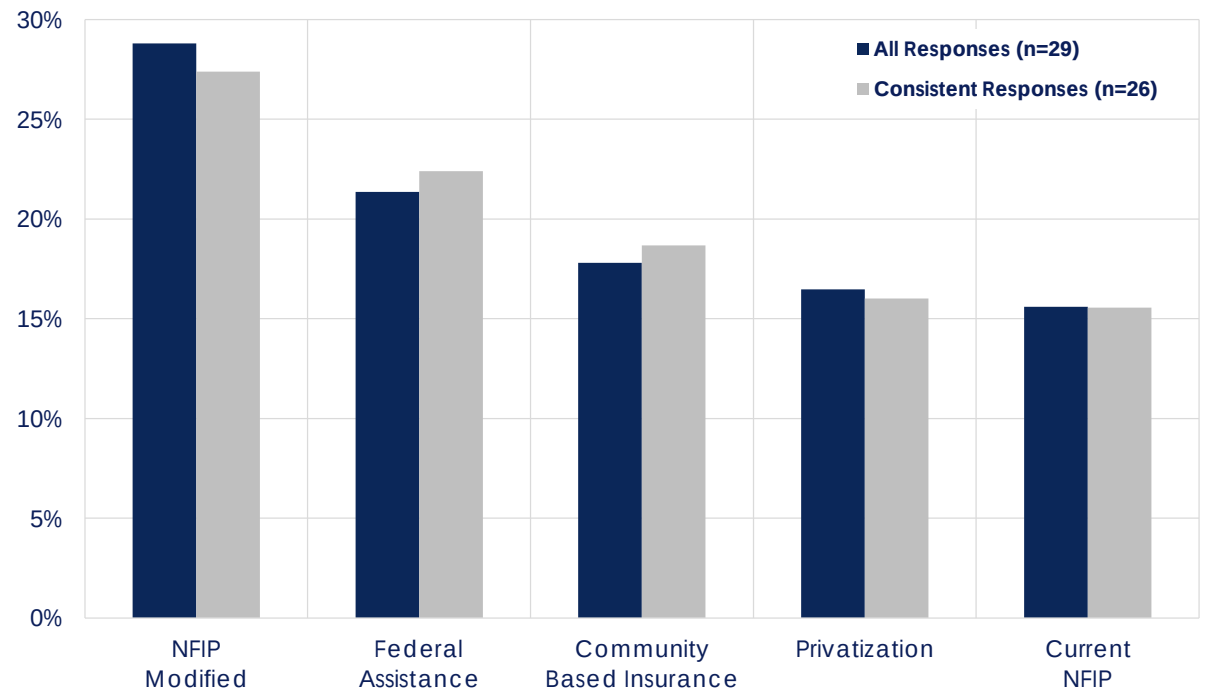
Criteria	Policy Options				
	Current NFIP	NFIP Modified	Privatization	Federal Assistance	Community Based
FEMA Weights	5	1	4	2	3
OFA Weights	5	1	4	2	3
State Weights	4	1	5	2	3
Local Weights	5	1	3	2	4
Non-Profit Weights	5	1	4	2	3
Private Sector Weights	5	1	4	2	3
Integrated Weights	5	1	4	2	3

A second potential source of sensitivity is the internal consistency of the experts' responses. In theory, an individual's response to a pairwise comparison survey should be internally consistent in that they satisfy basic transitive logic (i.e., if A>B and B>C, then A>C). In reality, some inconsistency is both tolerable and to be expected, especially as the number of comparisons increases.

A common method for examining this issue is to calculate a "consistency ratio", which measures the internal consistency of a set of survey responses relative to that which would be expected if the individual had chosen their responses at random. This ratio is then compared to a "consistency threshold" to determine if the survey meets a generally accepted level of consistency. The academic literature indicates that acceptable consistency thresholds can range from 0.05 to 0.20, with the appropriate value largely depending on the nature of the survey — the greater the number of comparisons, the higher the allowable threshold. For the purposes of this analysis, the Working Group selected a minimum consistency threshold of 0.20.

Of the 29 criteria-based responses, three did not meet the minimum consistency requirement. This raises the possibility that the results of the expert panel assessments may be sensitive to the decision to include or exclude these responses. As show in Figure 4.16, however, additional analysis suggested that excluding the three responses in question does not have a meaningful impact on the results. Given this lack of sensitivity, the analysis team decided to include these three responses in the expert panel assessment.

Figure 4.16: Final Policy Scores – All Responses versus Consistent Responses



4.5 Qualifications, Limitations, & Uncertainties

The expert panel assessment was designed to leverage the specialized knowledge and seasoned judgment of leading scholars on the NFIP, flood insurance, risk management, floodplain management, and other closely related fields. Accordingly, it should not be viewed as a "poll", and the results should not be interpreted as such. Rather, it is more appropriately viewed as a systematic "focus group" designed to capture the opinions of a small but highly informed collection of individuals.

In addition to this general consideration, there are other qualifications, limitations, and uncertainties specific to this analysis:

(1) Policy alternatives were evaluated in their "pure" form.

The Working Group purposefully constructed policy alternatives that are provocative and represent the broadest possible range of options. To preserve the distinguishing features of these alternatives and better understand their relative strengths and weaknesses, the Working Group tasked panel members with assessing policies in their "pure" form and within the context of serving as a wholesale replacement to the existing program. It is conceivable, however, that certain policy frameworks may perform significantly better if modified to address weaknesses, integrated with other policy frameworks, or deployed on a smaller scale than envisioned in this evaluation.

(2) Policy alternatives have varying levels of specificity.

Descriptions of the four policy alternatives contain varying levels of detail. It is conceivable that in some instances the presence or lack of specificity created uncertainty regarding a policy's implementation and impact, thereby influencing experts' ability to distinguish between them with meaningful precision.

(3) Small differences in policy scores are not necessarily meaningful differences.

In some instance, differences in composite scores are relatively small, especially among the Community Based Insurance, Privatization, and Current NFIP options. While the disaggregated results for these three policies indicate important strengths and weaknesses, their overall scores are too similar to definitively conclude that one performs substantially better than the other.

Furthermore, although AHP is a widely accepted decision making method among both academics and practitioners, it is not without its critics. Accordingly, this study has taken steps to acknowledge and address some of the more common methodological concerns.

(1) Potential for rank reversal

Rank reversal occurs when the addition of a new, irrelevant alternative (or the removal of an existing alternative) changes the order in which the alternatives are ranked (Gass, 2005).

Although the absence of rank reversal is a key axiom of expected utility theory models[3], it is not an axiom of AHP theory. Nevertheless, the analysis took additional steps to test for rank reversal. Specifically, the analysis was also conducted using the so-called AHP "Ideal Mode". Under this approach, policy scores are subjected to two normalization processes, which help ensure against rank reversal. Policy rankings did not materially differ across these two approaches, suggesting that rank reversal is not a significant concern.

(2) Potential for intransitivity

Transitivity dictates that if alternative A is preferred to alternative B and alternative B is preferred to alternative C, then A should be preferred to C. Gass (1998) suggests that intransitivity may arise in AHP when problems are complex and involve a large number of alternatives. In such cases, he recommends presenting the intransitivity to the decision maker and determining whether responses should be revised or allowed to stand. This approach was adopted in analyzing the expert panel surveys.

(3) Robustness of the measurement scale

Saaty (1980) proposes a 1-9 ratio scale for conducting pairwise comparisons, which has become the AHP standard. Some AHP critics point out that changing this scale would result in different priority scores for each option. However, this criticism underscores the fact that AHP's final priority scores have no inherent meaning other than an indication of relative preference. Judgments regarding the magnitude of one option's superiority over another are merely notional. For example, if Alternative A receives a final score of 0.4 and Alternative B receives a final score of 0.2, it would be correct to conclude that Alternative A is preferred to Alternative B, but it would be incorrect to conclude that A is "twice as good" as B (Coyle, 2004).

[3] Expected utility theory models, including the Multi-attribute Utility Theory, include a principle known as "independence of irrelevant alternatives". A common interpretation of this axiom is "if 'A' is preferred to 'B', then introducing a third alternative 'X' must not result in 'B' being preferred to 'A'.

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V. Data Analysis

The second component of the policy evaluation process utilized a combination of public data, private data, and existing empirical research to conduct a more narrowly focused quantitative assessment of the policy alternatives. The data analysis was designed to overcome two key constraints: (1) the need to simulate the impacts associated with a wide range of policy features in one analysis and (2) significant data limitations. Accordingly, the quantitative assessment uses the current program as a "baseline" by which to measure the directional impacts associated with the four reform alternatives. Key differences between the current program and the reform alternatives were identified through a comparative analysis of policy design frameworks. This process avoided analyzing policy provisions that are constant across all policy options and focused the analysis on those policy design features that represent a meaningful divergence from the current program. The potential timing, direction, and/or magnitude of impacts on key metrics were then estimated using a series of highly specialized analytical modules, which were customized to the nature of the criteria under consideration and the availability of relevant data. Finally, the key metrics for each criterion were evaluated and a ranking was assigned to each policy alternative based on the collective weight of evidence.

5.1 Process

This quantitative evaluation utilized a five-step process to identify, classify, and evaluate key differences between the current program and the four reform alternatives:

(1) Identify those policy elements that differ significantly across the five alternatives.

(2) Map the distinguishing policy elements into the reform criteria to identify the most appropriate metrics for analysis.

(3) Develop a comprehensive set of metrics that indicate the degree to which each policy satisfies the considered criteria.

(4) Conduct a module-based assessment to estimate the direction, timing, and/or magnitude of impacts on key metrics relative to the Current NFIP baseline.

(5) Summarize specific results and metrics along each criterion into a standard score for each policy alternative to facilitate a side-by-side evaluation and accounting of strengths and weaknesses.

Figure 5.1: Key Policy Elements & Metrics

✓ Difference from Current NFIP ✗ No difference from Current NFIP

#	Policy Elements	NFIP Modified	Privatization	Federal Assistance	Community Based
1	Structure-Based Subsidies	✓	✓	✓	✓
2	Rate Grandfathering	✓	✓	✓	✓
3	Rate Setting	✗	✓	✓	✓
4	Risk Assessment	✓	✓	✓	✓
5	Mandatory Purchase	✗	✗	✗	✓
6	Availability of Disaster Assistance	✓	✓	✓	✓
7	Implementation of New Rates	✗	✓	✓	✓
8	Maximum Annual Rate Change	✓	✓	✓	✓
9	Phasing Out Subsidies	✓	✓	✓	✓
10	Phasing Out Grandfathering	✓	✓	✓	✓
11	Income-Based Subsidies	✓	✓	✓	✓
12	Mitigation Standards	✓	✓	✓	✓

Due to a combination of data and resource constraints, the scope of the analysis was limited to the following criteria:

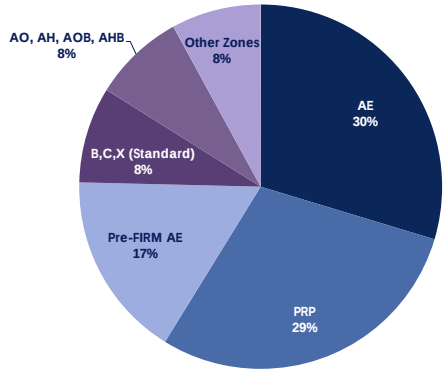
- Criterion #1: Cost of flood is borne by individuals,
- Criterion #2: Individuals incur the cost of increased risk gradually,
- Criterion #3: Assistance is provided to those who cannot afford the cost of flood,
- Criterion #4: Minimize exposure to flood hazards, and
- Criterion #6: Efficiency – maximize the benefit/cost ratio.

Furthermore, although Criterion 6 was initially considered as part of the data analysis, the lack of credible and consistent data precluded a full benefit/cost analysis. Therefore, assessment of the efficiency criterion was limited to a discussion of considerations most relevant to developing an efficient flood insurance program. Other criteria were excluded from the data analysis because they were either not amenable to data analysis or not quantifiable within the scope and timeline of this policy evaluation.

5.2 Analytical Approach

The analysis leverages a variety of public and private data sources, including NFIP policies and claims data, Community Rating System data, the most recent NFIP Actuarial Rate Review, and the U.S. Census Bureau's American Community Survey. This data, documented more fully in Appendix C, was used to construct a series of analytical modules, with each module organized around and customized to a group of policy elements, metrics, and a specific reform criterion. A range of impacts and outcomes were then simulated by adjusting parameters according to the details specified in the policy design frameworks.

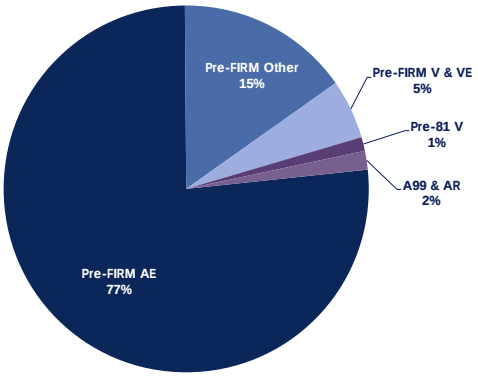
Figure 5.2: Policies in Force by Zone



Source: Keybridge Research based on NFIP policy data.

The data analysis relied on a suite of carefully documented assumptions that characterize the flood insurance market or, when necessary detail was lacking, further specify the policy alternatives. Specifically, key assumptions were made regarding insurance premium subsidies and discounts, individual and community responsiveness to economic and non-economic incentives, and the effectiveness of mandates, among others. In many instances, assumptions were based on estimates provided by empirical studies and other academic literature. In other cases, existing research provided an insufficient guide, and assumptions used in the data analysis were specified by Working Group members in consultation with Keybridge. These assumptions are discussed in more detail in Appendix D.

Figure 5.3: Distribution of Annual Subsidy Value by Zone



Source: NFIP Actuarial Rate Review (2010); Keybridge Research.

The point-of-departure for the analysis was the construction of a baseline based on the Current NFIP, which was primarily comprised of insurance-based indicators and metrics, as well as the number of policies across flood zones, elevations, and communities. This data was used to estimate the number of policies receiving structure-based subsidies, PRP discounts, CRS discounts and cross-subsidies, and the approximate number of grandfathered X-zone policies.[4]

As of July 2011, NFIP data reports a total of 5,560,395 policies in force under the current program. AE-zone (46% of total) and Preferred Risk Policies ("PRP") (29% of total) policies represent the largest categories of policies, comprising 75% of the entire program. Although the majority of

[4] See Appendix E

post-FIRM structures are charged full-risk rates, the rate structure for other policies may include four types of subsidies, discounts, and cross-subsidies.

(1) Structure-based Subsidies: Applied to approximately 1,173,805 policies (21.5% of total). The NFIP estimates that these subsidies provide an average discount of 57.5% from full-risk rates.

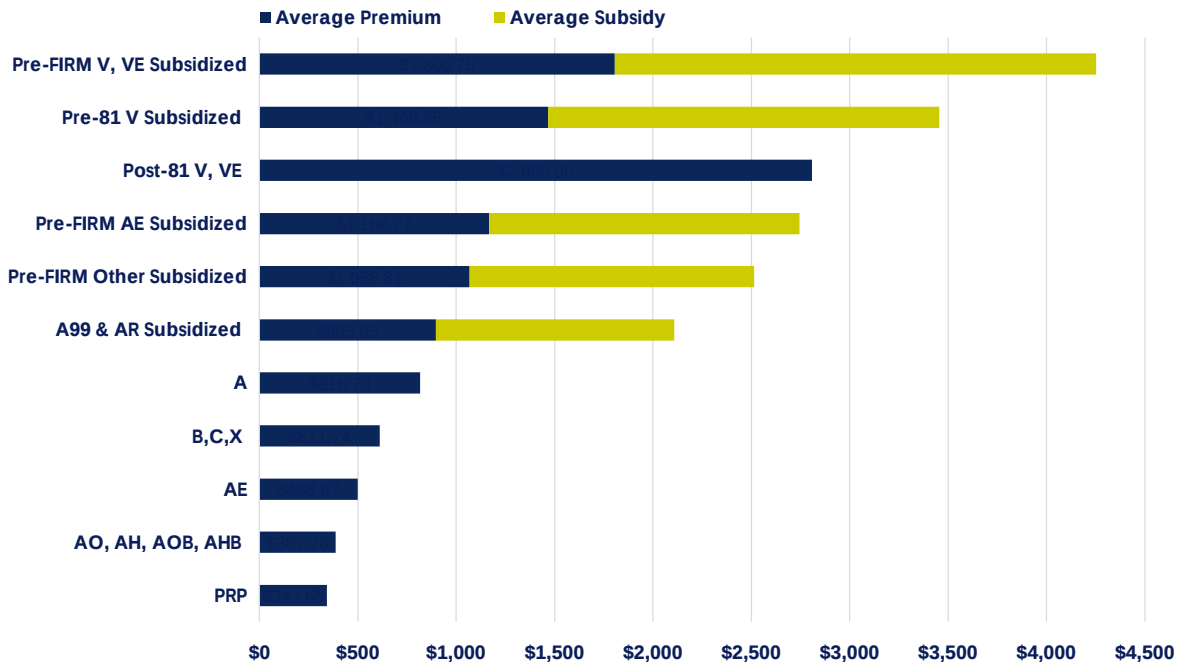
(2) Grandfathering Cross-Subsidies: Applied to approximately 250,000 X-zone policies and cross-subsidized by standard X-zone policies. The NFIP estimates that grandfathered rates provide an average discount of 25% from full-risk rates.

(3) PRP Discounts: 1.6 million PRPs receive roughly an 8% discount from full-risk rates.

(4) CRS Cross-Subsidies: Policies in CRS communities receive between a 5% and 45% discount, which is offset by just over a 10% cross-subsidy across all CRS policies.

Removing each of these subsidies and discounts would move the NFIP's current baseline rate structure significantly closer to full-risk rates. Policy alternatives accomplish the move to full-risk rates to varying degrees, as determined by a variety of policy provisions: what events trigger rate adjustments, which policies would be affected by those adjustments, whether and how the mandatory purchase requirement might interact with rate changes, and the timing of those changes.

Figure 5.4: Annual Average Premium & Estimated Structure- Based Subsidies



Source: NFIP Rate Review 2010. Assumes that the average subsidy for pre-FIRM structures is 57.5% of the full-risk premium needed to fund the long-term expectation for losses, as cited in the 2010 Actuarial Rate Review. Although the nature of the subsidies for A99 & AR policies is significantly different than for pre-FIRM structures, this analysis assumes that the magnitude of the subsidy is similar in the absence of more definitive data.

Figure 5.5: Current Premiums, Estimated Subsidies, Cross- Subsidies & Discounts

Flood Zone	Number of Policies	Average Annual Premium (October 2010)	Average Value of Subsidy or Discount[1]	Average Value of Cross Subsidy	Average Full Risk Rate[2]
A					
Pre-FIRM Subsidized	133,053	$817	$1,105	($86)	$1,836
Not Subsidized	106,371	$817	$0	($36)	$780
AE					
Pre-FIRM Subsidized	920,599	$1,166	$1,578	$54	$2,798
Not Subsidized	1,649,625	$499	$0	$10	$509
AHO					
Pre-FIRM Subsidized	65,383	$388	$525	$34	$947
Not Subsidized	452,355	$388	$0	$15	$402
AR & A99	26,000	$896	$1,212	$35	$2,143
D					
Pre-FIRM Subsidized	1,720	$1,069	$1,446	($86)	$2,429
Not Subsidized	1,249	$1,069	$0	($36)	$1,032
Other					
Pre-FIRM Subsidized	902	$1,069	$1,446	($253)	$2,262
Not Subsidized	16,652	$1,069	$0	($108)	$961
V, VE					
Pre-FIRM Subsidized	35,435	$1,807	$2,444	$46	$4,297
Pre-81	10,907	$1,468	$1,987	$37	$3,492
Not Subsidized	45,651	$2,807	$0	$30	$2,837
PRP (NFIP)	1,621,168	$344	$27	$0	$371
B,C,X					
Standard	223,325	$612	$0	($266)	$346
Grandfathered	250,000	$612	$204	($50)	$765

[1] Values based on average subsidy and discount rates of 58% for pre-FIRM structures, 8% for PRPs, and 25% for grandfathered policies; [2] Weighted average across CRS rankings.

While determining the magnitude and impact of rate changes is relevant to all policy alternatives, additional methodological approaches must be layered on top of these basic rate calculations in order to more fully capture the unique characteristics of the following alternatives.

- For the Privatization option, private sector behavior and policy uptake were simulated based on an analysis of stakeholder input provided by private insurers during Phase II and an examination of the historical loss ratios by flood zone. Based on this review, it was determined that private market underwriting of flood insurance is likely to be limited to low risk PRP policies, at least in the near term. Given this expectation, potential rate increases instituted by the private market would likely impact a relatively small number of structures with an outstanding policy.

- Under the Federal Assistance option, the major difference from the current program is the establishment of a federal cost-share system that would cover between 50% and 95% of flood damages, depending upon the extent of a community's mitigation activities. Given this feature, the data analysis focused on describing the incentive structure created by the cost-share system, which would also extend to individual insurance premiums, and its impacts on insurance markets and behavior. For example, although Federal Assistance would charge full-risk rates, the proposed cost-share structure would have the effect of reducing the total cost of insurance for a given level of coverage – implicitly expanding the federal government's subsidization of flood insurance.

- Evaluation of the Community Based alternative diverged somewhat from the approach taken with the other policy options; providing full insurance coverage for all structures in participating communities significantly changed the impact of rate changes on other analysis metrics. Accordingly, the primary goal of the analysis in this context was to estimate which communities are most likely to participate in the flood insurance program and the total number of structures that would be covered. To this end, estimates of Current NFIP penetration and participation by flood zone and CRS ranking, which was used as a proxy for program participation, formed the basis Community Based Insurance's data analysis.

The analytical approach outlined above is primarily concerned with cost-based metrics and criteria. However, a full evaluation of the policy alternatives also required a careful analysis of mitigation-based metrics, as insurance pricing and rates is only one of many factors that influence the amount and effectiveness of mitigation activity. The mitigation-based analytical approach employed in this assessment considered risk assessments, minimum standards, and financial incentives to mitigate, among other factors. As with the cost-based analysis, the mitigation-based analysis also uses the current program as a baseline against which to assess the impacts and outcomes of four policy alternatives.

5.3 Results

5.3.1 Criterion #1: Cost of flood is borne by individuals

The key driver for evaluating the degree to which a policy option satisfies Criterion 1 is the extent to which policyholders are charged full-risk rates. This is primarily determined by policy provisions

regarding insurance premiums, subsidies, and discounts. At one end of the spectrum, Community Based Insurance would eliminate all subsidies and discounts and charge communities the aggregate full-risk rate of all structures in the community. At the other end, the Federal Assistance alternative would charge full-risk rates to individual structure owners, although its proposed cost-share mechanism would create large implicit subsidies. NFIP Modified and Privatization propose a more moderate approach, by gradually phasing out subsidies for non-primary structures and eliminating grandfathering immediately. In addition, to the extent that private insurers underwrite low-risk PRP policies, the Privatization option would likely result in the elimination of PRP discounts. Based on the data analysis, policy rankings relative to Criterion 1 are as follows:

(1) Community Based Insurance: Under a community-based program, participating communities would receive a single insurance bill that represents the full aggregate risk for all structures in the community, and local government is given discretion in determining how to distribute premium costs throughout the community. Although it is conceivable that local officials may decide to somewhat cross-subsidize rates within their community, it is assumed for the purpose of analysis that costs will generally be distributed according to each structure's assessed risk. Accordingly, given that approximately 70% of currently insured structures are located in communities that are likely to participate, almost 39 million total structures, it is estimated that roughly 70% of current policyholders would be charged full-risk rates. In addition, structures located in participating communities that are currently uninsured would also be covered at full-risk rates under this alternative — substantially increasing program participation.

(T.2) Privatization: The percentage of insured structures paying full rates would effectively double under Privatization, reaching just over 85%. However, this assessment is highly dependent upon assumptions made regarding which policies the private market would be willing and able to insure. In addition to incorporating the same provisions regarding pre-FIRM subsidies and immediately grandfathered discounts as NFIP Modified, Privatization would also likely increase the number of PRP policies paying full-risk rates. To the extent that private insurers are willing to underwrite PRPs, it is estimated that those premiums would likely increase by roughly 7%,[5] with only 2% of total NFIP insured risk receiving some form of subsidy or discount.

(T.2) NFIP Modified: NFIP Modified would institute a moderate approach to moving the program toward full-risk rates, primarily through the phasing out of pre-FIRM structure-based subsidies at the transfer of ownership and the immediate elimination of grandfathered discounts. Relative to the current program, NFIP Modified would likely increase the share of all policies paying full-risk rates to 54%, of SFHA structures by roughly 9%, and NSFHA structures by more than 1% over a 13 year period (according to the average rate of housing stock turnover). However, it is also estimated that the move to full-risk rates and the associated rate increases would likely cause approximately 40% or more of subsidized policyholders to drop coverage.

[5] As noted on page 32, PRP policies currently receive approximately an 8% discount from full risk rates. Assuming that private insurers target a 70% payout ratio and that they achieve some cost savings in operating expenditures relative to the NFIP, premiums would likely increase by just 7% for privatized PRP policies.

(4) Current NFIP: Less than 50% of policies pay full-risk rates under the current program. In addition, the penetration rate in SFHAs is likely below 30% and a complicated rating system often conceals the true risk of flood for policyholders. As a result, approximately 4% of all NFIP insured risk is ultimately subsidized by taxpayers as opposed to funded by premium payments, more than any other policy alternative with the exception of Federal Assistance.

(5) Federal Assistance: On average, all insured structures under the Federal Assistance alternative would pay just 49% of their total cost for flood for a given level of coverage. Although policyholders would technically be charged full-risk rates, effective rates would be significantly reduced by the policy's proposed cost-share mechanism. In addition to providing federal funds to communities for pre- and post-disaster assistance, the cost-share would also be applied to homeowners' insurance policies. As a result, effective rates would decline by the percent of a given community's established cost-share.

Figure 5.6: Summary of Analytical Results for Criterion 1

Key Metrics	Current NFIP	NFIP Modified	Privatization	Federal Assistance	Community Based Insurance[3]
Percent of NFIP Insured Risk That is Subsidized	4.0%	2.6%	2.1%	61.2%	0.0%
Total Policies[1]	5,560,395	5,086,994	5,065,465	5,560,395	38,987,714
SFHA Penetration Rate	25.9%	23.6%	23.6%	25.9%	60.6%
Percent of All SFHA Structures Paying Full Rates	17.0%	18.2%	18.2%	0.0%	60.6%
NSFHA Penetration Rate	3.3%	3.0%	3.0%	3.3%	48.3%
Percent of All NSFHA Structures Paying Full Rates	0.3%	0.7%	3.0%	0.0%	48.3%
Percent of Total Policies Paying Full Rates	44.9%	54.0%	85.7%[2]	0.0%	100.0%
Per Policy Percent Discount from Full Rate for Subsidized Policies	43.4%	43.4%	57.5%	49.0%	0.0%

[1] Refers to number of structures insured for CBI; [2] The difference between NFIP Modified and Privatization is due to full-risk pricing for PRPs under Privatization. These policies would represent a relatively low amount of overall flood risk; [3] Analysis assumes that participation under CBI will mirror participation in the CRS program. To the extent that this is not the case, several key metrics for this alternative would change significantly.

5.3.2 Criterion #2: Individuals incur cost of increased risk gradually

Three factors are most relevant to satisfying Criterion 2: (1) timing of rate increases, (2) magnitude of rate increases, and (3) portion of the insured population experiencing rate increases. Specifically, the data analysis adopts the view that phasing in rate increases over a longer period of time is more likely to satisfy Criterion 2, as the rate of the increase affects the

extent to which individuals perceive rate increases as "gradual" and do not reject the assumption of risk. Accordingly, specific provisions from the policy frameworks provided by the Working Group were combined with the Criterion 1 data analysis to identify how many policies would be impacted by premium increases and the average annual rate at which those increases would be implemented.

Figure 5.7: Summary of Analytical Results for Criterion 2

Key Metrics	Current NFIP	NFIP Modified	Privatization	Federal Assistance[2]	Community Based Insurance
Maximum Change in Rates During a 2-year Period, Due to Risk Assessments *(Compounded Rate)*	21%	44%	No Limit / 40% for residual market	No Limit	No Limit
Number of Structures Experiencing a Rate Increase That Maintain Policy	N/A	234,177	1,833,757	474,244	1,991,425
Average Annual Change in Rates per Structure Affected By Subsidy Elimination[1]	0.0%	+10.4% per year for 13 years	+10.4% per year for 13 years	+4.8% for 1 year	+135.3% for 1 year
Average Annual Change in Rates per Structure Affected by Discount Elimination[1]	0.0%	+33.3% for 1 year	+16.7% for 1 year	0.0%	+27.2% for 1 year

[1] Weighted average across policies with increasing rates; [2] Federal Assistance is analyzed from the perspective of "effective premiums." All premiums would increase to full-risk rates, but for the vast majority of policies the federal cost-share would more than offset that increase.

(1) Current NFIP: Under the current program, new rates are phased in over two years, with a maximum annual percent change of 10%. Given that all existing subsidies and discounts would remain in place, the scope and scale of cost increases is likely to be substantially less than under other alternative policies.

(2) Federal Assistance: Less than 10% of policies would immediately pay an average of almost 5% more for the same level of coverage, while over 90% of policyholders would experience a reduction in their effective rate. Federal Assistance would also place no limits on future annual rate increases as a result of new or revised risk information.

(3) NFIP Modified: Grandfathering would be immediately eliminated and subsidies would be largely phased out over an average of 13 years, consistent with the rate of housing stock turnover. The maximum allowable annual rate increase would be raised from 10% to 20%.

(4) Privatization: Results are similar to NFIP Modified, with the exception that privatized PRP policies would likely see an immediate rate increase of roughly 7%.

(5) Community Based Insurance: Nearly two million policies would be immediately impacted by the elimination of all federal subsidies and discounts. This policy option places no limits on annual rate increases to community policies, and leaves the questions of how to collect increased premiums from individuals and pass through rate increases to local community governments. There is, therefore, no guarantee that individuals would be shielded from sharp rate increases, should they occur in a given community.

5.3.3 Criterion #3: Assistance is provided for those who cannot afford the cost

The data analysis adopts the view that two factors are most relevant to satisfying this criterion: (1) the availability of a means-based assistance program to offset the cost of insurance and (2) the availability of a means-based assistance program to offset the costs of mitigation. However, all of the policy alternatives lack key details regarding the eligibility criteria for assistance, as well as the amount of assistance available for those who qualify.

Accordingly, this analysis assumes that the level of assistance per household and eligibility requirements are consistent across all alternatives relative to Current NFIP, with the exception of Community Based Insurance, which specifies that federal assistance would be provided to "small and impoverished" communities.

(1) Federal Assistance: Unlike other policy alternatives, the Federal Assistance policy provisions would provide federal means-based assistance for both insurance premiums and flood risk mitigation activities to all eligible households.

(T.2) NFIP Modified & Privatization: These two alternatives provide federal means-based assistance for insurance premiums to all eligible households, but not for mitigation activities.

(4) Community Based Insurance: Policy provisions under the community-based model would not provide federal means-based assistance for mitigation activities and would restrict means-based assistance for insurance premiums to "small and impoverished" communities (i.e., communities with no more than 3,000 residents that have been determined by the state to be economically disadvantaged). It is estimated that "small and impoverished" communities constitute less than 1% of low-income households located in a floodplain, although communities would have the flexibility to adopt their own means-based programs or progressive tax systems.

(5) Current NFIP: Provides no means-based assistance for insurance or mitigation.

Figure 5.8: Summary of Analytical Results for Criterion 3

Key Metrics	Current NFIP	NFIP Modified	Privatization	Federal Assistance	Community Based Insurance
Percent Low-Income SFHA Households Eligible for Federal Insurance Subsidies	0%	100%[1]	100%[1]	100%[1]	<1%[2]
Percent Low-Income SFHA Households Eligible for Federal Mitigation Subsidies	0%	0%	0%	100%[1]	0%

[1] This does not necessarily mean that 100% of low-income households will receive federal subsidies, but that all low-income households in an NFIP participating community can apply to receive federal subsidies under this policy option. Details not provided in the policy alternatives used for evaluation will ultimately determine which households are determined to be low-income and the size of subsidies; [2] CRS data indicates there are 77 small & impoverished communities. Seven of these communities participate in CRS, comprising 0.6% of all participating communities. The analysis assumes that "low income" households are evenly distributed across participating communities.

Criterion #4: Minimize exposure to flood hazards

The data analysis adopts the view that four factors are most relevant to satisfying this criterion: (1) stringency of building codes and standards, (2) availability of financial mitigation incentives (grants, subsidies, tax credits, etc.), (3) insurance pricing, and (4) community participation.

The optimal deployment and alignment of these four incentives require that a flood insurance program: (1) effectively communicate risk to individuals and communities, (2) provide financial assistance where behavioral biases may constrain individual and community responsiveness to risk, and (3) implement mandates that ensure a minimum level of mitigation. Due to resource constraints and the necessary broad scope of the data analysis, this assessment considers the extent to which policy options will effectively communicate risk and provide financial assistance through a qualitative analysis, based on the policy design frameworks. The effect of mandated minimum standards across policy alternatives was estimated using a more quantitative approach.

Figure 5.9: Summary of Analytical Results for Criterion 4

Key Metrics	Current NFIP	NFIP Modified	Privatization	Federal Assistance	Community Based Insurance
Total Number of Policies Paying Full Rates	2,495,228	2,746,232	4,345,871	0[1]	38,987,714
Per Policy Percent Discount from Full Rate for Discounted Policies	43.4%	43.4%	57.5%	61.1%	0.0%
Percent of New Structures Elevated Above BFE	73.4%	100%	100%	100%	73.4%
Percent Reduction in Expected Flood Loss Per Structure Due to Elevating New Structures to BFE +1'	0%	15%	15%	15%	0%
Trend in Incentives to Utilize Mitigation Grant Programs	*(Baseline)*	Same	Same	Down	Up
Total Participating Communities	~21,000	~21,000	~21,000	~21,000	1,145

[1] Federal Assistance is analyzed from the perspective of "effective premiums." All premiums would increase to full-risk rates, but for the vast majority of policies the federal cost-share would more than offset that increase; [2] Analysis assumes that participation under CBI will mirror participation in the CRS program. To the extent that this is not the case, several key metrics for this alternative would change significantly.

According to data analysis, policy rankings relative to Criterion 4 are as follows:

(1) Community Based Insurance: Community Based Insurance performs best relative to the current program, as it significantly strengthens the insurance price signal for the most number of policies. Although rates will be aggregated at the community level, almost 39 million structures will be insured at full-risk rates, a more accurate price signal to more communities and structure owners than under any other policy option. A key policy feature that differentiates Community Based Insurance from the other policy options is its shift away from directing the insurance price signal to the individual, and instead directing it to the local community government, which often holds land use authority. This structural shift could result in a greater amount of higher impact mitigation projects.[6] Already, the majority of applications submitted to federal mitigation grant programs come from communities, not individuals, and directing a full-risk insurance price signal to the community level may increase utilization of such programs. However, it should be noted that the performance of Community Based Insurance relative to this criterion is highly sensitive to assumptions regarding which communities are likely to participate. Should fewer or different

[6] See Appendix D for the data analysis' assumptions regarding why an individual's decision to mitigate is only marginally responsive to the insurance price signal.

communities participate than is currently assumed, the amount and impact of mitigation would likely be reduced.

Although this alternative would not implement stricter federal elevation standards for new construction relative to the current program, it seems likely that the structural realignment of mitigation incentives under Community Based Insurance, coupled with the large number of structures insured by this option would result in significantly more and more effective mitigation than under the other policy alternatives.[7]

(T.2) NFIP Modified: NFIP Modified would require new construction to elevate a minimum of 1 foot above the BFE, which is a meaningful mitigation activity, particularly on a per structure risk-reduction basis. However, this alternative does relatively little to strengthen community-level mitigation incentives and would only marginally incentivize additional mitigation at the individual level, as it would continue certain subsidies and discounts that distort risk communication.

(T.2) Privatization: Privatization performs similarly to Modified NFIP with respect to minimizing exposure to flood hazards. Assuming that private insurers underwrite PRPs, the percentage of policies paying full rates is likely to increase to 85% (over four million policies, as compared to almost three million under NFIP Modified). However, the overall impact of the stronger price signal on mitigation efforts is expected to be marginal and is unlikely to substantially differentiate this policy from Modified NFIP with respect to this criterion.

(4) Federal Assistance: Federal Assistance would also require new construction to elevate a minimum of 1 foot above BFE, which would reduce risk by an estimated 15% for each new structure. However, the Federal Assistance cost-share mechanism would adversely affect mitigation incentives for communities and individuals. Given the relatively generous cost share for current federal mitigation grant programs, it is estimated that the majority of participating communities and individuals would receive less generous federal grants for mitigation activities than they receive under the current program. Reduced federal assistance would likely result in lower utilization rates of federal mitigation grant programs, which are typically used to fund large-scale, high impact mitigation projects. In addition, the cost share mechanism would also apply to individual insurance policies, resulting in lower effective rates for the majority of policies for a given level of coverage. Factoring in the cost share provision, the average per policy discount from full risk rates under Federal Assistance would increase to just over 60% per policy — distorting the insurance price signal and negatively impacting incentives to mitigate.

(5) Current NFIP: Mitigation incentives are weakest under the current program. Minimum building standards do not require new construction to elevate above the BFE and the insurance price signal is significantly muted for some policyholders due to the presence of structure-based subsidies and discounts.

[7] See Appendix D for a discussion of the assumption regarding community participation under Community Based Insurance.

5.3.4 Criterion #6: Efficiency – Maximize the benefit/cost ratio

Although the evaluation of Criteria 4 considered each policy alternative's directional impacts on a variety of relevant mitigation metrics, a more detailed accounting of benefits (i.e., avoided losses due to mitigation) was infeasible due to a variety of factors, including data limitations, a lack of specificity in the policy frameworks, and time constraints. Similar factors also precluded a full accounting of the investments and administrative costs associated with varying levels and types of mitigation projects under policy alternatives. Consequently, a detailed analysis of social costs and benefits was not possible within the scope of the current analysis.

With that said, future analysis might consider the several factors when estimating a program's efficiency from a societal perspective. Generally speaking, the social benefits realized under each policy should correspond to the net reduction in flood losses resulting from mitigation efforts. The associated benefits include the avoided loss of life, property, economic function, and environmental function. The associated social costs may include the construction of structural flood barriers, relocation of people away from flood-prone areas, compliance with mandated building codes and standards, restoration of natural flood barriers, and administrative and operational activities.[8]

5.3.5 Summary of Results

Given that the metrics utilized in the quantitative analysis encompass a range of data types and units, an overall assessment of the extent to which policy alternatives satisfy a given criterion requires that these metrics be interpreted and summarized into a standard unit. Accordingly, Keybridge evaluated the results for each criterion and summarized its overall assessment using a "Harvey Ball" scale.[9] In assigning Harvey Ball rankings to each policy, Keybridge considered four factors:[10]

(1) A comprehensive interpretation of the quantitative results, including their direction and relative magnitude.

(2) The relative importance of metrics in achieving the criterion.

(3) The potential impact of highly relevant, non-quantifiable factors and uncertainty regarding key assumptions.

(4) The criteria weights specified in Section 2.

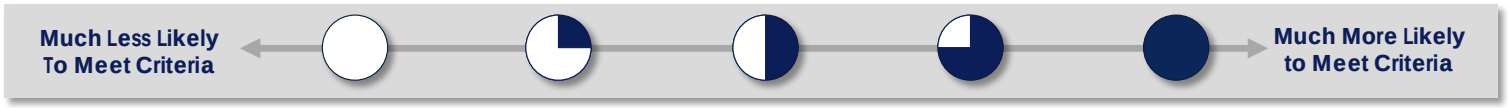
The results of Keybridge's overall assessment are provided in Figure 5.10.

[8] Note that other commonly perceived "costs" associated with the NFIP (e.g., insurance premiums, subsidies and discounts, disaster assistance) primarily constitute transfer payments within society.

[9] Harvey Balls were created by Harvey Poppel of Booz Allen Hamilton in the 1970s. They have been widely adopted by various industries for the purpose of indicating the degree to which elements meet specific criteria.

[10] Although rooted in the data analysis, the final criteria rankings are ultimately subjective in nature and are provided solely for the purpose of facilitating discussion regarding the relative performance of policy alternatives.

Figure 5.10: Data Analysis Policy Ranks by Criteria



Criteria	Current NFIP	NFIP Modified	Privatization	Federal Assistance	Community Based
Cost of Flood is Borne by Individuals					
Individuals Incur Costs Gradually					
Assistance Provided to Those Who Cannot Afford the Cost of Flood					
Minimize Exposure to Flood Hazards					

5.4 Sensitivity Analysis

The data analysis relies on numerous assumptions, most of which have an inherent degree of uncertainty.[11] While many assumptions do not have a notable impact on the overall policy rankings or the analysis conclusions, the assumptions discussed below exert significant leverage on key metrics and the performance of policy alternatives, particularly relative to Criterion 1. While each of these assumptions would impact the relative performance of the policy alternatives to a limited degree, the assumption regarding participation in the Community Based Insurance alternative has the most significant potential to impact the results of the data analysis. Moreover, while most assumptions would likely have similar directional impacts on all policy alternatives, participation rates for Community Based Insurance is the only assumption with significant potential to actually alter policy rankings, particularly relative to Criterion 1.

Percent of home purchases subject to the MPR: MPR applies to structures located in an SFHA with a "federally related loan" — that is, a mortgage provided by a federal lender, a federally regulated lender, or one that is backed by a government sponsored enterprise ("GSE").[12] Analysis suggests that the percent of home purchases in flood zones subject to MPR ranges from 53% to 97%, with the most likely figure being 82%. This assumption directly affects penetration rates under the NFIP Modified and Privatization alternatives. For instance, to the extent that the number of structures subject to MPR is greater than estimated in this analysis, a transition to full-risk rates is likely to result in fewer policy cancelations.

MPR Compliance Rate: This analysis calculates MPR compliance rates using FEMA estimates of penetration rates. The data analysis suggests that the national MPR compliance rate is likely to be between 26% and 45%, with the most likely figure estimated at almost 43%. Similar to the above assumption, MPR compliance rates affect the number of policies that might be dropped as subsidies and discounts are eliminated under NFIP Modified and Privatization. For example, to the extent that compliance rates are lower than estimated in this analysis, a transition to full-risk rates is likely to result in an increase in policy cancelations.

Price Elasticity of Demand: Research suggests that the demand for insurance is relatively insensitive to price. However, as NFIP Modified and Privatization transition to full-risk rates over time, the demand for policies from structures not subject to MPR will be increasingly affected by price elasticity. A survey of academic literature suggests that the elasticity of demand for flood insurance is between -0.38 and -0.06, with an average of -0.20. Accordingly, it is estimated that a 10% increase in the price of flood insurance would reduce the number of policies by approximately 2%. However, under certain policy alternatives, the rate increases for some policyholders is likely to be beyond the bounds of historical experience. In such instances, the elasticity of demand is likely to be significantly higher than this average value — thereby increasing the number of dropped policies among currently subsidized homeowners.

PRP Loss Ratio: PRPs have a historical loss ratio of 1.47, including Hurricane Katrina (as a 1/30 year flood). This analyses estimates that private insurers would need to raise premiums by at least 7% to achieve a typical private market loss ratio of 0.7. Under various assumptions of the likelihood

[11] See Appendix D for a complete discussion of assumptions used in the data analysis.

[12] For more information, see "Mandatory Purchase of Flood Insurance Guidelines", FEMA, September 2007.

and frequency of the 2005 hurricanes, the actual PRP loss ratio is more likely to be around 0.94, with a range between 1.19 and 0.82. The assumed actual loss ratio for PRPs affects policy options that transition toward the privatization of PRP policies — namely, Privatization and Community Based. A wider gap between the actual and target loss ratios for private insurers would lead to higher rates and could adversely affect flood insurance demand.

Cost Savings by Private Insurers: In addition to the gap between actual and target PRP loss ratios, private insurers' ability to achieve cost savings vis-à-vis the NFIP could result in lower PRP premiums under privatization. Analysis of flood insurance premium structures indicates potential savings in the "Other Operating Expenses" segment of the rate structures, although the magnitude of these savings is unknown. A range of 0% to 50% was used, with the most likely case being approximately 25% cost savings. However, "Other Operating Expenses" are a small fraction of overall premiums, at just over 7%, meaning that this assumption translates into a mere 0% to 3.7% overall cost savings. Nevertheless, assumptions regarding the likely cost savings achieved by private insurers have a direct impact on the premiums charged to PRPs under increased privatization, which in turn affect demand for PRP policies under Privatization and Community Based Insurance.

Participation under Community Based Insurance: The results for the Community Based option are highly sensitive to assumptions regarding the community participation rate. For instance, using the distribution of participating communities among the CRS rankings as a proxy, Community Based Insurance performs significantly better than the other alternatives as long as those communities with a CRS ranking of 5 or better participate in the program. However, if only those communities with a CRS ranking of 4 or better participate, Community Based Insurance would result in a dramatic reduction in participation of 90% or more. Results of the data analysis factor in full participation for all current CRS communities, but a wide range of participation was factored into the sensitivity analysis.

To assess the impact on the data analysis of these more uncertain assumptions, a sensitivity analysis was conducted to evaluate the performance of each policy alternative against a range of assumptions. The sensitivity analysis was conducted using Monte Carlo simulations along the following method:

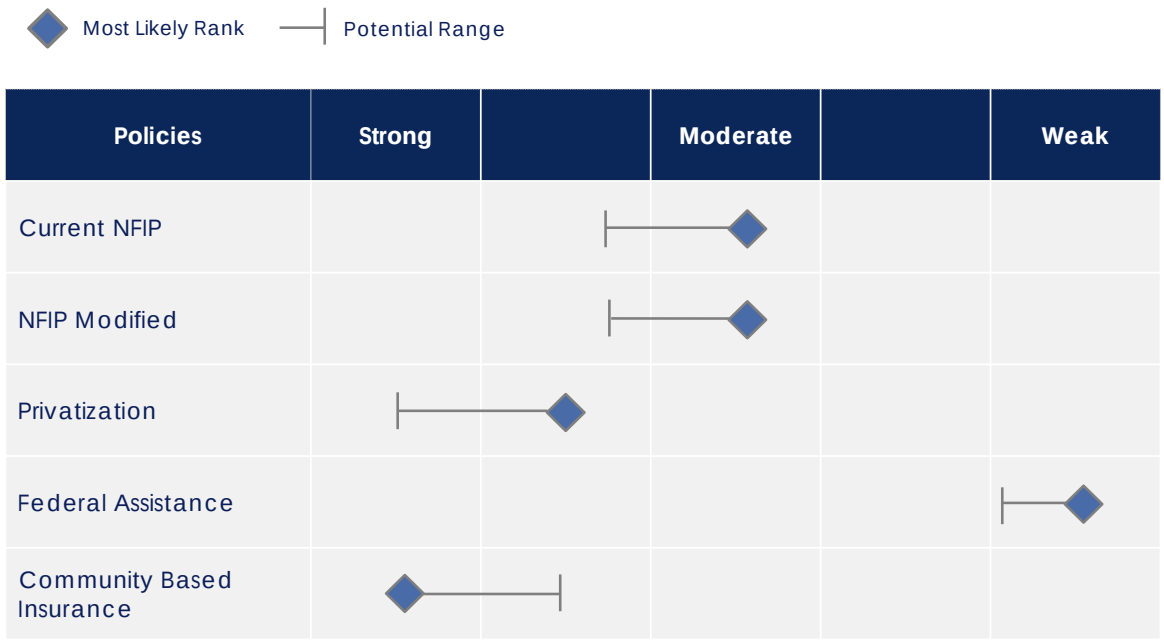
- Assign a range and probability distribution to each assumption.
- Run 10,000 simulation trials by randomly sampling from each assumption's probability distribution and calculating the key metrics for each policy alternative.
- Determine the range and probability distribution for each policy along key metrics.

Sensitivity tests reveal that policy performance relative to Criterion 1 is relatively robust across a range of assumptions. Specifically,

- Federal Assistance performs the worst under all alternate scenarios.
- Current NFIP and NFIP Modified rank third, relative to Criterion 1, under all scenarios.

- Privatization performs better than Current NFIP, NFIP Modified, and Federal Assistance under all scenarios.
- Community Based has an 80% chance of ranking first relative Criterion 1 and a 20% chance performing similarly to Privatization, due to sensitivity to the assumption regarding community participation.

Figure 5.11: Data Analysis Sensitivity Regarding Criterion 1



5.5 Qualifications, Limitations, & Uncertainties

Results of the data analysis should be viewed within the context of certain limitations, qualifications, and uncertainties.

(1) Lack of policy-level data

Due to privacy constraints, the NFIP was unable to provide structure-level policy or claims data. Although aggregated data was sufficient to construct general estimates of the likely impacts resulting from the five policy alternatives, more detailed data would have enabled a more sophisticated analysis.

(2) Unspecified risks

NFIP does not maintain data on the residual risks, nor does it factor in the costs associated with levees and dams. Similarly, the program does not incorporate future risks (e.g., urbanization and climate change) into its rates.

(3) Lack of Specificity for Means-Based Assistance

All policy alternatives to the Current NFIP include some form of means-based assistance, but fail to include details on how such a program might be designed and implemented.

(4) Uncertain Private Market Impacts

Although the data analysis makes certain assumptions regarding the development of a private market for primary flood insurance and its impact on insurance rates and penetration, such impacts are highly uncertain.[13] Estimates regarding insurance rates, market penetration, and other factors would be subject to significant variation depending upon the specifics of how private markets develop.

(5) Uncertain Participation for Community Based Insurance

Analysis around the impacts of the Community Based alternative is highly dependent upon the number of participating communities. For analytical purposes, it is assumed that only communities currently participating in the Community Rating System ("CRS") program have the desire and capacity to participate in the Community Based Insurance program. If this level of participation is not achieved, the benefits estimated for this alternative would be significantly reduced.

[13] See Appendix E for a more detailed discussion of these assumptions.

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VI. Key Insights & Conclusions

6.1 Reform is needed.

NFIP Reform is a concerted effort to respond to concerns from a wide array of stakeholders regarding the extent to which the current program continues to meet the evolving needs of the public, including at-risk individuals, participating communities, and general taxpayers. The stakeholder input gathered during Phase I of the reform process provided significant anecdotal evidence to suggest that the NFIP does not effectively and efficiently satisfy several key program objectives. The results of the analysis conducted in Phase III are highly consistent with this anecdotal evidence, validating stakeholder concerns regarding the current program and confirming the need for reform.

The results of the expert panel assessments, in particular, provide convincing evidence that the current program suffers from a variety of significant challenges. As shown in Figure 6.1, expert panel members ranked the Current NFIP option last among all five policy alternatives. This unfavorable overall assessment reflects the Current NFIP's poor performance on a majority of the evaluation criteria, including ensuring that the costs of flood are borne by individuals, providing assistance to those who cannot afford the cost of flood, and minimizing exposure to flood hazards.

Importantly, the results of the analysis phase indicate not only that the current program suffers from significant challenges, but also that alternative approaches have the potential to address them. For instance, the expert panelists expressed a preference for NFIP Modified over Current NFIP on each of the eight criteria. Expert panel assessments also indicate, though somewhat less emphatically, that the Community Based Insurance, Federal Assistance, and Privatization options offer select opportunities to improve upon the status quo. The results of the data analysis are generally consistent with these findings.

6.2 No one pure policy option emerges as the unequivocal best approach.

The results of the analysis phase clearly indicate that reform is needed, but they are more ambiguous regarding the best path forward. A pattern of "dominance" in the results would offer the most compelling evidence that one particular option is best.[14] While there are limited cases in which one policy dominates another, there is no instance in which one policy dominates every other alternative relative to the full set of reform criteria.[15] Indeed, no one policy option even begins to approach dominant status.

The absence of a pattern of dominance effectively heightens the importance of criteria weights, which provide some guidance regarding the relative importance of reform objectives. When the criteria weights are factored into the analysis, the results suggest that NFIP Modified is likely to outperform the other policies. Nevertheless, although the differences in performance

[14] For instance, Policy A would dominate Policy B if it performed just as well or better on all eight criteria.

[15] For example, the expert panel assessments suggest that the NFIP Modified dominates Current NFIP, as it performs just as well or better across all eight criteria. It does not, however, dominate the Community Based Insurance, Federal Assistance, or Privatization options.

between NFIP Modified and the four other alternatives are discernable and potentially significant, it is difficult to conclude that they are overwhelming or decisive in all instances.

6.3 NFIP Modified offers a strong platform for reform.

Although none of the pure policy options evaluated emerge as the unequivocal best approach, the results of the analysis phase suggest that the NFIP Modified option offers a strong platform for reform. This conclusion is based on several key observations.

First, NFIP Modified performs consistently well across the evaluation criteria. In contrast, the performance of other policies is significantly more uneven, with extremely strong performance on some criteria being offset by extremely weak performance on others. Accordingly, the NFIP Modified option may offer a more stable foundation on which to build a package of policy reforms, given the more uneven performance of other alternatives.

Second, expert panel members rated NFIP Modified highly with respect to both administrative feasibility and political acceptability. Other alternatives performed poorly on at least one of these criteria. This suggests that, regardless of its advantage or disadvantage on other criteria, NFIP Modified may represent the only viable alternative to the current program, at least within the context of existing conceptions of administrative feasibility and political acceptability.

Third, both the expert panel assessments and the data analysis highlight the fact that the Community Based Insurance, Federal Assistance, and Privatization options suffer from significant uncertainties. Given the lack of historical experience with these paradigms in the United States, such uncertainties are not unexpected. Unlike the NFIP Modified option, however, it will take time to more fully explore the implications of these uncertainties, pilot test policy designs, and scale those policies to a level at which they could serve as a suitable national program. Thus, as a practical matter, NFIP Modified may serve as the only feasible option for reform in the short and medium terms.

6.4 Other pure policy options could selectively augment a package of reforms.

Although the Community Based Insurance, Federal Assistance, and Privatization options are unlikely to serve as foundations for reform in the near term, they have the potential to selectively augment a package of reforms.

For example, a key feature of the Community Based Insurance option is that it provides comprehensive compliance and coverage within participating communities. However, the analysis suggests that such an approach may not be administratively feasible or politically acceptable for many communities – thereby limiting the overall scope of the program. A voluntary approach that limits deployment of this model to communities that are both willing and able to implement it may serve as a valuable complement to a more broad-based policy.

As another example, the expert panel assessments suggest that the Privatization option offers several potential benefits, particularly with respect to cost and efficiency criteria. Yet the data analysis suggests that the role of private markets is likely to be limited in the near term, with private insurers focusing on low-risk policies and ceding moderate and high-risk policies to the federal government. With that said, if reform can create the conditions necessary to foster

private market development alongside a more comprehensive public program, it could give private insurers the opportunity to gain the experience and confidence needed to expand coverage to moderate and high-risk structures over time.

Lastly, the Federal Assistance option is designed to address the need for strong mitigation incentives and effective floodplain management standards at a more structural level than many of the other alternatives, acknowledging that reducing risk exposure and flood-related damages is key to the long-term viability and success of a national flood insurance program. Although the data analysis indicates that many of the incentives to mitigate proposed by this alternative may have relatively little impact on policyholders' behavior and carry a high associated cost for the federal government, certain elements of the Federal Assistance option may prove more effective when integrated into another policy paradigm.

Ultimately, the Community Based Insurance, Federal Assistance, and Privatization options have the potential to augment a package of policy reforms. The challenge will be integrating elements of these policies in such a manner that allows them to coexist alongside an NFIP Modified approach and serve those sections of the flood insurance market for which they are best suited.

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Appendix A: Policy Design Frameworks for Evaluation

Policy Framework: Current NFIP		
Element	**Sub-Element**	**Feature**
Market Structure	Who is the policyholder?	The individual property owner
	Who provides primary flood insurance?	NFIP
	Who provides reinsurance against catastrophic loss?	NFIP does not offer reinsurance; Reinsurance will be available to the extent that it is offered by private insurance markets
Rate Setting	Who has rate setting authority?	NFIP
	On what basis are rates set?	Flood mapping, loss experience, structure elevation relative to BFE
	What triggers a change to existing rates?	Release of a new map or a letter of map change; Flood-related loss experience; Change in relevant characteristics of the structure
	Over what timeframe will new rates be implemented?	Rate changes phased in over a 2 year period for newly identified or changed flood hazards through PRP policy
	Are there any limitations affecting how rates may be adjusted?	Yes - annual increases in average rate class premiums are limited to 10%
	Will higher deductible policies be made available, relative to the current deductible ceiling?	No
Risk Assessment	Who is responsible for mapping and risk assessment?	FEMA
	Are residual risks behind levees mapped?	No
	Are residual risks downstream of dams mapped?	No
	Are future risks mapped and, if so, for what purpose?	If requested by the community
Mandatory Purchase Requirement	What structures are subject to the MPR?	Mortgage structures located in SFHAs
	Are those structures able to opt out and, if so, what are the consequences?	No
	How will structures comply with the MPR?	Mortgage lenders enforce the MPR at loan origination
	Will structures subject to MPR be able to discontinue coverage after a given amount of time?	No

Eligibility	Is access to insurance contingent upon participation in the program?	Yes
	Are there structure-based restrictions for participation in the program?	No
	Is eligibility for participating in the insurance program contingent upon the adoption of minimum mitigation standards?	Yes
	Is eligibility for participating in the insurance program determined at the individual or community level?	Community
Mitigation Standards	Who is responsible for establishing minimum standards?	NFIP
	Are minimum standards more or less stringent than current standards? How so?	The same
	Who is responsible for enacting/enforcing mitigation	Communities enact and enforce; NFIP monitors participating
	Are there incentives to enact mitigation standards beyond the minimum requirement?	Yes - mitigation activities at individual structures can result in lower assessed risk and lower premiums; also CRS program and mitigation grants
	Is there compensation for enacting mandatory minimum standards?	No
Structure-based Subsidies	Which, if any, structures will receive subsidies?	All pre-FIRM structures
	Will subsidies be phased out and, if so, for which structures?	No
	What is the trigger for eliminating subsidies?	None
	Over what time frame will subsidies be eliminated?	None
	Will rate grandfathering continue?	Yes
Income-based Subsidies	Who will be eligible to receive means tested assistance to purchase insurance?	No means tested assistance is made available.
	Who will be eligible to receive means tested assistance to comply with mitigation standards?	No means tested assistance is made available.
	Who will administer the voucher program?	N/A

Solvency	Is the NFIP's existing debt forgiven?	No
Disaster Assistance	Is access to disaster assistance contingent upon community or individual participation in the insurance program?	Yes
	Is access to disaster assistance contingent upon the community or individual enacting minimum mitigation standards?	Yes
	Are there any structure-based restrictions on receiving disaster assistance?	No
Other/Program Administration	Who is responsible for collecting premiums?	WYOs, or NFIP directly through insurance agents
	How many/which entities are involved in program	FEMA; WYOs; contractor partners; communities; states; tribes;

Policy Framework: Current NFIP with Modifications		
Element	**Sub-Element**	**Feature**
Market Structure	Who is the policyholder?	The individual property owner
	Who provides primary flood insurance?	NFIP
	Who provides reinsurance against catastrophic loss?	NFIP does not offer reinsurance; Reinsurance will be available to the extent that it is offered by private insurance markets
Rate Setting	Who has rate setting authority?	NFIP
	On what basis are rates set?	Flood mapping, loss experience, structure elevation reletive to BFE
	What triggers a change to existing rates?	Release of a new map or a letter of map change; Flood-related loss experience; Change in relevant characteristics of the structure
	Over what timeframe will new rates be implemented?	Rate changes phased in over a 2 year period for newly identified or changed flood hazards through PRP policy
	Are there any limitations affecting how rates may be adjusted?	Yes - annual increases in average rate class premiums are limited to 20%
	Will higher deductible policies be made available, relative to the current deductible ceiling?	No
Risk Assessment	Who is responsible for mapping and risk assessment?	FEMA
	Are residual risks behind levees mapped?	Yes
	Are residual risks downstream of dams mapped?	Yes
	Are future risks mapped and, if so, for what purpose?	Yes - for regulatory purposes due to urbanization
Mandatory Purchase Requirement	What structures are subject to the MPR?	Mortgaged structures in SFHAs; Areas protected by levees; Residual risk areas downstream from dams
	Are those structures able to opt out and, if so, what are the consequences?	No specific opt-out provision. If structures choose not to purchase flood insurance, they will be ineligible to receive federal disaster assistance
	How will structures comply with the MPR	Mortgage lenders enforce the MPR at loan origination
	Will structures subject to MPR be able to discontinue coverage after a given amount of time?	No

Eligibility	Is access to insurance contingent upon participation in the program?	Yes
	Are there structure-based restrictions for participation in the program?	No
	Is eligibility for participating in the insurance program contingent upon the adoption of minimum mitigation standards?	Yes
	Is eligibility for participating in the insurance program determined at the individual or community level?	Community
Mitigation Standards	Who is responsible for establishing minimum standards?	NFIP
	Are minimum standards more or less stringent than current standards? How so?	More stringent - communities may not develop in SFHAs or non-SFHAs, if that development would increase flood risk elsewhere in the watershed; Adoption of ASCE-24 consensus standard; Establish minimum 1 ft freeboard for all construction and substantial improvements
	Who is responsible for enacting/enforcing mitigation standards (i.e., who is the primary floodplain manager)?	Communities enact and enforce; NFIP monitors participating communities
	Are there incentives to enact mitigation standards beyond the minimum requirement?	Yes - mitigation activities at individual structures can result in lower assessed risk and lower premiums; CRS program and mitigation grants
	Is there compensation for enacting mandatory minimum standards?	No
Structure-based Subsidies & Cross Subsidies	Which, if any, structures will receive subsidies?	Pre-FIRM primary residences
	Will subsidies be phased out and, if so, for which structures?	Yes - for non-residential; Non-primary residences; Repetitive loss structures (including pre-FIRM RL structures)
	What is the trigger for eliminating subsidies?	Transfer of ownership; After specified repetitive loss experience; At loan origination
	Over what time frame will subsidies be eliminated?	Varies for structures, depending on the trigger; Subsidy phase-out for RL structures will be driven by number of losses
	Will rate grandfathering continue?	No - grandfathering will be discontinued at transfer of ownership and under specified repetitive loss experiences

Income-based Subsidies	Who will be eligible to receive means tested assistance to purchase insurance?	Low income individuals
	Who will be eligible to receive means tested assistance to comply with mitigation standards?	None available
	Who will administer the voucher program?	No voucher program - FEMA will coordinate assistance to low income individuals
Solvency	Is the NFIP's existing debt forgiven?	Yes
Disaster Assistance	Is access to disaster assistance contingent upon community or individual participation in the insurance program?	Individuals subject to MPR must have flood insurance in order to receive disaster assistance
	Is access to disaster assistance contingent upon the community or individual enacting minimum mitigation standards?	Yes
	Are there any structure-based restrictions on receiving disaster assistance?	No
Other/Program Administration	Who is responsible for collecting premiums?	WYOs or NFIP directly through insurance agents
	How many/which entities are involved in program administration?	FEMA; WYOs; contract partners; communities; contractor partners; states; tribes

Policy Framework: Privatization			
Element	**Sub-Element**	**Feature - Private Market**	**Feature - Federal Residual Market**
Market Structure	Who is the policyholder?	Individual	Individual
	Who provides primary flood insurance?	Private insurers	NFIP
	Who provides reinsurance against catastrophic loss?	Reinsurance community and NFIP	NFIP bears all risk
Rate Setting	Who has rate setting authority?	Private markets. If necessary, a Federal Rating Committee to achieve rating and form freedom	NFIP
	On what basis are rates set?	Private market's assessment of flood risk	NFIP assessment of flood risk
	What triggers a change to existing rates?	A reassessment of risk by private insurers	A reassessment of risk by NFIP
	Over what timeframe will new rates be implemented?	Immediately upon updated risk assessment	Rate changes phased in over a 2 year period for newly identified or changed flood hazards through PRP policy
	Are there any limitations affecting how rates may be adjusted?	No (other than by competition)	Yes - annual increases in average rate class premiums are limited to 20%
	Will higher deductible policies be made available, relative to the current deductible ceiling?	Potentially - as determined by private insurers (they allow 5% deductible in other catastrophe peril lines, such as wind)	No
Risk Assessment	Who is responsible for mapping and risk assessment?	Private insurers would conduct their own risk assessments, possibly maintain federal mapping, too.	Federal mapping would continue for residual market and floodplain manangement purposes
	Are residual risks behind levees mapped?	Private insurers would want to identify levee areas (possible role for federal government, such as Army Corp)	Yes
	Are residual risks downstream of dams mapped?	Private insurers would want to identify dam areas (possible role for federal government, such as Army Corp)	Yes
	Are future risks mapped and, if so, for what purpose?	Private insurers would want to identify future risk (possible role for federal government, such as NOAA)	Yes - for regulatory purposes due to urbanization

Mandatory Purchase Requirement	What structures are subject to the MPR?	Determined by private markets - no MPR requirement instituted by federal government	Determined by private markets - no MPR requirement instituted by federal government
	Are those structures able to opt out and, if so, what are the consequences?	Optional - States that opt not to require flood insurance as part of homeowners insurance would not have access to federal reinsurance or federal residual market	Yes - structures opting out will be ineligible to receive federal disaster assistance
	How will structures comply with the MPR	N/A	Mortgage lenders enforce the MPR at loan origination
	Will structures subject to MPR be able to discontinue coverage after a given amount of time?	N/A	No
Eligibility	Is access to insurance contingent upon participation in the program?	No	Yes
	Are there structure-based restrictions for participation in the program?	No	Yes - new construction in SFHA will not be eligible to be handed over federal government as part of high-risk residual pool
	Is eligibility for participating in the insurance program contingent upon the adoption of minimum mitigation standards?	No	Yes - states (and/or communities) must adopt minimum standards to be eligible to have high-risk policies taken on by NFIP
	Is eligibility for participating in the insurance program determined at the individual or community level?	Individual	Community

Mitigation Standards	Who is responsible for establishing minimum standards?	Private markets will support and encourage standards for individuals, communities, and watersheds	FEMA
	Are minimum standards more or less stringent than current standards? How so?	Private insurers will determine consensus standards for individuals	More stringent - communities may not develop in SFHAs or non-SFHAs, if that development would increase flood risk elsewhere; Adoption of ASCE-24 consensus standard; Establish minimum 1 ft freeboard for all construction and substantial improvements
	Who is responsible for enforcing/monitoring mitigation standards (i.e., who is the primary floodplain manager)?	The individual and private insurers	Communities enact and enforce
	Are there incentives to enact mitigation standards beyond the minimum requirement?	Yes - to reduce an individual's assessed premium	Yes - mitigation activities at individual structures can result in lower assessed risk and lower premiums; CRS program and mitigation grants
	Is there compensation for enacting mandatory minimum standards?	No	No
Structure-based Subsidies & Cross Subsidies	Which, if any, structures will receive subsidies?	No structures will receive subsidies	Pre-FIRM primary residences; Structures newly mapped into SFHA are eligible for a 2-year preferred risk policy (PRP).
	Will subsidies be phased out and, if so, for which structures?	N/A - no subsidies offered through private insurers	Yes - for non-residential; Non-primary residences; Repetitive loss structures (including pre-FIRM RL structures)
	What is the trigger for eliminating subsidies?	N/A - no subsidies offered through private insurers	Transfer of ownership; After specified loss experience; At loan origination
	Over what time frame will subsidies be eliminated?	N/A - no subsidies offered through private insurers	Over a 2-5 from the time this policy is adopted for RL structures; Varies for other structures, depending on the trigger
	Will rate grandfathering continue?	No	No

Income-based Subsidies	Who will be eligible to receive means tested assistance to purchase insurance?	Federal vouchers for low-income individuals	Federal vouchers for low-income individuals
	Who will be eligible to receive means tested assistance to comply with mitigation standards?	Possible federal mitigation programs	None available
	Who will administer the voucher program?	Preexisting federal government program with experience administrating a voucher system	Preexisting federal government program with experience administrating a voucher system
Solvency	Is the NFIP's existing debt forgiven?	Yes	Yes
Disaster Assistance	Is access to disaster assistance contingent upon community or individual participation in the insurance program?	Individuals must have flood insurance in order to receive disaster assistance	Individuals must have flood insurance in order to receive disaster assistance
	Is access to disaster assistance contingent upon the community or individual enacting minimum mitigation standards?	Yes	Yes
	Are there any structure-based restrictions on receiving disaster assistance?	No	No
Other/Program Administration	Who is responsible for collecting premiums?	Private insurers	WYOs or NFIP directly through insurance agents
	How many/which entities are involved in program administration?	Private insurers	FEMA; WYOs; communities; contractor partners; states; tribes

Policy Framework: Federal Assistance		
Element	**Sub-Element**	**Feature**
Market Structure	Who is the policyholder?	The individual
	Who provides primary flood insurance?	NFIP
	Who provides reinsurance against catastrophic loss?	NFIP does not offer reinsurance; Reinsurance will be available to the extent that it is offered by private insurance markets
Rate Setting	Who has rate setting authority?	NFIP
	On what basis are rates set?	Based on risk assessment and flood hazard mapping
	What triggers a change to existing rates?	Release of new maps; Updated risk assessment
	Over what timeframe will new rates be implemented?	Immediately
	Are there any limitations affecting how rates may be adjusted?	No
	Will higher deductible policies be made available, relative to the current deductible ceiling?	Yes. Individuals will be required to provide evidence of the ability to "self-insure" for amount of deductible
Risk Assessment	Who is responsible for mapping and risk assessment?	Federal agency: FEMA, possibly USGS
	Are residual risks behind levees mapped?	No (no change from current program)
	Are residual risks downstream of dams mapped?	No (no change from current program)
	Are future risks mapped and, if so, for what purpose?	Yes - to give communities the option of regulating to future conditions to achieve a higher rating and more favorable federal cost share arrangement
Mandatory Purchase Requirement	What structures are subject to the MPR?	Residences and commercial structures in SFHAs
	Are those structures able to opt out and, if so, what are the consequences?	No
	How will structures comply with the MPR	Communities must track insured structures and enforce MPR as a condition for program participation
	Will structures subject to MPR be able to discontinue coverage after a given amount of time?	No

Eligibility	Is access to insurance contingent upon participation in the	No
	Are there structure-based restrictions for participation in the program?	No - residential, commercial, and public infrastructure structures are all eligible
	Is eligibility for participating in the program contingent upon the adoption of minimum mitigation standards?	Yes
	Is eligibility for participating in the program determined at the individual or community level?	Community-level (the local government unit with permitting and land-use authority)
Mitigation Standards	Who is responsible for establishing minimum standards?	FEMA sets minimum land-use and building standards; Local communities determine the extent of additional standards and requirements
	Are minimum standards more or less stringent than current standards? How so?	Equal to current standards, as specified in the NFIP and Disaster Mitigation Act of 2000
	Who is responsible for enforcing/monitoring mitigation standards (i.e., who is the primary floodplain manager)?	Communities
	Are there incentives to enact mitigation standards beyond the minimum requirement?	Greater federal cost share for disaster assistance, floodplain management, and flood control standards; Tax incentives
	Is there compensation for enacting mandatory minimum standards?	Tax incentives
Structure-based Subsidies & Cross Subsidies	Which, if any, structures will receive subsidies?	None - all structures will be charged full-risk rates
	Will subsidies be phased out and, if so, for which structures?	Yes - all structure-based subsidies will be phased out
	What is the trigger for eliminating subsidies?	Adoption of policy
	Over what time frame will subsidies be eliminated?	Immediate
	Will rate grandfathering continue?	No

Income-based Subsidies	Who will be eligible to receive means tested assistance to purchase insurance?	Federal vouchers for low-income individuals subject to the MPR
	Who will be eligible to receive means tested assistance to comply with mitigation standards?	Federal vouchers for (1) Low-income individuals (2) Impoverished communities
	Who will administer the assistance program?	Preexisting federal government program with experience administrating a voucher system
Solvency	Is the NFIP's existing debt forgiven?	Yes
Disaster Assistance	Is access to disaster assistance contingent upon community or the individual participation in the insurance program?	Yes - the community. (The Federal Assistance option is not an insurance program - it is a disaster assistance program.)
	Is access to disaster assistance contingent upon the community or individual enacting minimum mitigation standards?	Yes - the community
	Are there any structure-based restrictions on receving disaster assistance?	Yes - new residential and commercial construction undertaken in an existing SFHA will not be eligible to receive any disaster assistance
Other/Program Administration	Who is responsible for collecting premiums?	WYOs or NFIP direct through insurance agents
	How many/which entities are involved in program administration?	Same federal to local framework as current program (with significant state assistance); The community will have a significantly greater role and more responsibilities in administering the program at the local level

Policy Framework: Community Based Insurance		
Element	**Sub-Element**	**Feature**
Market Structure	Who is the policyholder?	The community (local government unit with permitting and land-use authority, as delegated by the state)
	Who provides primary flood insurance?	NFIP
	Who provides reinsurance against catastrophic loss?	No reinusrance
Rate Setting	Who has rate setting authority?	NFIP
	On what basis are rates set?	Regular and frequent risk assessments performed on individual structures within the community, and aggregated into a community-wide risk assessment
	What triggers a change to existing rates?	New risk assessments
	Over what timeframe will new rates be implemented?	Immediately upon receipt of new risk information
	Are there any limitations affecting how rates may be adjusted?	No - all rates will reflect the full risk across the community
	Will higher deductible policies be made available, relative to the current deductible ceiling?	No
Risk Assessment	Who is responsible for mapping and risk assessment?	The federal government, with state partnership in some cases
	Are residual risks behind levees mapped?	Yes
	Are residual risks downstream of dams mapped?	Yes
	Are future risks mapped and, if so, for what purpose?	No
Mandatory Purchase Requirement	What structures are subject to the MPR?	Structures located in SFHA
	Are those structures able to opt out and, if so, what are the consequences?	No
	How will structures comply with the MPR	Through community participation in the program - participation will result in insurance coverage for all structures in that community. Or by obtaining insurance through private markets.
	Will structures subject to MPR be able to "drop" coverage after a given amount of time?	No

Eligibility	Is access to insurance contingent upon participation in the	Yes
	Are there structure-based restrictions for participation in the program?	No - all structures within participating communities are covered
	Is eligibility for participating in the insurance program contingent upon the adoption of minimum mitigation standards?	Yes
	Is eligibility for participating in the insurance program determined at the individual or community level?	Community level
Mitigation Standards	Who is responsible for establishing minimum standards?	NFIP sets minimum standards.
	Are minimum standards more or less stringent than current standards? How so?	Equally stringent
	Who is responsible for enforcing/monitoring mitigation standards (i.e., who is the primary floodplain manager)?	Communities enact and enforce; NFIP monitors participating communities.
	Are there incentives to enact mitigation standards beyond the minimum requirement?	Yes - more stringent mitigation standards reduce exposure to flood risk, and therefore a community's assessed premium
	Is there compensation for enacting mandatory minimum standards?	No
Structure-based Subsidies & Cross Subsidies	Which, if any, structures will receive subsidies?	Availability of structure-based subsidies will be determined by the community
	Will subsidies be phased out and, if so, for which structures?	Yes - all federal strucure-based subsidies under the current program will be phased out
	What is the trigger for eliminating subsidies?	Adoption of Community-Based Insurance policy
	Over what time frame will subsidies be eliminated?	Immediately upon policy adoption
	Will rate grandfathering continue?	No
Income-based Subsidies	Who will be eligible to receive means tested assistance to purchase insurance?	Communities with "small and impoverished community status" will qualify for federal vouchers, tax credits, or rebates
	Who will be eligible to receive means tested assistance to comply with mitigation standards?	No assistance will be provided to comply with mitigation standards
	Who will administer the voucher program?	Preexisting federal government program with experience administrating a voucher system

Solvency	Is the NFIP's existing debt forgiven?	Yes
Disaster Assistance	Is access to disaster assistance contingent upon community or individual participation in the insurance program?	Yes - access to disaster assistance will be restricted for non-participating communities
	Is access to disaster assistance contingent upon the community or the individual enacting minimum mitigation standards?	Yes - the community (which is responsible for enforcing individual standards to maintain community compliance with minimum standards)
	Are there any structure-based restrictions on receiving disaster assistance?	No
Other/Program Administration	Who is responsible for collecting premiums?	Communities
	How many/which entities are involved in program administration?	FEMA, states, communities

Appendix B: Expert Panel Assessments – Survey Comments

C1 - Cost flood is borne by individuals			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
1	Privatization	Costs Borne by Individual	The privatization option is particularly hard to assess in terms of how successfully the private market will limit externalizing costs onto both the federal residual market and other individuals.
2	Federal Assistance	Costs Borne by Individual	I rated the federal assistance option as though it were actually possible to deny all forms of federal disaster assistance to non-participating or non-compliant communities and properties. But I am not sure it is possible to completely prevent those costs from being shared , no matter what the policy created before the disaster says.
3	Community Based Insurance	Costs Borne by Individual	I assumed the community was a reasonable proxy for the individual when evaluating certain parts of the community based insurance option.
4	Cross Cutting	Costs Borne by Individual	I read this criterion as " the cost of flood to an individual is borne by this individual".
5	Cross Cutting	Costs Borne by Individual	This is a complex criterion. I think that most research indicates that the premiums charged have a small impact on participation rates. Therefore, any movement away from subsidies is desirable.
6	Community Based Insurance	Costs Borne by Individual	Regarding the community based alternative, we don't know how fair communities' rate structures would be. I wonder if communities would prefer to out-source this task?
7	Cross Cutting	Costs Borne by Individual	Beyond explicit subsidies, there are a number of other provisions and factors that would affect the extent to which the costs of floods are borne by individuals. The provisions and factors include rate setting, risk assessment, mandatory purchase requirements, income based subsidies, and disaster assistance.

C2 - Individuals Incur Cost of Increased Risk Gradually			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
8	Cross Cutting	Costs Incurred Gradually	One critical element will be that the price charged to individuals be clearly explained to them. One option would be for the NFIP to add a one page of explanation as to why the policyholder has to pay $X.
9	NFIP Modified	Costs Incurred Gradually	The gradual aspect of the proposed reform is critical. 3 to 7 years seems to be a good compromise from what we know in decision science research. It would also provide some balance between different options currently being discussed on the Hill. Freezing the MPR for 5 years as some senators have proposed (after the maps have been updated) will not help; in 5 years people in these flood zones will likely petition their senator again for another 5 year extension.
10	Cross Cutting	Costs Incurred Gradually	Evaluating this criterion seems pretty straight-forward. The first two alternatives offer explicit limitations on rate increases but others do not.
11	Cross Cutting	Costs Incurred Gradually	The Current Program has the greatest constraints on how quickly rate adjustments are implemented followed by the Current Program with Modifications proposal. The other proposals summaries do not seem to indicate any constraints on how quickly rate adjustments are implemented.
12	Privatization	Costs Incurred Gradually	My responses on the survey form assume that private insurers will have full discretion in pricing and rate adjustments, i.e., regulators will not impose any constraints on private flood insurance rates. However, this may not be a valid assumption. Also, if a federal rating commission is established, I do not know how quickly it would allow private insurers to increase their rates.

C3 - Assistance is provided for those who cannot afford the cost of flood			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
13	Privatization	Provide Affordability Assistance	The Privatization option seems to be written with more contingencies (e.g., may have an MPR or federal rating committee) than the other options. I was more uncertain about how it might be implemented and its unintended consequences, and this uncertainty may have led to it losing weight relative to other policies that seem better defined . However, some of this uncertainty is inherent in the Privatization option because the way in which it introduces private insurance markets is the largest departure from the present NFIP.
14	Cross Cutting	Provide Affordability Assistance	I felt that the concept of affordability needed to encompass more than just the "income-based subsidies" elements of the policy framework. I am unconvinced that all people who need assistance would fall under any income ceiling which might be set for a voucher program. I am also concerned about options which might leave lower income individuals in the SFHA or in RL properties unprotected - even if by their own or their community's "choice."
15	Cross Cutting	Provide Affordability Assistance	FEMA could recommend that Congress commission a comprehensive study to be undertaken by GAO on the "How" of the proposed flood insurance voucher program as part of the renewal of the program.
16	Cross Cutting	Provide Affordability Assistance	Note also that the implementation of this voucher program could be done by working jointly with the food stamp program which has already established criteria to select who can receive those stamps or not. Building on existing programs should help a lot.
17	Privatization	Provide Affordability Assistance	The Privatization option gives individuals more control over their fates (especially if we're looking at it in its non-MPR form), but that doesn't mean they'll make "good" prospective choices (or that they will be able to afford to buy insurance if they're in a high-risk area as subsidies are phased out). Which means they will be uninsured and ineligible for disaster assistance. And in certain cases under Privatization, communities could fail to meet the newly stringent federal residual market mitigation standards, again leaving individuals without access to disaster assistance.

C3 - Assistance is provided for those who cannot afford the cost of flood			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
18	Community Based Insurance	Provide Affordability Assistance	I like the community-based program because it builds upon the tradition of local land use controls. However, its weakest point is this criterion of affordability. I think that without some guidance, there would be highly variable outcomes.
19	Cross Cutting	Provide Affordability Assistance	The description of who will be eligible for subsidies varies. It appears to me that assistance to low income individuals will be more restrictive under the Federal Assistance and Community Based proposals than under the Modified and Privatization proposals.
20	Community Based Insurance	Provide Affordability Assistance	The Community proposal seems most restrictive in that assistance will be provided to communities and not individuals. There could be low income individuals living in communities not deemed to "small and impoverished". Further, it is not clear how assistance provided to small and impoverished communities will be distributed among its inhabitants.
21	Cross Cutting	Provide Affordability Assistance	The actual criterion is "assistance is provided to those who cannot afford the cost of flood." I interpreted this to mean all costs of flood individuals might incur, both pre- and post-event. And it is unclear what affordability means in this context: presumably a person who has substantial assets but who has a disproportionate portion of those assets exposed to flood losses could still not afford the cost of flood. This means that any policy option which might expose anyone to flood costs at any point in the disaster cycle would lose ground when evaluated using this criterion.
22	Federal Assistance	Provide Affordability Assistance	The Federal Assistance option provides assistance to some of those who cannot afford the cost of flood through "income-based subsidies." The Federal Assistance option is roughly equivalent to the Privatization option based on income-based subsidies. However, under the Federal Assistance option it's possible that some communities will opt out or choose to allow development in the SFHA, which could leave individual property owners (who would not necessarily be the original developers of the SFHA) without access to disaster assistance much later on.

C3 - Assistance is provided for those who cannot afford the cost of flood			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
23	NFIP Modified & Federal Assistance	Provide Affordability Assistance	The Current NFIP With Modifications option is not as strong as the Federal Assistance option under "income-based subsidies" because the With Modifications option does not provide any income-based subsidies for mitigation. This simply means that the Federal Assistance option is more likely to allow some individuals, who would not be otherwise able to afford it, to protect themselves from incurring costs of flooding.
24	NFIP Modified & Privatization	Provide Affordability Assistance	In addition to the uncertainty about the MPR [in Privatization], it's unclear who among "those who cannot afford the cost of flood" are in the private market column, which has much more up in the air in terms of who it will protect, and who is in the federal residual market column.

C4 - Minimize exposure to flood hazards			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
25	Privatization	Minimize Exposure	Privatization may have a slightly greater impact on reducing the exposure to flood hazards in that floodplain lands would be more attractive to those: - Who can afford high premiums, with fewer stuctures and fewer risk prone structures - Who don't really need to worry about risk (the well capitalized or poor) - Who can build well engineered structures that have sufficient density (families) to offset the increased costs of construction and premium
26	Federal Assistance	Minimize Exposure	Federal Assistance has the potential for having greater impact in reducing exposure than the NFIP or NFIP Modified, with the caveat the policy can change overnight in our highly charged polarized political environment where science often takes a back seat to partisan politics.
27	Cross Cutting	Minimize Exposure	I remember when the James Lee Witt, in his Project Impact days applauded Davenport Iowa for not building levees that would have allowed development in vulnerable areas, only to have the FEMA Director Joe Allbaugh chastise the city and threaten to remove funding for not having built levees.
28	Cross Cutting	Minimize Exposure	Policy alternatives that favor local incentives to adopt land use and avoidance strategies will more likely reduce exposure to risk over the long term. However, adequate details regarding possible local mitigation techniques above current requirements were not provided by the briefing packet.
29	Privatization	Minimize Exposure	I have a bias regarding Privatization. Such an approach would become more about generating profit for the private insurance company versus the objective of the NFIP.
30	Community Based Insurance	Minimize Exposure	I think that the Community approach holds the potential to minimize exposure to flood hazards because land use is the most effective way to accomplish this end. However, I fear that the community approach would result in uneven adoption of the program across diverse communities and/or very uneven implementation of program elements that are adopted.
31	Cross Cutting	Maximize Floodplain Functions	A major problem I see with all alternatives lies in there being no watershed or basin planning. Most benefits (and costs) are not and cannot be realized on a reach-by-reach or community-by-community basis. This is a problem with the Current NFIP, Modified NFIP, and the Community Based approach .

C5 - Maxmize natural & beneficial functions of the floodplains			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
32	Federal Assistance	Maximize Floodplain Functions	The federalization alternative has the potential of addressing issues within the context of watersheds.
33	Privatization	Maximize Floodplain Functions	Privatization does not address the watershed issue. I feel the result will be an occupation of the floodplain by those that can assume risk and for those for whom risk doesn't matter – the very wealthy and poor.
34	Current NFIP & Modified NFIP	Maximize Floodplain Functions	The Current NFIP and Modified NFIP do provide some incentives to address issues within the context of watersheds through the CRS. The CRS would be more effective if its requirements reflected substantive policy. Currently it addresses more procedural issues (e.g., encourages having a stormwater plan, regardless of whether plan may actually have more negative impacts than positive ones).
35	Community Based Insurance	Maximize Floodplain Functions	The Community approach has the potential of pitting communities along a similar reach or coast against each other .
36	Cross Cutting	Maximize Floodplain Functions	The largest drivers of protecting the natural and beneficial functions of floodplains will occur through mitigation grants (e.g., buyouts) and specific community-level incentives for preserving open space (e.g., CRS). Increasing insurance pricing, as would occur with phase out of the subsidies or Privatization might have a little impact at slowing development in ecologically beneficial areas, but this would likely be marginal. Which option would be best on this criteria thus depends on the specifics of changes to CRS, to regulations, and how community-based premiums would vary in response to preserving open space. There is some work to suggest that requiring higher elevations will not slow development, so regulations/incentives would have to be targeted at preserving open space.

C5 - Maxmize natural & beneficial functions of the floodplains			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
37	Federal Assistance	Maximize Floodplain Functions	The federal assistance program has flexibility to allow the federal government to build in rewards for communities to undertake environmental restoration.
38	Cross Cutting	Maximize Floodplain Functions	Most of the changes in the program deal with financial considerations and who pays for damages - and I struggled to think about how this would really affect natural and beneficial functions of floodplains. Perhaps one could argue that policies that were the most stringent would have beneficial effects as they would discourage development - but this is offset by policy that requires specific plans to get access to preferential insurance rates.
39	Cross Cutting	Maximize Floodplain Functions	I assumed this includes such considerations as: ecosystem services; recreation and amenity uses of floodpain; water management objectives that might utilize floodplains such as groundwater recharge; capture and beneficial use of floodflows (including facilitating groundwater recharge).
40	Cross Cutting	Maximize Floodplain Functions	Privatization and Modified NFIP highlight the importance of premiums that reflect risk so that individuals have an opportuity to undertake cost-effective mitigation measures. If individuals are myopic and focus only on the short-term then they still may not undertake these measures. One needs to consider long-term strategies such as multi-year insurance tied to property and long-term loans to maximize the societal benefit/cost ratio.

C6 - Efficiency - Maximize the benefit cost ratio			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
41	Cross Cutting	Efficiency	The key benefits from any program to reduce or slow flood losses do not come from the sale of insurance policies. They come from wise decisions about how flood prone areas are used. Hence, the program alternatives that address this head-on have greater promise.
42	Cross Cutting	Efficiency	Subsidized policies could lead to over-investment (from an economic efficiency perspective) in risky areas. As such, policies to phase out subsidies should be efficiency enhancing.
43	Cross Cutting	Efficiency	It is hard to determine the efficiency impact of tighter regulations and expanded mandated insurance coverage. If this forces adoption when it has net benefits but is not done for reasons such as behavioral biases or lack of information, then it would enhance efficiency. If it forces adoption when it does not have net benefits, then clearly it would not enhance efficiency.
44	Cross Cutting	Efficiency	Just because an action lowers flood damages does not mean that it improves efficiency - you have to balance this against the benefits of taking the risk. There are lots of benefits to living in floodplain in many places. These needs to be weighed against expected damages.
45	Modified NFIP	Efficiency	Mapping future conditions gives more information to improve decision-making and thus I would think would enhance efficiency.
46	Privatization	Efficiency	It is important to maintain (and expand) the MPR. People seldom buy flood insurance otherwise. Private markets have not required earthquake insurance for residential properties--not obvious why it would require flood insurance if left to its own devices. Without MPR households won't consider full costs of living in high risk areas. Failure to provide the correct incentives will result in reduction in benefit/cost ratio.
47	Cross Cutting	Efficiency	Subsides for low income households should only be provided for families that already live in high risk zones (perpetual subsidies are a bad idea).
48	Community Based Insurance	Efficiency	I worry that the assessments levied by communities under the Community Based option will be viewed as taxes and thus opposed or appealed down the road.

C7 - Administrative Feasibility			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
49	Community Based Insurance	Administrative Feasibility	I have serious doubts about the administrative feasibility of the Community Based option, especially from the standpoint of the individual communities. Cost allocation, in particular, could prove extremely challenging.
50	Privatization	Administrative Feasibility	Privatization (which I would prefer to call "public-private partnership") will likely involve some significant administrative challenges, particularly with respect to setting premiums for public reinsurance and making sure that the government didn't get stuck with all of the worst risks without adequate premium payments to cover the cost.
51	Privatization	Administrative Feasibility	Transitioning to a private system will require some coordination, but seems doable.
52	Current NFIP & Modified NFIP	Administrative Feasibility	The Current NFIP is always the easy choice but I do not think the NFIP modifications will be unduly hard to implement.
53	Community Based Insurance	Administrative Feasibility	Community Based cost-sharing would have to be clearer, but the real problem I see is political implementation - variance between SFHAs, political jurisdictions and "taxing" jurisdictions seems an impossible coordination problem.
54	Federal Assistance	Administrative Feasibility	Federal Assistance is a somewhat vague option, but does not seem too difficult to do.
55	Privatization	Administrative Feasibility	Eliminating mandatory purchase will decrease coverage.

C7 - Administrative Feasibility			
Comment #	**Policy**	**Criterion/Theme**	**Comment**
56	Community Based Insurance	Administrative Feasibility	Complex interactions between feds (making risk assessments and communicating to locals) and locals (using this and other info to assess insurance needs). How will the federal government set prices? Also, it will be very difficult for locals to administer premium collection, claims filing, and insurance payments, both from a pure capacity standpoint as well as an ability to come up with a system to do this fairly. Plus, it's unclear what recourse people in SFHAs would have if their community declines to participate. I imagine that this option would probably devolve into the local community acting as an administrative pass-through for federal insurance to individual properties: individuals would apply for coverage, the local community would aggregate all the applications and buy a meta-policy from the federal government.
57	Federal Assistance	Administrative Feasibility	The biggest problem with this is deciding the benefit of a given amount of mitigation in terms of avoided losses (and hence greater guaranteed federal disaster assistance). Also, it is not clear how this would work. If the federal government pays an increasing cost share for greater amounts of mitigation, wouldn't it be cheapest for the local community to get the most mitigation, where the federal government pays 100%? In that case the locals don't pay anything plus get complete disaster assistance.

C8 - Political Acceptability			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
58	Community Based Insurance	Political Acceptability	Community Based Insurance would meet with the strongest political opposition because it represents the greatest departure from an individual insurance model.
59	Federal Assistance	Political Acceptability	The Federal Assistance approach would come after Community Based in terms of negative political reaction.
60	Modified NFIP	Political Acceptability	The Modified NFIP program would be unlikely to generate strong political enthusiasm, but also would be unlikely to generate strong opposition.
61	Privatization	Political Acceptability	Privatization has the greatest potential to be politically acceptable, though the name is rather misleading and could prove polarizing. I would favor referring to this option as "public-private partnership", which seems more accurate and potentially less controversial or polarizing.
62	Privatization	Political Acceptability	Privatization is the best way to get information - forcing pricing mechanisms to work on the task of reducing flood losses. However, I do not believe that private companies should be given a completely free hand with respect to policy design. They should be able to compete on rates, but the policy coordination problem is significant, as is the seller-consumer information asymmetry. No consumer is going to understand subtle, yet potentially critical differences in policy design. This makes privatization tricky. Either way, you're going to lose the consumers or industry. If rates are allowed to be truly competitive - subject to some kind of excessiveness/adequacy of competition review - insurers should be willing to go along.
63	Modified NFIP	Political Acceptability	Modifications are helpful, but there is probably no credible mechanism for pre-committing the government to a policy of non-intervention (where people have failed to take precautions).
64	Federal Assistance	Political Acceptability	The Federal Assistance option will be a difficult sell to non-flood communities, but given Katrina, there should be some room to maneuver.

C8 - Political Acceptability			
Comment #	**Policy Alternative**	**Criterion/Theme**	**Comment**
65	Privatization	Political Acceptability	Private industry will take the good risk, leaving the federal government with only poor risk and hence less risk spreading opportunity. Also, without the MPR, many residences will drop insurance and uninsured losses will be larger. For both reasons it will be difficult to sustain this after a large loss.
66	Community Based Insurance	Political Acceptability	Denying disaster assistance to an underinsured community with large losses would probably would be difficult to sustain after a large loss.
67	Federal Assistance	Political Acceptability	General political difficulty with promising to cover local losses with federal dollars. Plus susceptible to suspicion that we couldn't accurately price the value of mitigation efforts towards increased disaster assistance.
68	Current NFIP &	Political	NFIP and NFIP with modifications have the political benefit of incumbency.

General Comments & Suggestions			
Comment #	**Policy Alternative**	**Theme**	**Comment**
69	Privatization	General comments	The privatization option needs to contain more specificity to be considered on an equal footing with the other policy options. While it is possible that creating a private flood insurance market might lead to rate setting that best reflects the risk, this ill-defined hybrid public-private market leaves me unconvinced that that problems of cherry picking, moral hazard, etc. will actually be addressed. E.g., what would be the specific trigger for reinstating the MPR, and what would be the solution for structures that should have been insured carrying over from the pre-MPR period? Is there some possibility that further into the NFIP reform process, after more research, the privatization option could be chosen but implemented with an MPR from the beginning? Similar answers need to be spelled out about the federal rating committee, development of the reinsurance market, and other planned adjustments if the market does not distribute costs across all actors as planned.
70	Cross Cutting	Costs Borne by Individual	While I was able to apply the specific criterion to the different policies, I remain concerned about the wording of the descriptive text accompanying the criterion. The sentences imply that individuals possess much more complete information and (are able to) make "rational choices" about flood risk than is supported by current social science knowledge.
71	Privatization	General comments	The notion of privatization of flood insurance has been misunderstood. Everyone I talked to thinks this is about getting rid of the NFIP and letting flood risk be covered only by private insurers. This has created a lot of confusion. Moving forward you might want to say very explicitly that this option is more about transferring part of the exposure to the market.
72	Cross Cutting	Catastrophe Insurance	None of the proposals really address a key issue for the future of flood insurance: catastrophe risk financing. As we know the current program is not designed to handle truly catastrophic risk by itself. This question is likely to be central in the debate about the future of the program in the coming 4 months. Should the current debt be forgiven? If so, should one modify the design of the program? How? Should cat bonds, dedicated government bonds, reinsurance be issued/purchased? Should premiums be increased to start build a catastrophe flood reserve? Is it politically feasible to charge the "right" price to include cat risk in the pure premium? How much more would it be? What is the PML for the entire NFIP? What is the PML by state, regions?

General Comments & Suggestions			
Comment #	**Policy Alternative**	**Theme**	**Comment**
73	Cross Cutting	Insurance Lapse & Multi-Year Policies	Hundreds of thousands of people who should be covered simply let their policy lapse after 2 - 4 years (cf; Wharton study by Michel-Kerjan et al, 2011). While discussions on that very challenge took place at the listening session in DC in December, I have not seen any proposal being included into the reform options. Multi-year flood insurance could be introduced as an option in the menu of contracts policyholders could select from. In the same way that they need to select a deductible and limit on their policy, whether the policy covers building and or content, they could select the time period they want to be cover for. A recent survey of 500 individuals across America by the Wharton team indicates that not only would a majority of individual favor this multi-year coverage (notion of stability), but also that the introduction of this additional option in the menu of contracts would increase the overall demand for insurance.
74	Cross Cutting	Mapping	From an insurance and risk management point of view, accurate risk assessment is needed to help ensure accurate risk-based pricing and determine where cost-effective mitigation measures are warranted. My impression is that FEMA is steadily seeking to improve flood mapping and risk assessment. My question is how granular is flood mapping (and how granular will it be in the future)? The reason I ask this question is that in any insurance system the objective is align prices as closely as possible with the risk or expected loss for the exposure that is insured
75	Privatization	MPR	I am concerned about the elimination of federal laws/enforcement of MPR under the privatization proposal. I understand that some may believe that lenders and GSEs will have sufficient incentives of their own to require the purchase of flood insurance by those borrowers subject to "signficant" flood risk, whatever that will mean. However, I question whether those incentives will be sufficient to motivate all lenders to impose MPRs.
76	Community Based Insurance	Administrative Feasibility	While the Community Based Insurance option is intriguing and has some desirable attributes, I question whether many communities will have the capacity to determine risk-based charges for properties within the community. I would anticipate that there could be significant political pressure in many communities to impose some form of charge for flood insurance and considerable controversy over how the cost of flood insurance would be allocated among different properties.

General Comments & Suggestions			
Comment #	**Policy Alternative**	**Theme**	**Comment**
77	Cross Cutting	Risk Communication	I agree with those who say we need to move away from some of the nomenclature that is currently used to describe flood risk, e.g., 100-year flood zones. I'm not sure what the best alternative is but the flood risk faced by a particular property needs to be expressed in a different way.
78	Cross Cutting	Risk Communication & Education	I think that most people have a poor understanding of flood risk and why they are required or should buy flood insurance. I also think that most people do not understand how insurance works. This observation is not confined to flood insurance but could also extend to other types of insurance. Hence, I think significant resources should be devoted to consumer education with associated research to determine the effectiveness of different methods used to improve consumers' understanding of flood risk, how flood insurance works, and why.
79	Modified NFIP	Future Conditions & Climate Change	I did not consider that future conditions addressed climate impacts. This is in despite of 50 year projections demonstrating the following for the Northwest: - Our Cascade drainages will go from snow/rain dominated systems to rain dominated ones - Our forests will be severely stressed, die-offs and forest fires will greatly increase discharge. Succession will be slow - Water will not be stored as snow - Rain intensity are/will continue to increase - Sediment loads will crease with aggravation will reduce the effectiveness of levee system - Flooding will increase
80	Cross Cutting	General comments	To be successful, any policy alternative pursued by FEMA needs to consider the wide range of contextual characteristics for communities subject to flood risks. A one size fits all approach may lead to unintented consequences, such as increased development of floodplain and or vulnerable areas, lack of compliance, "gaming" of the system in place.
81	Cross Cutting	Mapping	Policy alternatives must consider the fact that the 100-year floodplain may not be the best marker for risk on which to base insurance purchase requirements. Recent national data analyses suggest that, particularly in low-lying coastal areas, over 40 percent of losses are outside of the floodplain boundary (even in jurisdictions with updated maps).

General Comments & Suggestions			
Comment #	**Policy Alternative**	**Theme**	**Comment**
82	Community Based Insurance	Cross-Community Cooperation	I see benefits in community based approach operating within a set of Federal parameters so that one community cannot benefit at another's expense. This would allow a basin NAI as it were. If one community cannot develop without causing adverse impacts then it could buy benefits from other river communities. This is happening now, but not without much consternation. King County in Washington State bought 40,000 acres of development rights in an upper forested watershed. Downstream communities benefit, but are under no obligation to buy or market these rights. They are benefiting in the long term, but they have determined that with these current difficult times they cannot afford to carry out their end of the barge.
83	Cross Cutting	Maximize Floodplain Functions	To most effectively preserve the natural and beneficial functions of floodplains, the NFIP should link to other environmental programs or focus on buyouts and preserving open space in in the design of incentive programs like CRS (eg giving more points to this activity). I don't think insurance per se is the right vehicle to preserve wetlands.
84	Cross Cutting	Maximize Floodplain Functions	The contextual questions related to C5 seem to not be balanced. Regarding negative impacts on natural functions and minimizing these, what about practices that could enhance natural functions? Regarding enhancing the natural floodplain functions, what about related environmental and ecosystem benefits that may go beyond the pre-development natural functions?
85	Cross Cutting	Minimize Exposure	Contextual questions for Criterion 4 on minimizing exposure: what about not just requiring adoption but also "encouraging" adoption.
86	Cross Cutting	Efficiency	Contextual questions for Efficiency: what about loss of amenity values?
87	Modified NFIP	Future Conditions & Climate Change	NFIP w/ Modifications ... risk assessment ... in addition to urbanization we need to consider changes due to climate change.
88	Privatization	Risk Assessment	Seems like, due to adverse selection, it would significantly increase public costs of program. Seems the various private sector mapping and risk assessment efforts would be duplicative of federal efforts. Would entities be competing to get best risk information but then not share this information?

General Comments & Suggestions			
Comment #	**Policy Alternative**	**Theme**	**Comment**
89	Community Based Insurance	General comments	I assumed the policies and standards for floodplain development would basically remain the same as the current program for comparison's sake On a pilot basis I would have ranked this program as a #2 or #3 if it could be tried in just a few communities initially. In general, what would be the opportunity to mix and match portions of the different options?
90	Cross Cutting	Multi-Year Policies & Mitigation Loans	A group of us have been advocating that FEMA consider multi-year flood insurance policies with premiums reflecting risk, coupled with long-term mitigation loans to overcome myopia and the cancellation of policies after several years. Insurance vouchers would be used to assist resident currently living in flood prone areas so that they will still get a premium discount if they undertake mitigation measures.
91	Modified NFIP	Political Acceptability	The current NFIP with modifications holds the potential for large unintended negative consequences. These stem from requiring insurance for those who previously were not asked to purchase it (due to flood control work residual risk). I see no acknowledgment of this or any attempt to manage the backlash. Moreover, the probability of a 150 year flood may be higher (but no insurance is required) than the failure of a flood control work (but those around the work are required to buy insurance).
92	Cross Cutting	Risk Communication & Education	If everyone is fully informed and bears all the costs of their decisions, then theoretically economically efficient decisions would be made. Clearly, this goal is not achieved in any of the policies.
93	Cross Cutting	Costs Borne by Individual	When costs are borne by others through subsidized policies or aid it could lead to over-investment in risky locations. However, while this is theoretically true, empirical evidence on the extent to which subsidies and disaster aid actually drive development decisions is sparse.
94	Cross Cutting	MPR	Behavioral economics research has shown that individuals can make "errors" when in comes to decisions about low probability events and not take the action that has the highest net benefits. Mandatory policies that overcome these tendencies could thus improve net benefits over a market-based alternative. To know this is the case for the regulations proposed in these policies, however, would require substantially more research.

General Comments & Suggestions			
Comment #	**Policy Alternative**	**Theme**	**Comment**
95	Cross Cutting	Disaster Assistance	The biggest challenge in the arena of federal disaster coverage (both insurance and assistance) is credible commitment. While it is both morally right and politically necessary for the federal government to assist disaster victims in their time of need, it also seems very likely that open-ended commitments to help disaster victims will dramatically raise disaster losses and federal payments over time as a result of significant moral hazard. The trick, then, is to be able to help those in need without provoking a dangerous degree of moral hazard. The simplest way to do this would be (1) to build an insurance program, with risk based premiums, that anyone could buy into and (2) to credibly deny assistance to anyone who failed to buy the insurance. One of my concerns across all of the proposals is that they don't seem to involve clear strategies for dealing with #2. Ultimately, it may be necessary to require that risk-based flood insurance coverage (whether private or public) be tied to every P&C policy. While this would clearly involve some significant administrative and political challenges, I suspect it's the best way to deal with the moral hazard and credible commitment problems, which are ultimately the most important problems of all.
96	Privatization	General comments	Pre-funding and minimizing losses should be the paramount goals, and these require "skin in the game" by all players. Privatization must be a part of that, but it will not work if insurers are completely left to their own devices. I'd recommend combining privatization with some aspects of Federal Assistance along the lines of the "Gentlemen's Agreement" that defines the allocation of flooding costs in the U.K.
97	Privatization	MPR	I think all options need the mandatory purchase requirement. Lenders won't necessarily require flood insurance on their own (they don't require earthquake insurance, for example).
98	Community Based Insurance	General comments	On one level the community insurance and, to a lesser extent, the federal assistance options appeal to me because they provide incentives for communities to work together to prepare and recover. However, there are competing individual incentives to free ride, and I'm not sure things could be sorted out fairly. Also, they are administratively complex and ambiguous. They also suffer from the prospect of the federal government possibly having to deny post disaster assistance to an entire community. It's one thing to deny individual properties; but a whole city is hard to imagine.

General Comments & Suggestions			
Comment #	**Policy Alternative**	**Theme**	**Comment**
99	Federal Assistance	General Comments	On one level the community insurance and, to a lesser extent, the federal assistance options appeal to me because they provide incentives for communities to work together to prepare and recover. However, there are competing individual incentives to free ride, and I'm not sure things could be sorted out fairly. Also, they are administratively complex and ambiguous. They also suffer from the prospect of the federal government possibly having to deny post disaster assistance to an entire community. It's one thing to deny individual properties; but a whole city is hard to imagine.
100	Cross Cutting	Disaster Assistance	Post disaster assistance is completely out of hand and seems difficult to stop given that it is largely invisible (because the majority comes though special appropriations). So focusing on approaches that reduce the need for assistance is clearly the way to go.
101	Cross Cutting	Request for Clarification & Empirical Evidence	I recognize that one of the things the Working Group may have hoped to get out of the expert panels were some informed guesses about these uncertainties, but I think with the general way that the options are written right now, I have to project too many moves in advance. I think it would greatly help if some specific statements could be made by the Working Group about the uncertainties based on NFIP operational experience. E.g., "under the Federal Assistance option a concern has been raised that some communities will opt out leaving innocent individuals ineligible for disaster assistance; we don't anticipate this to be significant problem based our experience with NFIP opt outs and CRS opt ins [insert statistics here]."

Appendix C: Data Analysis – Data Sources

Source	Data Description
NFIP Policy & Claims Database	Aggregated data on NFIP insurance policies and historical claims by flood zone.
NFIP's CRS Database	CRS database, including the distribution of policies across CRS categories and flood zones, and a breakdown of CRS premium discounts.
FEMA Penetration Report (2010)	The FEMA Penetration Report is a marketing report that estimates penetration rates at a localized level. This data was matched with CRS communities to estimate the penetration rates in CRS and Non-CRS communities.
NFIP Actuarial Rate Review (2010)	Provides detailed information on insurance rates—as well as historical data on flood losses, loss ratios, subsidies, and discounts—for each flood zone.
NFIP "State Fact Data Sheet"	Contains data on the number of policies, value of insurance coverage, penetration rate estimates, and other data for each state.
NFIP "Probability of Elevation" & "Damage by Elevation" Worksheets	Provides FEMA estimates for (1) the probability of a structure flooding in a given year assuming a given flood zone and elevation, and (2) the percent structural damage associated with floods of various water heights.
American Community Survey (2009)	Provides an estimate of the number and percentage of structures that currently have mortgages (68%), which was used with Dixon et al. (below) to estimate the current MPR compliance rate.
Dixon et al. (2006)	Provides the percentage of existing mortgages that are federally backed (85%)—used with ACS (above) to estimate the current MPR compliance rate.
Christopher Jones & Associates; American Institutes for Research (2006)	Provides estimates for the additional building costs associated with elevating floodplain structures one foot above the BFE.
Congressional Budget Office (2007); Multi-hazard Mitigation Council (2005)	Both reports estimate the benefits associated with floodplain mitigation activities.

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Appendix D: Data Analysis – Key Assumptions

Price Elasticity of Demand for Flood Insurance

Assumption: For every 10% increase in premiums, there is a 2.0% reduction in flood insurance policies.

Application: Each policy option will impact the average cost of flood insurance in different flood zones by influencing the number of premiums that are subsidized, grandfathered, and discounted. These changes, in turn, will impact the demand for insurance. To quantify this effect, an estimate of price elasticity is needed to project the impact of insurance price changes on the number of policies purchased and the share of total flood risk insured.

Discussion: Several studies suggest that the demand for flood insurance is inelastic to price (e.g., U.S. GAO, 1983; Browne & Hoyt, 2000; Kriesel & Landry, 2004; Dixon et al., 2006). Across these studies, the average price elasticity of demand is -0.20, which implies that a 10% increase in the price of flood insurance would result in a 2% decrease in the number of insurance policies.

Flood Insurance & Home Values

Assumption: In flood zones, the price of flood insurance is factored into home values.

Application: Under the NFIP Modified and Privatization alternatives, subsidies for pre-FIRM secondary residences will be eliminated at transfer of ownership. To model the impact of this policy, it is necessary to determine how the subsidy phase-out would affect the value of these residences. If the increased cost of purchasing a mandatory flood insurance policy is embedded in home values, then the subsidy phase-out should not lengthen the amount of time required to transfer the home to a new owner. However, if the home values do not reflect the increased cost of flood insurance, then the demand for such homes would consequently decrease, and transfer of ownership would be delayed. This, in turn, would affect the timing of impacts generated by the NFIP Modified and Privatization alternatives.

Discussion: In an efficient market, if the costs of flooding are known, then the market value of a home within a flood zone should be lower than a comparable home outside the flood zone. Additionally, in areas that have experienced flooding in the recent past, one would expect that the discounted value of homes in the floodplain would reflect the capitalized value of flood insurance premiums.

Several studies suggest that flood risk is priced into home values. On average, the market value of a home within the floodplain is lower than a comparable home outside the floodplain. Daniel et al. (2009) conducted a meta-analysis of 19 housing price studies and found that a 1% increase in flood risk is associated with a 0.6% decrease in home value after controlling for home and neighborhood characteristics. Likewise, Bin & Polasky (2003) surveyed five prominent studies (Shilling et al., 1985; MacDonald et al., 1987; Donnelly, 1989; Speyer & Ragas, 1991; and Harrison et al. 2001) that estimated the extent to which flood risk is priced into home values. They found that 4% to12% of the reduction in home values can be attributed to being located in the floodplain. The authors also reported that, with the exception of Harrison et al. (2001), the studies found that the sales price differential was more than the capitalized cost of flood insurance.

The extent to which the price discount for homes located in the floodplain reflects the cost of flood insurance depends upon several factors, including (1) an area's flood risk, (2) recent flood experience, (3) the discount rate for flood insurance, and (4) changes to federal policies. Harrison et al. (2001) studied an area that had no recent experience with major flooding, which may explain why the difference in home values was less than the price of flood insurance premiums (Bin & Polasky, 2003). Similarly, Bin & Polasky (2003) studied housing price values and flood insurance premiums before and after Hurricane Floyd and found that, prior to the storm, the price differential did not fully reflect the cost of insurance premiums. After the storm, however, the price discount for homes in the floodplain was greater than the capitalized flood insurance premiums.

Homes Purchased from a Federally Regulated Lender

Assumption: Approximately 82% of homes are purchased with a federally backed or regulated mortgage.

Application: The NFIP requires all floodplain structures with federally regulated loans or mortgages to have a flood insurance policy. However, several studies have demonstrated that not all structures subject to the MPR comply with this law (e.g., Landry & Kriesel, 2004; Dixon et al., 2006). NFIP data indicates how many residential structures are insured versus uninsured in each flood zone, but the data does not indicate how many of these residences have federally backed or regulated mortgages and are subject to the MPR. By estimating the percentage of homes that are purchased with a "federally related" mortgage, it is possible to calculate the percentage of structures subject to the MPR, as well as the average MPR compliance rate. These estimates, in turn, can be used to project the number of SFHA structures that will be insured under various policy alternatives.

Discussion: According to surveys by the National Association of Realtors, "cash-only" transactions comprised 15% of all home sales in 2008. Consequently, approximately 85% of home-buyers relied on mortgages when purchasing a home. Similarly, the National Association of Home Builders reported that 84% of first-time buyers had a mortgage in 2008 (Eisenberg, 2008). More recently, the percentage of homes purchased with cash has increased, from 26% in January 2010 to 32% in January 2011. However, the historical average is likely closer to the 2008 estimate.

Inside Mortgage Finance (2010) estimated that 96.5% of U.S. mortgages were federally related. Specifically, approximately 70% of mortgage activity went through government-controlled financing companies (e.g., Fannie Mae and Freddie Mac), and an additional 25% of mortgages were guaranteed through the Federal Housing Association (FHA) or Veterans Affair (VA) programs.

Multiplying the percentage of homes purchased with a mortgage (85%) by the percentage of mortgages regulated or owned by a federal lender (96.5%) yields the percentage of homes purchase with a federally related mortgage: 0.85 * 0.965 = 82%.

Existing Homes with a Federally Related Mortgage

Assumption: Approximately 57.8% of all existing owner-occupied homes have an outstanding federally related mortgage or loan — one that has been issued by a federally regulated lender, a federal lender, or is backed by Fannie Mae or Freddie Mac.

Application: The NFIP requires all floodplain structures with federally backed or regulated mortgages or loans have a current flood insurance policy. However, studies have established that not all structures subject to the mandatory purchase requirement comply with this law (e.g., Landry & Kriesel, 2004; Dixon et al., 2006). NFIP data indicates how many residential structures are insured versus uninsured in each flood zone, but it does not reveal the percentage of residences with federally related mortgages or loans. By estimating the percentage of homes that have an outstanding mortgage or home equity loan issued, or regulated by a federal entity, it is possible to calculate the percentage of structures subject to the MPR as well as the average MPR compliance rate, which in turn can be used to project the number of SFHA insurance policies under various policy alternatives.

Discussion: To approximate the proportion of homes with an outstanding federally related mortgage, the following estimates were used:

- According to the 2009 American Community Survey, 68% of all owner-occupied homes had a mortgage outstanding (U.S. Census Bureau, 2009a).
- According to Dixon et al. (2006), roughly 85% of mortgaged SFHA residences have a federally related mortgage.

Therefore, multiplying the percentage of existing homes with an outstanding mortgage (68%) by the percentage of these mortgages that are backed or regulated by a federal entity (85%) yields the percentage of existing homes with an outstanding federally related mortgage: 0.68 * 0.85 = 57.8%.

MPR Compliance

Assumption: Approximately 42.8% of structures that are subject to mandatory purchase requirements (i.e., floodplain structures with a federally related mortgage) comply with this requirement and purchase insurance.

Application: The MPR compliance rate is a key factor in determining how many structures will be insured under each policy alternative, as the vast majority of SFHA structures that are currently insured are also subject to the MPR.

Discussion:

- Although NFIP does not maintain data on the precise MPR compliance rate, the rate can be estimated using the following equation:

*SFHA Penetration Rate = (Structures Subject to MPR * MPR Compliance Rate) + (Structures in SFHA Not Subject to MPR * Insured Structures in SFHA Not Subject to MPR)*

- According to the 2009 American Community Survey, 68% of all owner-occupied homes had a mortgage outstanding. According to Dixon et al. (2006), roughly 85% of mortgaged homes in the SFHA are federally backed or regulated. Combining the two estimates above, the percentage of structures in the SFHA that are subject to MPR is 57.8% (0.68 * 0.85 = 0.578). This is the second variable in the above equation. Similarly, the percentage of SFHA structures that are *not* subject to the MPR can be calculated: (1 - 0.578 = .422). This is the fourth variable in the above equation.

- According to NFIP data, the SFHA penetration rate is 26% (this is the first variable in the above equation), and the NSFHA penetration rate is 3%. Given that NSFHA structures are not required to purchase insurance, this number is used as a proxy for the fifth variable in the above equation (i.e., the percentage of SFHA structures that are not subject to the MPR, but still purchase insurance).

- Inputting these data into the equation above and solving for the remaining unknown variable results in an MPR Compliance Rate of approximately 43%.

Degree of Grandfathering

Assumption: There are approximately 250,000 "grandfathered" X-Zone policies that receive average rate discounts of 25%.

Application: The Current NFIP provides rate discounts to structures that were originally mapped outside the floodplain, but have been subsequently re-mapped into the SFHA due to changing flood conditions and/or improved map quality. All four policy alternatives would eliminate this practice, which would result in immediate and substantial rate increases that could, in turn, influence some property owners to drop their insurance policies.

Discussion:

- The NFIP does not track the number or location of grandfathered policies, but program officials estimate that there are approximately 250,000 of these policies, located primarily in X-Zones.

- Similarly, NFIP data do not indicate the magnitude of discounts provided to grandfathered policies. NFIP actuaries believe that grandfathering discounts are smaller than the average subsidy provided to pre-FIRM subsidized policies located in the SFHA. Specifically, they estimate that grandfathered policies receive an average discount of 25%.

Policies Covered by Private Market

Assumption: Under the Privatization option, private market will initially only take on the lowest-risk policies: roughly 1.6 million PRP policies. Likewise, private insurers are unlikely to sell additional policies to property owners located outside the floodplain (e.g., in B, C, and X-zones) who are not currently enrolled in NFIP.

Application: The Privatization approach is designed to allow the private sector to retain a portion of the flood insurance policies it currently administers through the "Write Your Own" (WYO)

program and cede the remaining policies to the federal government in a residual insurance market. In theory, private insurers may also achieve efficiencies that could enable them to charge lower premiums, possibly inducing demand for flood insurance in previously uninsured areas. To determine the likelihood of these potential outcomes, Keybridge examined historical NFIP loss patterns for various flood zones.

Discussion:

- **Preferred Risk Policies ("PRPs"):** Initially, private insurers are likely to cover structures that are (1) outside the floodplain and (2) unlikely to file flood loss claims or receive flood-related disaster assistance. The PRP designation applies to structures with limited loss experience in low-risk B-zone, C-zone, and X-zone areas, which are outside of the SFHA. These policies receive a discounted rate through the current NFIP. Currently, there are roughly 1.6 million PRPs, comprising 29% of total flood policies (FEMA, 2011b).

- **Uninsured Structures in Low-Risk Areas:** The relatively high cost of flood insurance for low-risk areas deters some property owners in B, C, and X-zones from purchasing insurance. However, NFIP currently loses money on PRPs due to their discounted rates; the historical loss ratio indicates that NFIP loses almost 50 cents on every dollar of PRP insurance. If 2005 (Hurricane Katrina) is factored in as a 1/100 year event, NFIP's loss ratio is still relatively high at 0.94. It is likely that private insurers could reduce some overhead expenses vis-à-vis the current NFIP, but these efficiencies would not be sufficient to offset the higher, risk-based premiums that would be necessary to bring the loss ratio to a profitable level. Keybridge estimates that private insurers would need to increase premiums by approximately 7% from current levels (in addition to achieving some cost savings) in order to achieve a loss ratio of 0.7. Assuming a price elasticity of -0.2, higher rates would reduce demand for PRPs by roughly 21,500 policies.

- **Policies within Special Flood Hazard Areas ("SFHAs"):** Initially, private insurers are not likely to insure structures located within SFHAs because they are associated with higher risk and greater historical flood loss. The high variability in flood losses for these policies and the private sector's lack of experience in this market suggest that the private sector would cede these properties to the federal residual pool. There are 3.4 million SFHA policies nationwide, comprising 62% of total policies. (FEMA, 2011b).

- **Non-PRP policies:** Initially, private insurers are not likely to insure properties that are currently covered by "Standard" B, C, X-zone policies that are not enrolled in PRP. According to FEMA officials, a large majority of non-PRP insured structures that are charged lower, NSFHA premiums are either (1) structures that actually lie within the SFHA due to a map update, but are still assessed the lower premium (i.e., "grandfathered" policies), or (2) structures that were wrongly mapped outside of the SFHA and have not yet been re-mapped. In either case, it is unlikely that private insurers would consider these properties to be "low risk", making them reluctant to provide insurance. Nationwide, there are about 500,000 of these policies, comprising 23% of total B, C, X-zone policies and 9% of all policies (FEMA, 2011b).

Participation in Community Based Insurance Alternative

Assumption: Participation in the Community Rating System ("CRS") suggests a given community's willingness and ability to participate in the Community Based alternative.

Application: The Community Based option shifts the responsibility for administering an insurance policy from individual property owners to communities. As such, communities would need to develop a funding mechanism to pay for their policy, presumably by assessing fees. To evaluate the extent to which a given community is both willing and able to participate in this type of program, this analysis uses current participation in CRS as a proxy.

Discussion: The CRS initiative is a voluntary program that incentivizes communities to engage in voluntary risk reduction initiatives in exchange for discounts on flood insurance premiums. Participation in CRS reflects a certain level of administrative capacity and community willingness to collectively mitigate risk. At a minimum, participating communities must be able to (1) devise a plan to reduce or eliminate repetitive loss structures and (2) enact ordinances on height requirements for new structures. Qualitative analysis of community-based flood mitigation strategies suggests that participating communities possess certain characteristics, including:

- **Strong organizational capacity**: Brody et al. (2010) found a positive and robust relationship between a community's organizational capacity and the ability to implement flood mitigation strategies.
- **Access to resources (human & financial capital)**: Posey (2009) found that CRS participation increases as community income and education levels rise.
- **Competent leadership:** Several studies have found that a community's ability to collectively mitigate hazard risk depends upon a leadership team that can assess and communicate risk within a community and form the necessary partnerships with private and public actors to respond to this risk (Maxim et al., 2001; Dalton & Burby 1994; Berke et al. 1996; Brody 2003; Laverack & Wallerstein 2001; Posey, 2009).

Private Market Behavior Under Community Based Insurance

Assumption: The private market under the Community Based Insurance alternative will initially only take on low-risk PRP policies that are located outside of CRS communities. Private insurers are unlikely to sell additional policies for low-risk structures that are not currently enrolled in NFIP, and will not be able to profitably cover the remaining policies that exist outside of CRS communities.

Application: Under the Community Based Insurance alternative, NFIP policies are sold to entire communities rather than individual property owners. Structures that are located outside a participating community can purchase flood insurance from private insurers, and will be required to do so if they are located in the SFHA and have a federally related mortgage. Therefore, it is important to assess how the private market is likely to respond in this new environment and estimate the potential size of the market that might be left without affordable access to federal or private flood insurance.

Discussion: As previously discussed, participation in the Community Based alternative likely will be limited to existing CRS communities. This would result in 1.8 million currently insured structures located in non-CRS communities that would need to rely on the private market to supply flood insurance. Assuming private insurers within the Community Based alternative operate the same as in the Privatization alternative, the following outcomes are expected:

- Private insurers will likely be willing to take on PRP policies that are not located in a CRS-enrolled community.
- Private insurers will likely raise premiums for these PRPs, which would likely cause approximately 8,000 policies to be dropped.
- Policies that are not currently enrolled in PRP and are also located in communities that do not participate in CRS likely would not be covered by the private market. These structures would no longer be insured against flood.

Mapping & Risk Assessment

Assumption: Each policy alternative has the equivalent ability to produce flood maps of similar quality.

Application: The accuracy of flood maps is critical to the process of setting rates that fully reflect risk. NFIP's flood maps have been subject to scrutiny with respect to quality and the frequency of updates, as discussed below. In theory, the private sector, if allowed greater access to flood insurance markets, could be able to improve upon NFIP's flood maps, which in turn could result in a more accurate assessment of flood risk.

Discussion: The value of a flood map largely depends upon the underlying data used to create it and how it is used. Many of FEMA's flood maps are hindered by the quality of the underlying topographic data, which are sometimes out-of-date or lacking entirely. As of April 2008, approximately two-thirds of NFIP's flood maps were more than ten years old. Cost constraints inhibit more frequent collection of topographic data and detract from FEMA's ability to create more accurate maps. According to a recent study, the choice to update maps has been determined primarily by data collection costs, which have exceeded the associated benefits of improving map accuracy (Michel-Kerjan & Kousky, 2009). In addition, flood maps are only useful if communities use them to inform new construction decisions. GAO (2010) found that FEMA's efforts to promote community acceptance of flood maps have been insufficient.

Given these challenges, it is unclear whether the private market would have the incentive to produce more accurate maps. In theory, the private market could mobilize the resources necessary to create accurate flood maps and encourage their use if there was an associated profit motive. However, empirical evidence to evaluate this claim was unavailable, and as such, all policy alternatives are assumed to have the same ability to produce flood maps of a given quality.

Turnover of Housing Stock

Assumption: The U.S. housing stock turns over, on average, every 13 years.

Application: Under the NFIP Modified and Privatization alternatives, the phase-out of subsidies is tied to transfer of home ownership. Therefore, to estimate when this transfer is likely to occur, Keybridge analyzed the average turnover of housing stock.

Discussion: To estimate average turnover, the owner-occupied housing stock was divided by the seasonally adjusted annual rate ("SAAR") of existing home sales. For example, in the 4th Quarter of 2010, the owner-occupied housing stock was 74.8 million, and the SAAR of existing home sales averaged 4.7 million (U.S. Census Bureau, 2009b). At that pace, it would take approximately 15.8 years to transfer ownership of the entire U.S. housing stock. Over the past 11 years, the average turnover rate over has been 13 years. This figure dropped to 10.4 years during the second and third quarters of 2005, and reached a peak of 18.0 years in the 3rd Quarter of 2010 — reflecting the recent volatility in the housing market.

While this estimate provides a useful benchmark, it does not tell a complete story. Some homeowners may stay in their homes for several decades or more, while others may turnover more quickly; some houses may be sold multiple times in a short period. Nonetheless, given historical data, 13 years is a reasonable approximation for the amount of time that it would take to phase out the majority of subsidies via transfer of ownership.

Federal Assistance Cost-Share Structure & Participation

Assumption: The federal cost-share structure under Federal Assistance will begin with the NFIP paying 50% of insurance, mitigation, and disaster assistance costs. The cost share will increase in 5% increments, mirroring the CRS program's 1-9 rating scale, depending on the extent and effectiveness of a community's proposed mitigation activities. The distribution of NFIP communities among the cost-share levels will also mirror the current CRS program distribution, with non-CRS participants receiving the baseline 50/50 cost-share.

Application: The Federal Assistance alternative would introduce a federal cost-share system for insurance, mitigation, and disaster assistance and require participating NFIP communities to meet more stringent floodplain management and building standards. However, the policy framework does not specify exactly what the federal cost-share would be for different communities, what standards and mitigation activities would qualify for an increased cost-share, or by what increments the federal component of the cost-share would increase if such activities were pursued. Each of these policy features is critical to a full evaluation of full risk rates, insurance penetration, and the extent of community and individual mitigation under the policy option.

Discussion: The Federal Assistance alternative lays out a general framework for its cost-share mechanism, but some policy details necessary for quantitative analysis were not specified. Through discussions with the Working Group, the details necessary for analysis were outlined as follows. First, all communities that currently participate in the NFIP would continue to participate, thus meeting the more stringent floodplain management and building standards. Second, all

participating communities would receive no worse than a 50/50 federal cost-share, which would apply to both structure-level disaster assistance payments and community-level mitigation activities. Third, the federal component of the cost-share would increase in increments of 5% up to a maximum of 95% federal cost-share.[16] Fourth, communities would be distributed across the cost-share spectrum in a manner than mirrors the current CRS program. For example, communities that currently have the lowest CRS rating of 9 are assumed to qualify for a 55% federal cost-share for disaster assistance and mitigation activities, while communities that have the highest CRS rating of 1 would qualify for a 95% federal cost-share. Communities that do not currently participate in the CRS program would receive the minimum 50% federal cost-share.

Price Responsiveness & the Decision to Mitigate

Assumption: An individual's decision to mitigate is only marginally responsive to the insurance price signal.

Application: An evaluation of the policies relative to criterion four considers a range of drivers that influence community and individual decisions to mitigate, including the insurance price signal. Charging actuarial rates for flood insurance communicates the full risk of building or purchasing a structure in a given location and should influence an individual's decision to regarding which mitigation activities to pursue (if any). However, this analysis does not consider the insurance price signal to be a dominant driver of mitigation activity in light of the evidence discussed below.

Discussion: The insurance price signal does have some impact on an individual's decision to mitigate, as individuals are somewhat responsive to the price of insurance and adjust their behavior accordingly. However, two key factors limit the extent to which individual decisions to mitigate are responsive to the insurance price signal:

- **Behavioral Biases:** Individuals tend to overweight present costs and underweight future risk when making decisions (Kunreuther & Michel-Kerjan, et. al, 2009). Even when future risk is made known via flood insurance pricing, behavioral biases may lead individuals to discount or downplay that risk and amplify the immediate costs of mitigation.
- **Action Constraints:** In those cases where an individual is responsive to the insurance price signal and chooses to mitigate, their options are significantly limited. Individuals may choose to retrofit their individual structure, but mitigation investments that have the highest impact in terms of risk reduction and avoidance can only be undertaken at the community level. Such activities include property buy-backs and relocation, open space preservation, the erection of flood control structures, and drainage management systems. The decision to undertake and fund these high-impact mitigation projects is made by local governments, not individuals.

[16] The specific flood mitigation activities that would correspond to each cost-share level remain unspecified.

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The extent to which a policy transitions toward full risk rates is likely to have a significant impact on its ability to satisfy several key criteria. While a move to full-risk rates is the central piece of policy alternatives satisfying Criterion 1, a highly-weighted criterion, it also impacts policy options' performance relative to Criteria 2, 3, 4, and 6. As such, a more detailed accounting of those policy features that affect the extent to which full-risk rates are charged and how many structures experience full-risk rates is provided below.

Elimination of Subsidies & Discounts

The following series of tables displays the difference between Current NFIP rates and estimated full-risk rates for the program's existing portfolio. Specifically, Figure E.1 details the premiums charged under NFIP Current by flood zone and CRS ranking, which reflect a range a subsidies and discounts. Figure E.2 documents a partial elimination of current subsidies and full elimination of grandfathered discounts, as is proposed by the Modified NFIP and Privatization alternatives (insofar as the federal government continues to underwrite all policies that are not low-risk PRP under the Privatization alternative).

Although the transition to full-risk rating through the proposed phase-out and elimination of subsidies and discounts under the policy alternatives is desirable, it would also likely result in some dropped policies due to the interaction of price elasticity for flood insurance and MPR compliance rates.

Under the data analysis's assumptions regarding price elasticity and MPR compliance,[17] the NFIP Modified alternative's proposed phase-out of structure-based subsidies at transfer of ownership would likely eliminate almost 41% of current subsidized policies over a 13 year period, of which more than half (305,299) would be attributable to lack of MPR compliance. In addition, linking the elimination of structure-based subsidies to the transfer of ownership would result in the majority (57%) of the next cohort of floodplain property owners dropping coverage.[18] The immediate elimination of grandfathered discounts and subsequent remapping of all grandfathered structures into the flood zone would likely result in approximately185,000 dropped policies due to higher rates and the relatively poor MPR compliance rates, as well as 16,885 new policies due to the elimination of the cross-subsidy fee applied to standard X-zone policies.

[17] The price elasticity of demand for flood insurance was estimated at -0.2, based on the average of multiple studies. Keybridge Research estimated NFIP's MPR compliance rate at 42.8%, based on NFIP's policy data and estimates of penetration rates. See Appendix D for a full discussion of these estimates and assumptions.

[18] It is important to note that these estimates assume an average price elasticity and a uniform, average price increase due to subsidy elimination across all zones and policies. In fact, some subsidized policies may experience a much larger price increase than others when subsidies are removed, and where prices increase above the historical limit it likely that the price elasticity of demand will be somewhat greater than -0.2 and demand for flood insurance will fall more sharply. In short, as subsidies are phased out, the impact in terms of dropped policies will be the product of the distribution of premium increases and price elasticities across policies. However, given that calculating these distributions was beyond the scope of this analysis, averages have been used for price elasticity and the value of subsidy elimination. Given that price increases from subsidy phase-outs affects a relatively narrow share of the NFIP's total portfolio, applying an average price elasticity and price increase is unlikely to significantly underestimate the reduction in policy demand due to the retrenchment of subsidies.

Figure E.1: Current NFIP Rates by Flood Zone & CRS Rank

Flood Zone	CRS-1	CRS-2	CRS-3	CRS-4	CRS-5	CRS-6	CRS-7	CRS-8	CRS-9	CRS-10	Weighted Average
A											
Pre-FIRM Subsidized	$478	$521	$565	$608	$652	$695	$739	$782	$825	$869	$817
Not Subsidized	$478	$521	$565	$608	$652	$695	$739	$782	$825	$869	$817
AE											
Pre-FIRM Subsidized	$728	$795	$861	$927	$993	$1,060	$1,126	$1,192	$1,258	$1,324	$1,166
Not Subsidized	$312	$340	$368	$397	$425	$453	$482	$510	$538	$567	$499
AHO											
Pre-FIRM Subsidized	$246	$269	$291	$314	$336	$358	$381	$403	$426	$448	$388
Not Subsidized	$246	$269	$291	$314	$336	$358	$381	$403	$426	$448	$388
AR & A99	$558	$608	$659	$710	$761	$811	$862	$913	$963	$1,014	$896
D											
Pre-FIRM Subsidized	$632	$690	$747	$805	$862	$920	$977	$1,035	$1,092	$1,150	$1,069
Not Subsidized	$632	$690	$747	$805	$862	$920	$977	$1,035	$1,092	$1,150	$1,069
Other											
Pre-FIRM Subsidized	$589	$642	$696	$749	$803	$856	$910	$963	$1,017	$1,070	$1,069
Not Subsidized	$589	$642	$696	$749	$803	$856	$910	$963	$1,017	$1,070	$1,069
V, VE											
Pre-FIRM Subsidized	$1,119	$1,220	$1,322	$1,424	$1,525	$1,627	$1,729	$1,830	$1,932	$2,034	$1,807
Pre-81	$909	$992	$1,074	$1,157	$1,240	$1,322	$1,405	$1,488	$1,570	$1,653	$1,468
Not Subsidized	$1,738	$1,896	$2,054	$2,212	$2,370	$2,528	$2,686	$2,844	$3,002	$3,160	$2,807
PRP	$344	$344	$344	$344	$344	$344	$344	$344	$344	$344	$344
B,C,X											
Standard	$575	$575	$575	$575	$575	$575	$607	$607	$607	$639	$612
Grandfathered	$575	$575	$575	$575	$575	$575	$607	$607	$607	$639	$612

Figure E.2: NFIP Modified & Privatization Structure- based Subsidy & Grandfathering Eliminations by Zone

Category	Pre-FIRM Total	Pre-81 V	A99 & AR	GF-X	Total
Current Number of Policies w/ Discounted Rates	1,157,092	10,907	26,000	250,000	1,443,999
Current Value of Subsidies & Grandfathering	$1,724	$22	$32	$207	$1,829
MPR: Policies Maintained	153,591	3,829	9,128	61,846	228,394
Total Value (million $)	$236	$8	$11	$13	$267
MPR: Policies Dropped	205,267	5,117	12,199	82,654	305,237
Total Value (million $)	$315	$10	$15	$17	$357
Non-MPR: Policies Maintained	2,359	59	140	3,165	5,723
Total Value (million $)	$4	$0	$0.2 0	$1	$5
Non-MPR: Policies Dropped	76,281	1,902	4,533	102,335	185,051
Total Value (million $)	$117	$4	$6	$21	$147
Total Reduction in Number of Subsidies	**437,498**	**10,907**	**26,000**	**250,000**	**724,405**
Total Reduction in Value of Subsidies (million $)	**$672**	**$22**	**$32**	**$51**	**$776**
Number of Subsidies Continued	**719,594**	**-**	**-**	**-**	**719,594**
Value of Subsidies Continued	**$1,052**	**$0**	**$0**	**$0**	**$1,052**

Figure E.3: The Insurance Purchase Decision Under Increased Rates

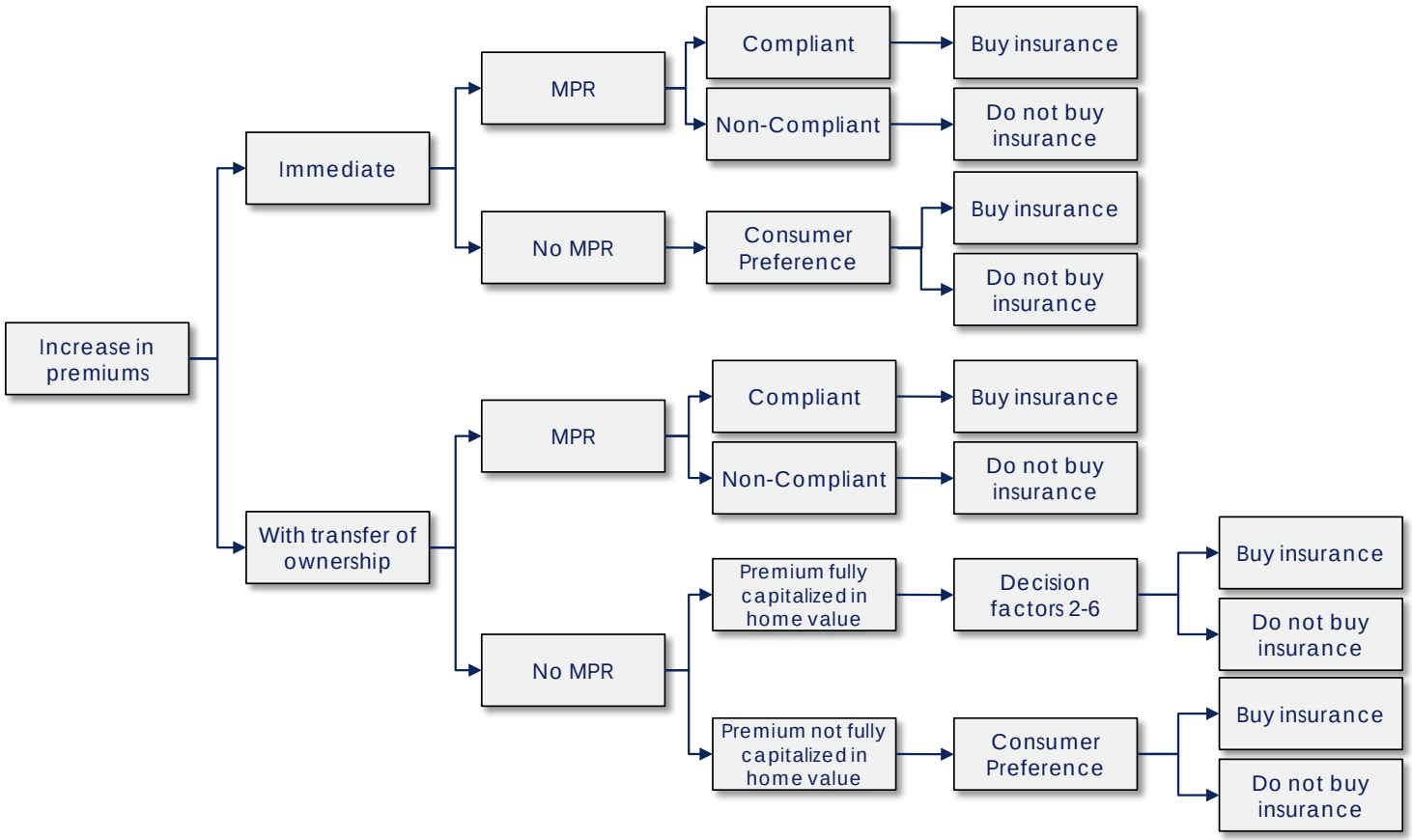
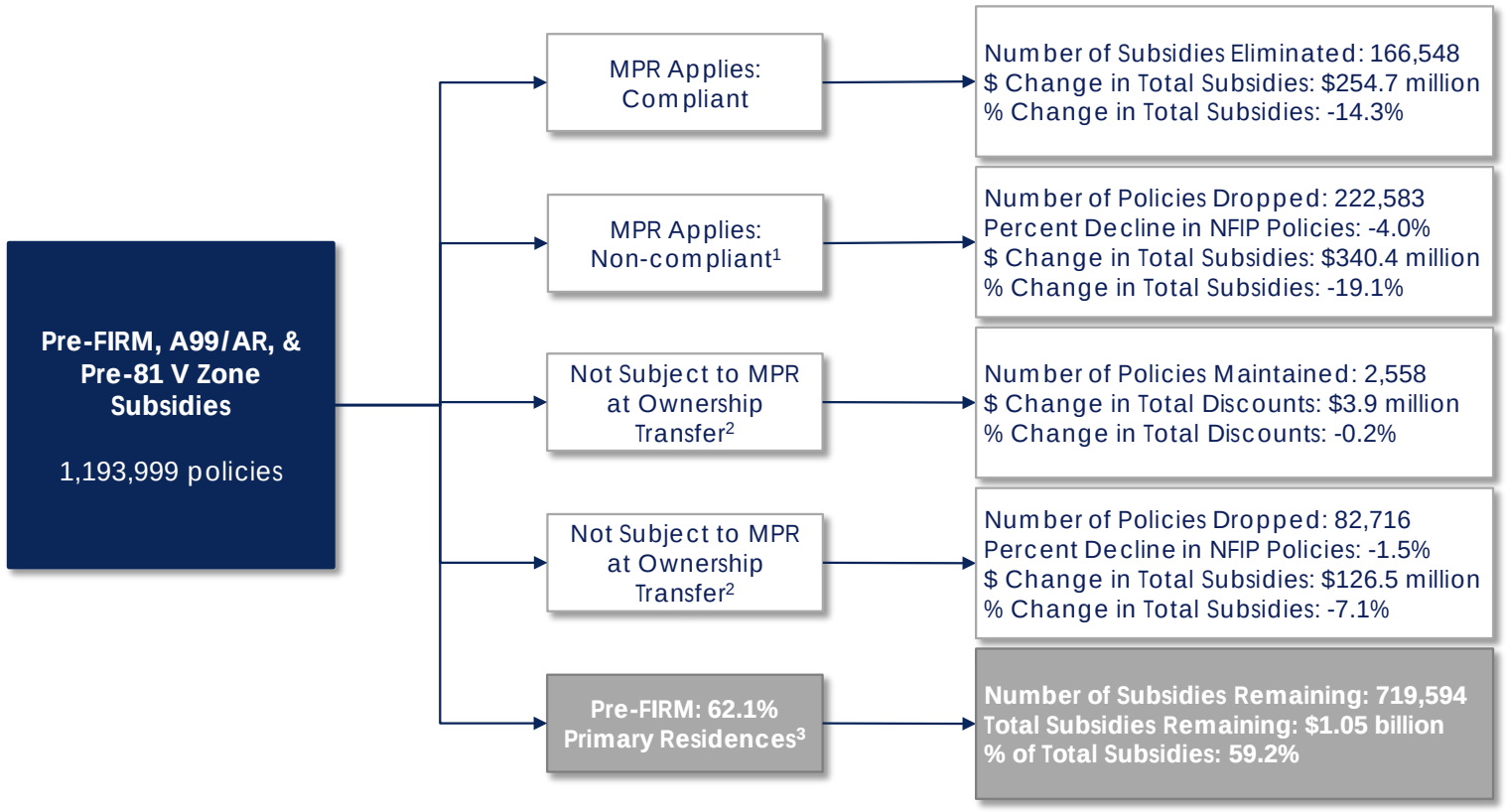


Figure E.4: Impact of Subsidy Eliminations

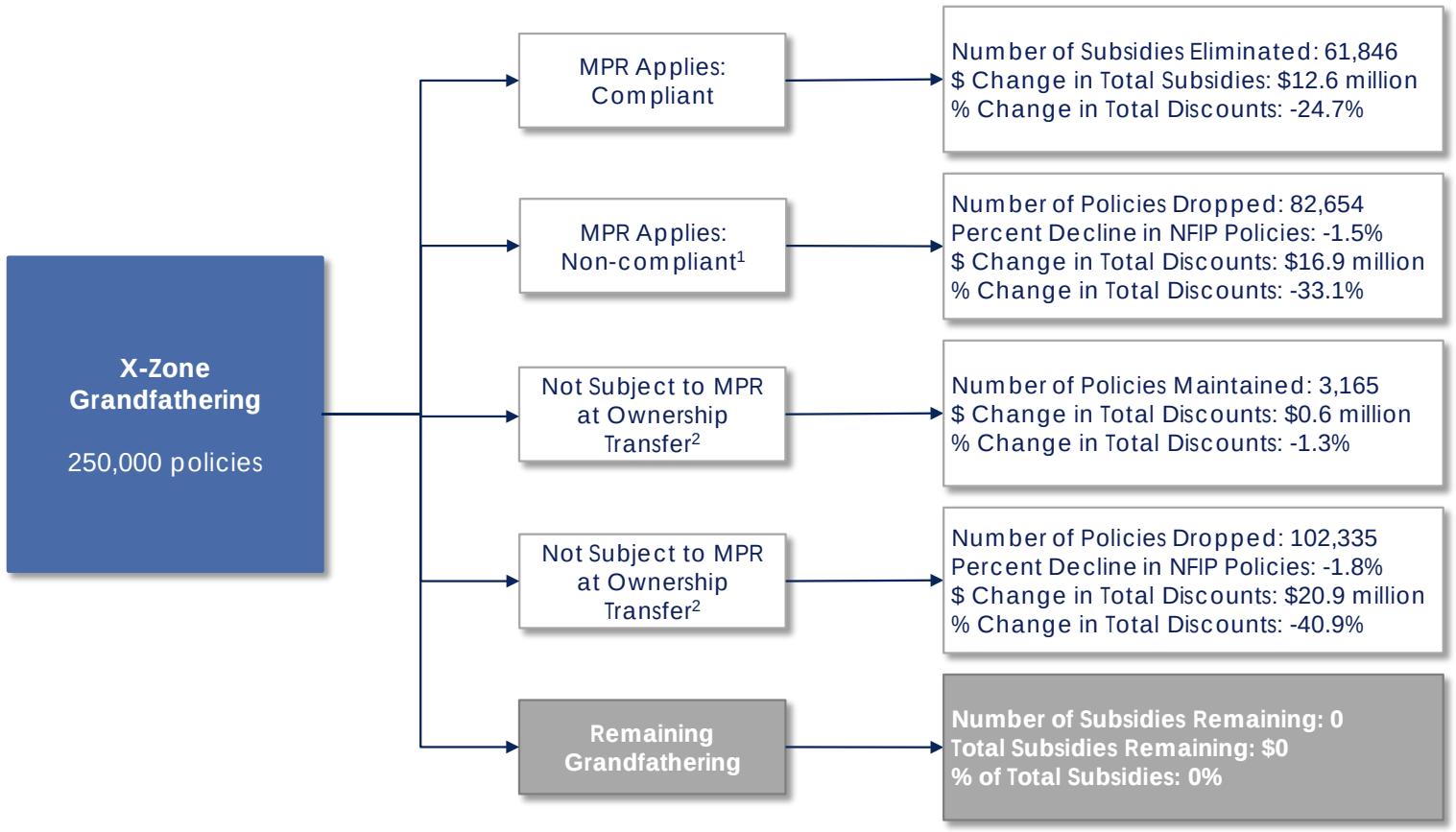


[1]Based on NFIP data, analysis assumes a 42.8% MPR compliance rate.

[2]Based on NFIP data, analysis assumes a 3% penetration rate for areas where the MPR does not apply.

[3]NFIP policy data shows that 62.1% of Pre-FIRM policies are primary residences. NFIP Modified would maintain subsidies for these structures.

Figure E.5: Impact of Grandfathered Discount Elimination



[1]Based on NFIP data, analysis assumes a 42.8% MPR compliance rate.

[2]Based on NFIP data, analysis assumes a 3% penetration rate for areas where the MPR does not apply.

Rate Setting under the Private Market

Adding another policy element to the discussion of full-risk rates, this analysis estimates that the privatization of the primary flood insurance market will, at least in the near to medium term, be limited to lower risk policies. This would place PRP policies at the highest likelihood of being picked up and underwritten by private insurers. Accordingly, estimates of the likely impact of privatization on insurance rates focus on the size and extent of current PRP policy discounts. Estimates of the current discount received by PRP policies receive and their more accurate full-risk rates are based on data published in the 2001-2009 NFIP Annual Rate Reviews ("ARR").

Figure E.6: Historical & Simulated PRP Loss Ratios

Year	Pre-Katrina	Katrina 1/50	Katrina 1/100	Katrina 1/200
2000	0.58	1.07	0.82	0.70
2001	0.84	1.32	1.08	0.96
2002	0.74	1.22	0.98	0.86
2003	0.66	1.15	0.90	0.78
2004	0.68	1.17	0.92	0.80
Average	**0.70**	**1.19**	**0.94**	**0.82**

The 2009 ARR reports that the 30-year historical loss ratio for PRPs is 1.47. However, analysis suggests that this unfavorable loss ratio is entirely a product of Hurricane Katrina, which is implicitly weighted as a 1 in 30 year event. In other words, while treating Hurricane Katrina as relatively high frequency results in a loss ratio of 1.47, treating 2005 flood losses as an event unlikely to ever happen again reduces the 29-year historical loss ratio for PRPs to 0.66. In fact, the true loss ratio for PRP policies should fall somewhere between the extremes of 0.66 and 1.47.

To estimate what a more likely loss ratio may be, a range of estimated PRP loss ratios for years 2000 through 2004 was calculated using a series of frequencies for 2005 flooding. Taking 2004 as an example, the estimated average PRP loss ratio is calculated as follows:

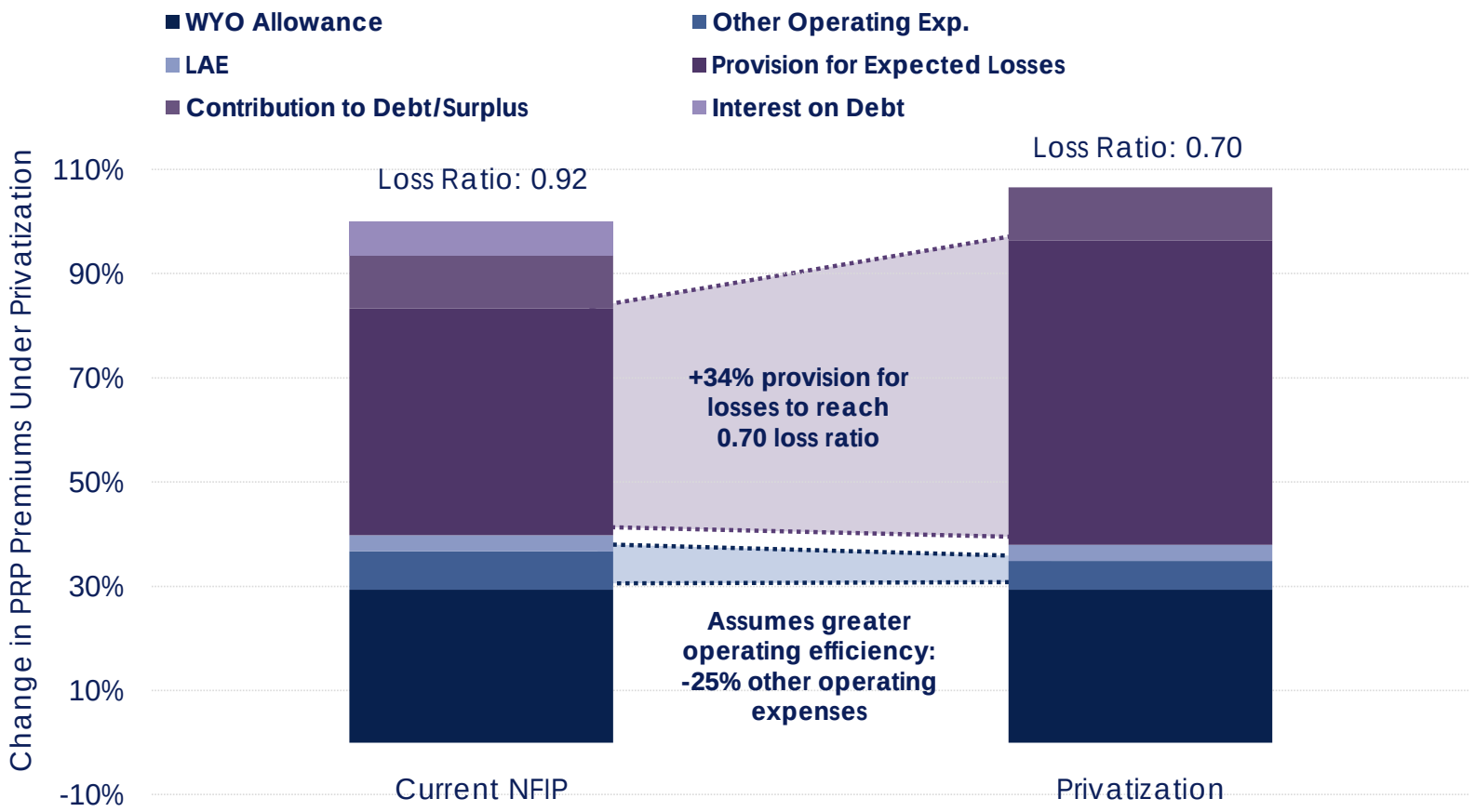
(1) Determine the loss factor for 2005 using historical loss ratios:

- 30-year loss ratio as of 2009: 1.47
- 29-year loss rate (excluding 2005) as of 2009: 0.66
- 2005 loss factor: (30 * 1.47) – (29 * 0.66) = 24.96

(2) Apply a range of weights to the 2005 loss factor and combine with pre-Katrina data to determine the average PRP loss ratio for a given year. The reported PRP loss ratio in 2004 was 0.68. Assuming that 2005 flooding was a 1 in 100 year event and that the historical record as of 2004 is representative of the remaining 99 years, the weighted PRP loss ratio for 2004 is 0.92.

Evidence suggests that private insurers would be unwilling to operate at such a high loss ratio. Instead, the targeted loss ratio for the private market would likely be closer 0.7. In order to achieve this lower target loss ratio, private insurers would need to increase the portion of premiums that account for expected losses. Specifically, under reasonable cost reduction assumptions and counting Hurricane Katrina as a 1/100 year event private insurers would have to adjust PRP rates by about 7% to achieve a 0.7 loss ratio. The data analysis estimates that such an increase in rates would likely result in approximately 21,500 dropped PRP policies.

Figure E.7: Potential Premium Changes for Privatized PRP Policies



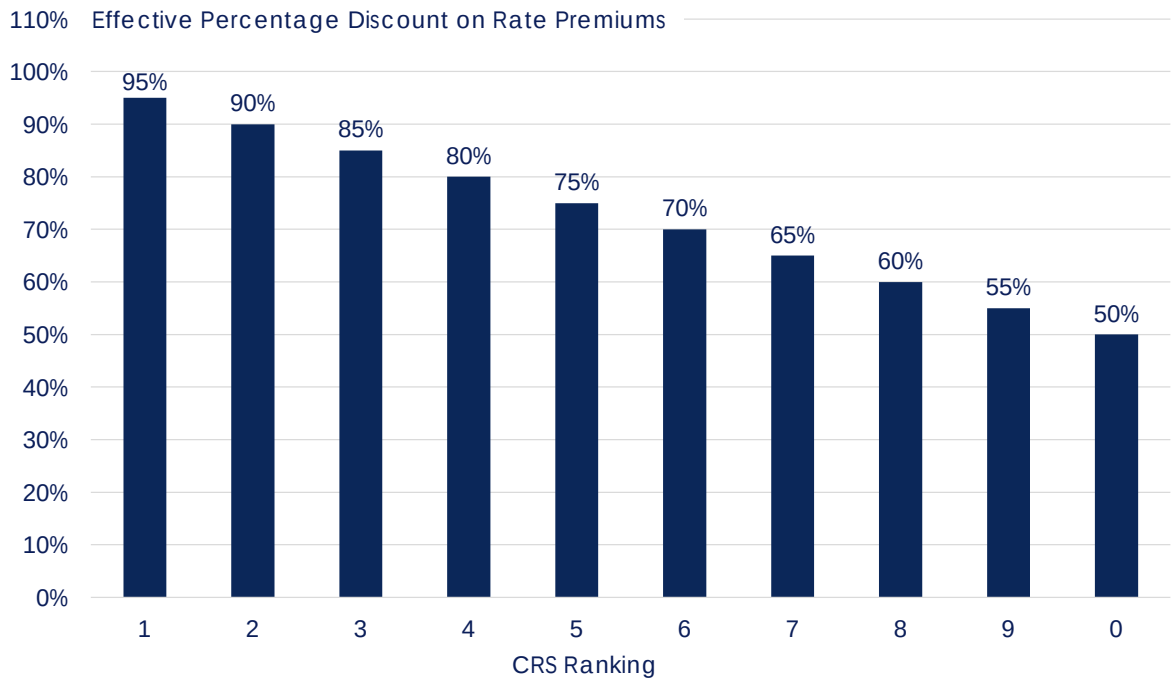
Note: Loss ratios typically range from 0.8 for non-casualty insurance or lower for casualty insurance (fire, earthquake etc.).

Effective Rates under Federal Assistance

Despite the technical move to full-risk rates under Federal Assistance, the option's proposed cost-share mechanism would effectively reduce rates for the majority of policyholders, as a community's federal cost-share would apply not only to mitigation projects and disaster assistance, but also to insurance premiums for all structures in that community. Effective rates for policyholders under the Federal Assistance alternative cost-share mechanism can be estimated according to the following calculation:

*[(Full Risk Rate – WYO fee) x (1 – Federal Cost Share)] + [The larger of: (Full Risk Rate * WYO fee * Percent Paid) or (Minimum WYO fee)[19]]*

Figure E.8: The Federal Assistance Cost Share Mechanism



[19] The analysis set a minimum WYO fee of $100 for PRPs and $150 for all other policies. Had this floor not been set, in some cases, fees calculated as a percentage of the policy would not have been high enough to cover WYO administrative costs.

Figure E.9: Effective Rates Under Federal Assistance

Flood Zone	CRS-1	CRS-2	CRS-3	CRS-4	CRS-5	CRS-6	CRS-7	CRS-8	CRS-9	CRS-10	Weighted Average
A											
Pre-FIRM Subsidized	$215	$280	$345	$410	$474	$551	$643	$734	$826	$918	$809
Not Subsidized	$178	$205	$233	$260	$288	$315	$343	$371	$398	$426	$393
AE											
Pre-FIRM Subsidized	$249	$348	$447	$560	$700	$840	$979	$1,119	$1,259	$1,399	$1,065
Not Subsidized	$168	$186	$204	$222	$240	$258	$276	$294	$312	$330	$287
AHO											
Pre-FIRM Subsidized	$183	$217	$250	$284	$317	$351	$384	$418	$451	$485	$395
Not Subsidized	$164	$178	$193	$207	$221	$235	$250	$264	$278	$292	$254
AR & A99	$226	$302	$377	$453	$536	$643	$750	$857	$964	$1,071	$823
D											
Pre-FIRM Subsidized	$236	$322	$408	$493	$607	$729	$850	$972	$1,093	$1,215	$1,045
Not Subsidized	$186	$223	$259	$296	$332	$369	$405	$442	$478	$516	$464
Other											
Pre-FIRM Subsidized	$230	$310	$390	$470	$565	$679	$792	$905	$1,018	$1,131	$1,127
Not Subsidized	$184	$218	$252	$286	$320	$354	$388	$422	$456	$490	$489
V, VE											
Pre-FIRM Subsidized	$302	$454	$645	$859	$1,074	$1,289	$1,504	$1,719	$1,934	$2,149	$1,669
Pre-81	$273	$397	$524	$698	$873	$1,048	$1,222	$1,397	$1,572	$1,746	$1,356
Not Subsidized	$250	$351	$451	$567	$709	$851	$993	$1,135	$1,277	$1,419	$1,102
PRP	$113	$126	$139	$152	$166	$179	$192	$205	$218	$231	$204
B,C,X											
Standard	$162	$174	$187	$199	$211	$223	$236	$248	$260	$272	$248
Grandfathered	$177	$204	$231	$258	$285	$312	$339	$366	$393	$421	$367

Penetration Rates under Community Based Insurance

The move to full-risk rates is only effective to the extent that the NFIP continues to insure a large number of structures, and preferably all structures located in a floodplain. For Community Based Insurance, SFHA and NSFHA penetration rates would technically be 100%, given that insurance policies are written at the community level and that all structures in a participating community are automatically insured. However, to get a full picture of structures insured at full-risk rates and policies left without access to federally underwritten insurance, community participation rates and the number of structures in participating communities must also be taken into account.

As specified in Appendix D, this analysis assumes that community participation in a community based program would parallel current participation in the NFIP's Community Rating System. Specifically, it is assumed that the 1,145 communities currently participating in the CRS program would also participate in the Community Based Insurance alternative. The NFIP estimates that there are approximately 3.7 million current policies in CRS communities and the data analysis estimates that there are just over 38 million total structures located in these communities. Taking current policies as a reasonable proxy for insured structures it can be estimated that insured structures under Community Based Insurance would increase from roughly 3.7 million to 38 million, or 100% of SFHA and NSFHA structures in participating communities.

In addition to this significant jump in insured structures, some currently insured structures would lose their federally underwritten policies under this alternative. Specifically, 1.2 million current policies in non-CRS communities that likely will not participate in the program, including approximately one million structures located in a flood zone, would be left without access to NFIP flood insurance. However, assuming that the private market would be willing to take on low to moderate risk policies, the nearly 600,000 PRP policies in non-participating communities would have access to insurance at rates roughly 7% higher than what they were previously being charged. Given the price elasticity of demand for flood insurance, this 7% rate increase would likely reduce demand among PRP policies by about 8,000.

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Appendix F: References

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