Economic Incentives for Building Safer Communities
A Background Paper

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This preliminary paper outlines the opportunities and challenges for utilizing economic incentives to help build communities that are safer with respect to the risks from natural disasters. The next section proposes a framework for evaluating the cost-effectiveness of alternative structural and non-structural loss reduction measures. We then specify a list of the key stakeholders who either require economic incentives to adopt these loss reduction measures or who provide the incentives. Section 3 lists a set of structural and non-structural measures that could be considered for reducing losses from hurricanes, earthquakes and floods. The following section specifies a set of economic incentives that may be considered for encouraging homeowners, tenants and businesses to adopt these loss reduction measures. The concluding section discusses the challenges of how one can get homeowners, tenants and businesses to adopt specific structural and non-structural measures and provides several strategies for dealing with these challenges.

NOTE: At the end of each section we list a set of open issues and questions that we would like to discuss with you at the Steering Committee meeting on Dec. 6\textsuperscript{th}.

1. NATURE OF THE FRAMEWORK

Figure 1 depicts the framework for examining structural and non-structural loss reduction measures for residences and businesses subject to damage from natural disasters. It builds on concepts developed in a report by the Heinz Center (1999) and by Kleindorfer and Kunreuther (1999).

![Figure 1: Framework for Analyzing Mitigation Strategies](image-url)
Ideally a *hazard assessment* consists of two parts: the likelihood of earthquakes, floods, hurricanes or other natural disasters which the individual homeowner, tenant or business cannot control and the direct and indirect impacts from the hazard which can be reduced through structural and nonstructural loss reduction measures. *Societal conditions* include the residential structures and business properties and those who inhabit them, along with their socio-economic features (e.g., age, education, income for residents and size of business, type of activity for businesses).

One also needs to understand the *decision processes* of those subject to the risk of a natural disaster. The term *decision processes* refers to the type of information and data collected by these individuals and how they are utilized in making choices. Unless we understand the way homeowners, tenants and business managers make decisions, we will have a difficult time suggesting a set of economic incentives which can be implemented.

Based on an understanding of the vulnerability of the structures and the decision processes of the apartment dwellers, one needs to develop a set of economic incentives for encouraging the adoption of these measures.

**Open Questions and Issues**

- Does this framework capture the key elements of the problem?
- What other features should be considered in addressing these issues?
- Which providers of goods and services should be asked to offer incentives?
- What are the benefits that one can indicate to these providers so they can justify providing these incentives for each market segment?
- How do we reach these providers to indicate the opportunities available to them in offering economic incentives?

**2. KEY INTERESTED PARTIES**

Below we list the set of key interested parties concerned with the risks associated with natural hazards and whether they are likely to provide economic incentives or require these incentives.

*Providing Economic Incentives*

- Insurance Industry (e.g. State Farm/USAA/American Re)
- Quasi-Government Agencies (e.g. Fannie Mae/Freddie Mac)
- Construction Material Manufacturers
- Realtors
- Banks (e.g. Bank of America)
- Architects and Construction Design Engineering Companies
- Moving Companies
- Furniture and Appliance Retailers
- Security Monitoring Firms
- Landscape Design, Installation, and/or Maintenance Companies
- State and Local Governments (reduction of taxes and fees, acceleration of permit approval, etc.)
- FEMA and Other Public Sector Agencies
Requiring Economic Incentives

- Contractors and Homebuilders
- Tenants/Renters (residential and commercial)
- Owners of Homes
- Businesses
- Public Sector Agencies

Open Questions and Issues

- Are there other interested parties we should include in these lists?
- What roles do they play in providing or requiring economic incentives?
- How do we convince government leaders that having disaster resistant structures save a community more than the cost of the incentives and helps to ensure the economic viability of the community after a disaster?

3. NATURE OF STRUCTURAL AND NON-STRUCTURAL MEASURES

A set of structural and non-structural measures should be considered for reducing losses from natural disasters. Below we have listed some examples of these measures for hurricanes, earthquakes, wildfires and floods for both residential structures and business properties

Structural Measures

Hurricanes

- Install impact-resistant garage door
- Install impact-resistant entry doors
- Glue roof decking to rafters
- Install shutters or impact-resistant windows
- Seal the joints between the roof decking panels (during new construction, or when replacing the roofing)
- Install clips and straps to connect the roof to the walls, walls to the foundation, etc. to ensure a solid building envelope.
- Install bracing for gable ends
- Install wind-resistant shingles

Earthquakes

- Attach building to foundation
- Install lateral bracing for soft stories
- Install clips and straps to connect the roof to the walls, walls to the foundation, etc. to ensure a solid building envelope.
- Install an automatic gas shutoff valve
Rural and Urban Wildfires

- Install a roof assembly with a Class A fire rating
- Utilize exterior wall materials with at least a one hour fire rating.
- Remove fuel from around the structure
- Install boxed eaves with proper vent screening

Flood

- Ensure that structure is above the Base Flood Elevation

Non-Structural Measures

- Brace water heaters and other items of equipment that could move and/or break utility lines
- Ensure that lighting fixtures, heating ducts, etc., are braced
- Attach furniture and equipment to walls
- Use hook and loop fasteners to attach computers, television sets, etc., to surfaces
- Install latches on cabinets

Open Questions and Issues

- What criteria should be used to prioritize the importance of different structural and nonstructural measures?
- What other structural and non-structural measures should we consider?
- What are the best estimates of the costs and benefits of these measures?
- What uncertainties surrounding these best estimates of costs and benefits?
- How do we communicate the awareness, need, and procedures for accomplishing these structural and non-structural mitigation actions?

4. NATURE OF ECONOMIC INCENTIVES

Residents and businesses faced with these hazards need to be offered a set of economic incentives so that they are willing to incur the investment costs associated with each of them. Below we have presented a set of these incentives from the viewpoint of the different stakeholders requiring them. In parentheses in **bold letters** we have listed the stakeholder(s) who would provide the specific incentive.

Incentives for Contractors and Homebuilders

- Lower permit fees (**local government**)
- Fast tracking permit process (**local government**)
- Lower interest rates for construction loans (**bank**)
- Discounts from material manufacturers (**manufacturers, their trade associations, distributors and dealers**)
- No sales taxes on fortified materials (**state and local government**)
- Reduced fees by architects and engineers on well-designed structures (**corresponding firms**)
Incentives for Homeowners and Businesses

- Reduced insurance premiums *(insurance and reinsurance companies)*
- Loans tied to one’s mortgage for investing in protective measures
- Lower interest rates on mortgages *(bank)*
- Lower loan application fees *(mortgage broker, bank)*
- No increase in assessment of property value for fortified structures *(state and local government)*
- Lower down payment on loan/larger mortgage amount *(bank)*
- Lower transfer tax *(state and local government)*
- Discounts on goods and services offered to residents and businesses *(corresponding firms)*

Incentives for Tenants

- Reduced insurance premiums *(insurance and reinsurance companies)*
- Discounts on goods and services offered to residents and businesses *(corresponding firms)*

Open Questions and Issues

- What other economic incentives should we consider?
- Who should provide them?
- What are the benefits to the providers?
- Can you give examples of how they have been used in practice?

5. IMPLEMENTATION CHALLENGES

In this section we indicate the challenges associated with getting individuals to adopt economic incentives for structural and non-structural measures. More specifically, we list some of the lessons that IBHS has learned in trying to induce homeowners, tenants, and businesses to adopt these measures. We also indicate lessons learned by researchers on why individuals are reluctant to adopt these measures. The section concludes with a few illustrative examples of the types of programs that will address these implementation challenges.

Lessons from IBHS Experience

Here are the seven key lessons that have come out of IBHS experience on trying to convince those at risk to adopt loss reduction measures:

1. Never use the term “mitigation.” Instead use safety protection and prevention.
2. It is very difficult to convince people that they are at risk to hazards, even in their own community; that is, they have a sense of denial.
3. The best way to convince people to take mitigation action is when their children come home from school and tell them they have to do it.
4. The exception to this is when economic incentives are offered for taking mitigation action.
5. The best way to reach people who do not have a predetermined interest in disaster safety is through television in the evening.
6. People do not want to be asked to take more than one mitigation step at a time.
7. They’ve said they must be asked over and over; i.e., a single television spot is not sufficient to generate action.

Lessons from Research Experience

There are five principal reasons why property owners and renters do not appear to want to invest in cost-effective mitigation measures. More detail can be found in Kunreuther (1996):

1. **Short Time Horizons** Individuals may have relatively short time horizons over which they want to recoup their investment in protection. Even if the expected life of the property is 25 or 30 years, the individual or business may only look at the potential benefits from the mitigation measure over the next 3 to 5 years. They may reason that they will not be residing in the property for longer than this period of time and/or that they want a quick return on their investment. We thus need economic incentives that take into account these short time horizons.

2. **High Short-Term Discount Rates** The need for a quick return is also consistent with the tendency of individuals to engage in hyperbolic discounting. Hyperbolic discounting is a term economists use to refer to the tendency for individuals to give greatly diminished consideration to all future benefits and costs relative to immediate ones. This has been used to explain the reluctance of individuals to incur the high immediate cost of energy-efficient appliances in return for reduced electricity charges over time. This factor also needs to be taken into account when developing economic incentives.

3. **Misestimating Probability** Some individuals may perceive the probability of a disaster causing damage to their property as being sufficiently low that the investment in the protective measure will not be justified. For example, they may relate their perceived probability of an earthquake (p) to a threshold level (p*), which they may unconsciously set, below which they do not worry about the consequences at all. If they estimate p < p*, then they assume that the event "will not happen to me". This form of denial implies that protective measures have no positive value to this individual. They will not want to invest any money into protection unless they receive economic benefits that are independent of the reduction in losses from a disaster.1

4. **Liquidity and Upfront Costs** If people have budget constraints, then they will be averse to investing in the upfront costs associated with protective measures simply because they feel they cannot afford these measures. It is not unusual for one to hear the phrase: “We live from payday to payday” when asked why a household has not invested in mitigation measures. We thus need to consider economic incentives that take into account these budget constraints.

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1 We note that some individuals may perceive the probability of a disaster causing damage to their property as being so high that they will want to invest in these measures even if they not very cost-effective from an economic point of view (e.g. having peace of mind)
5. **Truncated Loss Distribution** Individuals may have little interest in investing in protective measures if they believe that they will be financially responsible for only a small portion of their losses should a disaster occur. If their assets are limited in relation to their estimated potential loss, then these individuals may feel they that they can walk away from their destroyed home without being financially responsible. Similarly, if residents anticipate liberal disaster relief from the government should they suffer damage, then they would have less reason to invest in a cost-effective loss reduction measure.

**Proposed Strategies**

Given the above challenges in convincing people to adopt loss reduction measures we would like to propose several strategies as to how one might address the reluctance of people to adopt loss reduction measures through the use of economic incentives

**Premium Reductions Linked with Government Mitigation Loans** Property owners may voluntarily adopt mitigation measures if they are rewarded monetarily by receiving some financial benefit. One way to do this would be to provide premium reductions to reflect the lower damage that would be experienced from future earthquakes. If individuals are reluctant to incur the upfront cost of mitigation due to budget constraints, then one way to make this measure financially attractive to the property owner is to provide funds for mitigation through some type of long-term government loan. To illustrate, a 20-year loan for $1500 to strengthen the building at an annual interest rate of 10% would result in payments of $170 per year. If the expected annual reduction in losses was greater than $170 and the insurance premium reflected this, then the insured property owner would have lower total payments by investing in cost-effective mitigation than not doing so.

There may reasons to subsidize these loans for residential structures. Many poorly constructed buildings are occupied by low-income families who cannot afford the costs of mitigation measures on their existing structure or the costs of reconstruction should their house suffer damage from a natural disaster. Equity considerations argue for providing this group with low interest loans and grants for the purpose of adopting cost-effective mitigation measures or for them to relocate to a safer area. Since low-income victims are likely to receive disaster assistance from the government, subsidizing these protective measures can also be justified by showing that they reduced expected hazard/disaster-related costs incurred by the government both before and after an earthquake.

**Well-Enforced Building Codes** Retrofitting structures can reduce future losses but require inspections and enforcement procedures. Building codes mandate that property owners adopt mitigation measures. Such codes may be desirable when property owners would otherwise **not** adopt cost-effective measures because they either misperceive the benefits from adopting the measure and/or underestimate the probability of a disaster occurring. If a family is forced to vacate its property because of damage that would have been prevented if a building code had been in place, then this additional cost needs to taken into account by the public sector when evaluating the cost-effectiveness of a mitigation measure from a societal perspective.
Cohen and Noll (1981) provide an additional rationale for building codes. When a structure collapses, it may create externalities in the form of economic dislocations that are beyond the physical damage suffered by the owners. These may not be taken into account when the owners evaluate the importance of adopting a specific mitigation measure. For example, if a building topples off its foundation after an earthquake, it could break a pipeline and cause a major fire that would damage other structures not structurally damaged by the earthquake in the first place.

Open Questions and Issues

- What are other reasons why individuals do not adopt loss reduction measures voluntarily?
- To what degree can communication (e.g., advertising) strategies be designed that are effective in increasing adoption of loss-reduction measures?
- What role can opinion leaders in a community play in encouraging individuals to adopt loss reduction measures?
- What are the challenges in implementing the programs proposed above and how might we overcome them?
- Can one establish social norms in a community that “mitigation is a good economic investment”?
- How can we convince state and local government and all providers of goods and services that is in their best interest that community residents and businesses are protected in a disaster?
- What other strategies would you propose to encourage or require individuals and businesses to adopt protective measures?
- What other stakeholders would be involved in your proposed strategies?
- How do we reach them?
- How do we convince them?
- How do we prove (after a disaster) that their investment paid off?
SELECTED REFERENCES


