Weather, Risks, and Insurance:
The Challenge of Reconstruction in the Gulf Coast Region

Marcellus Andrews
Barnard College

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Summary

The hurricanes seasons of 2004 and especially 2005 have reminded the world why private insurance markets are unreliable devices for pricing and managing the financial consequences of extreme weather risk. The weather risks facing poor, badly managed, racially and class divided economies and societies like those along the Gulf Coast of the US can only be managed by moving away from the low tax, low wage, small government policy regime characteristic of the region to a mixed economy policy suite marrying private insurance to sustained public investments in weather risk mitigation and adaptation technologies.

The following remarks explore the economics of market failure in the private insurance system as well as various flawed public sector mechanisms that states in the region have relied on to manage the financial problems associated with extreme weather risk. Efficient and equitable public policy should use private insurance markets to properly price extreme weather while relying on stronger building codes and public investment to build a strong system of water and weather infrastructure across the region. States in the Gulf face one of two options: (a) recurring episodes of catastrophic property and human losses due to escalating risk made worse by government and market failure or (b) effective water and weather management infrastructure as well as rational risk pricing leading to higher insurance rates and higher taxes. Federal government assistance in financing the construction and management of water/weather infrastructure should not only balance the costs and benefits of protecting the Gulf to the nation as a whole, but should err on the side of safety for equity reasons, if need be at the cost of managing the gradual depopulation of the Gulf Coast in favor of other regions of the country. This stark policy orientation is driven as much by the ethical principle that all loves are of equal value in a liberal democracy as by the dictates of economic efficiency.

The Predicament

Hurricane Katrina reminds us all that insurance is a fragile institution in a market economy. The sheer magnitude of insured losses associated with Katrina alone, $41.1 billion (2005 dollars), are horrifying yet fascinating by virtue of their testimony to Nature's power to lay waste to life and property. These enormous losses amounted to 8.05% of insurance industry surplus and 9.61% of total property-casualty insurance premiums collected in 2005.[1] The insurance industry managed to earn positive profits despite the losses associated with Katrina and her equally nasty cousins, Hurricanes Rita and Wilma – return on equity to insurers was a healthy 9.1% in 2005. The seeming obscenity of healthy profits in the midst of the colossal losses of life and property along the Gulf in 2005 might be sickening, but the perversity of this situation is actually a sign that the private insurance mechanism is working as designed. Private insurance protects property and persons from the financial consequences of uncertainty, but only when profits are high enough to compensate for risk. Private insurance is not and has never been a device for protecting *all* people from harm, only those who can pay for financial protection.

The events of the past couple of years suggest that insurance markets do not, and perhaps cannot, work well when called on to manage the financial consequences of catastrophe. Indeed, economic reason suggests that private insurers *should* run away from catastrophe risks, given their responsibilities to shareholders and the peculiar constraints imposed by the exceedingly short time horizons of modern financial markets. Economic reason also suggests that societies facing catastrophic risks should perhaps rely less on private insurance for managing certain kinds of big risks in favor of other, less perverse systems.

Of course, neither private insurance nor public policy is of much use without extensive investments in water and weather infrastructure offering substantial physical protection against flooding within the Gulf region. Insurers are only rational when they avoid New Orleans and much of the Gulf all levels of government fail to invest in the most effective, and necessarily expensive, water control systems.

The following remarks on insurance, catastrophe and inequality presume that the people of the Gulf Coast might someday be the grateful beneficiaries of a massive, sustained and intelligent program of public works – a modern version of the Tennessee Valley Authority able to control flood risks through a combination of engineering marvels, smart regulation, and tight surveillance of the region's political mechanism to limit public corruption. Still, under the best of circumstances, there are still so many problems with insurance in the Gulf region – both due to the inherent weakness of the insurance mechanism as well as the interaction of insurance with the logic of economic inequality made worse by the historic racial and caste conflicts bequeathed to the region by its slave and apartheid past.

[1] Insurance Fact Book 2005, Insurance Information Institute

Catastrophe and Private Insurance

Private insurance markets are charged with the social function of pricing, transferring and managing risk, for profit. When insurance markets work well, prices both reflect the frequency and severity of financial losses in many sectors of economic life and provide powerful incentives for households and businesses to reduce their exposure to risk, particularly when insurance is either too expensive or unavailable. Yet, high insurance prices are, or at any rate should be, a barrier to certain forms of economic growth and development in regions facing extreme weather or earthquake risks, especially in our era of mounting evidence of rapid global warming and the resulting prospect of more frequent and severe hurricanes. Rational insurance pricing in the shadow of escalating climate risks would, if permitted, force homeowners and business owners alike to flee risky regions for less expensive and safer circumstances, thereby reallocating insured resources from high risk to low risk areas.[2] Indeed, the absence of private insurance in risky areas is usually thought of as an effective mechanism for reducing the exposure of vulnerable populations and properties to catastrophe, at the cost of perhaps slower but surely safer economic growth.

But insurance markets are not very good at managing disaster risk.[3] Part of the problem is that ordinary men and women are so bad at calculating their risk of losses that they all too frequently fail to insure themselves against calamity, with all the tragic consequences on display in Katrina's wake. But sensible economic analysis points to a much more basic political-economic flaw at the heart of the private insurance mechanism in the shadow of catastrophic risk: insurance is, and should be, expensive when risk exposures are great and the probability of catastrophe is large enough that the cost of protecting people and property is prohibitive. Indeed, private insurers have every reason to reduce their own risk exposure by withdrawing protection in the face of catastrophe.

This mechanism is socially pernicious when it is applied to health care, for reasons all too familiar. *It is also an ineffective device for pushing financially vulnerable people and property out of harm's way.* Expensive insurance does not lead people to quit risky behavior or regions in favor of safer sites; expensive insurance just means that too many people forgo insurance in the face of risk, so that protection against risk is, as always, based on the ability to pay. Of course, once catastrophe occurs, the uninsured are not only wounded by their bad fortune but are without resources to rebuild their lives by virtue of their lack of insurance, leaving government and charity to provide short term emergency relief but little in the way of well-planned or financed mechanisms for long term recovery.

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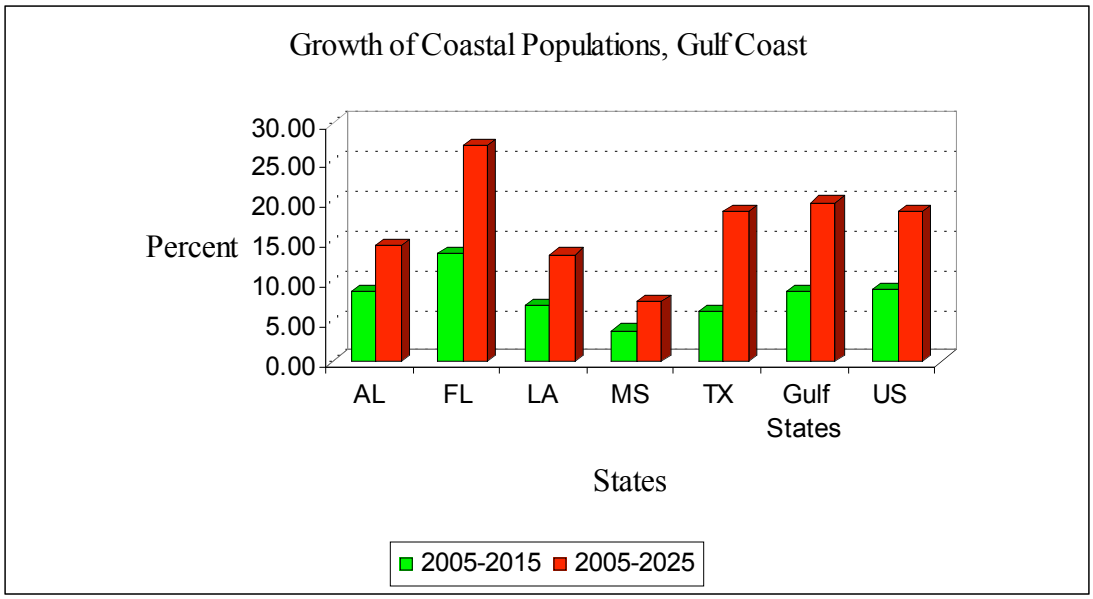
[2] Kunreuther (2000) presents a excellent overview of the insurance mechanism in the face of natural disaster risk.

[3] Jaffee and Russell (2003) provide a comprehensive summary of the economics of extreme event insurance, with special emphasis on natural disaster risk and terror risk.

Insurance and the Gulf Coast: Growing Vulnerablity

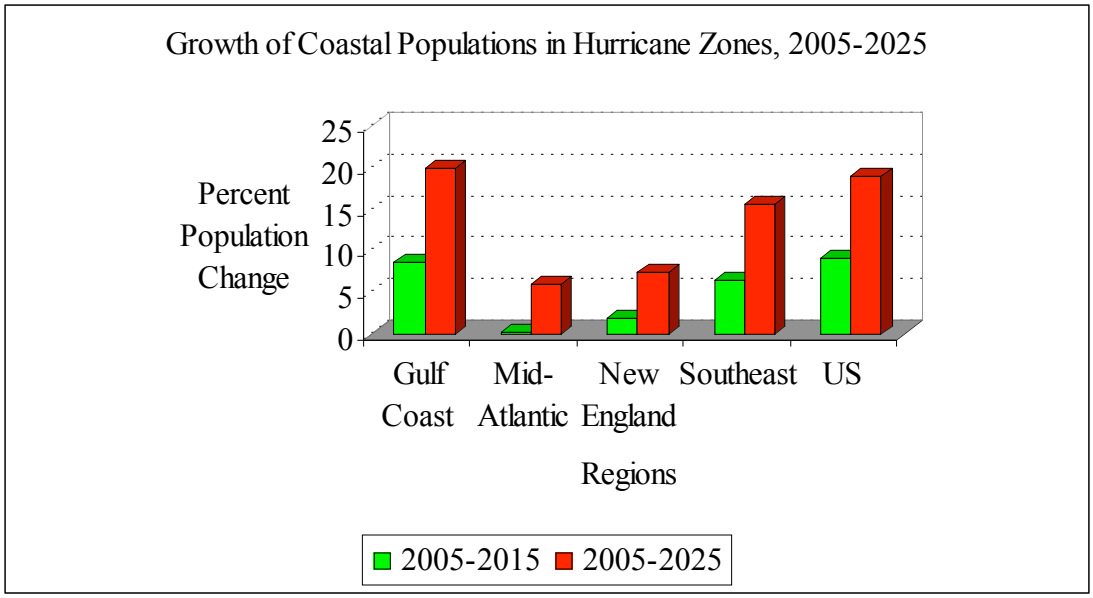
These basic problems with the economics of insurance in the face of catastrophe were ubiquitous along the Gulf in 2005, and are, sad so say, likely to get much worse over the next few decades. The scale of the problem is illustrated by the estimates of population and property growth along the Gulf and Atlantic Coasts between 2005 and 2025 presented in Figures One (a), One (b) and Two below. These estimates suggest that coastal populations along the Gulf will grow faster than the population for the United States while population growth along the Atlantic Coast, another part of the nation's hurricane zone, will fall short of that of both the nation and the Gulf.

Figure One (a)



Source: US Census Bureau – State Projections and author's calculations.

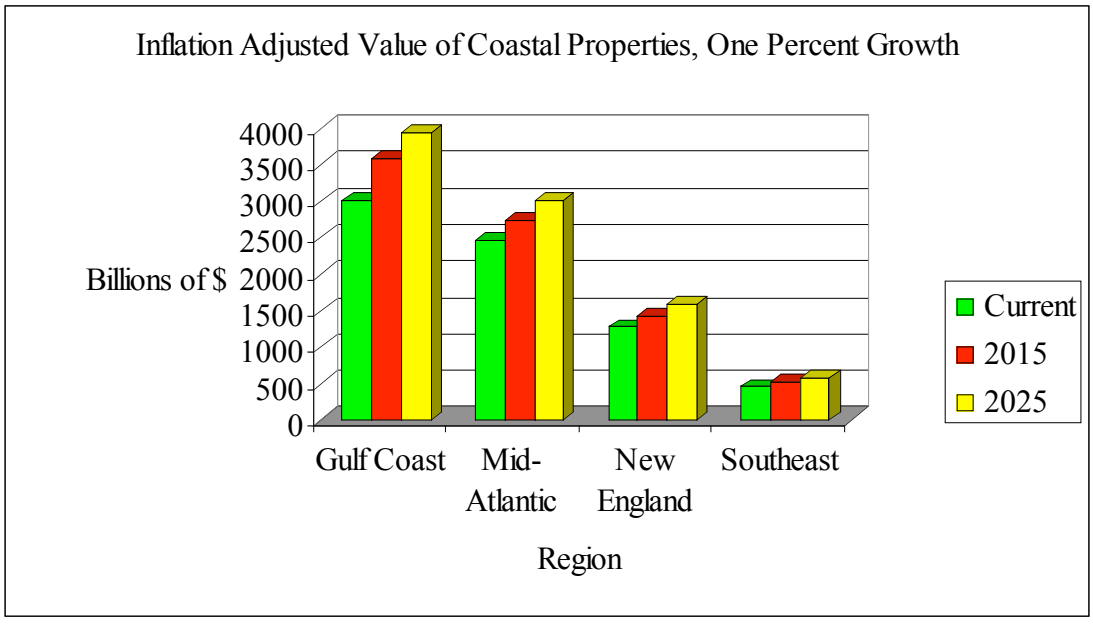
Figure One (b)



Source: US Census Bureau – State Projections and author's calculations.

Figure Two below shows the degree of coastal property exposure that will exist in 2015 and 2025 assuming that these properties grow by at a one percent real rate per annum between 2005 and 2025.

Figure Two



Source: AIR-Worldwide and Insurance Information Institute

These charts point to an unhappy future of risk and ruin in the hurricane zones, especially along the Gulf and southeastern coasts of the US. A growing fraction of populations from North Carolina south and west through Texas will make their home on the coasts at just the time that science suggests that climate change may generate more frequent and intense tropical storms and hurricanes in the decades ahead. This growing property and human exposure to extreme weather risk in hurricane zones reflects the uncomfortable fact that millions of people are ignoring these risks, in part because the price of insurance does not come close to accurately reflecting their potential for property losses in these dangerous regions.

The price of risk in hurricane zones is low for two reasons. First, far too many people fail to buy flood insurance in the hurricane zones despite the fact that hurricanes invariably generate substantial flood losses. While part of the problem is the well-documented capacity of human beings to underestimate the risk of big losses, most of the problem is that flood insurance coverage is voluntary. This is a curious public policy choice, not least because it occurs in the same country where drivers are required to carry automobile insurance to protect them against the risks associated with using their cars.

Hide and Seek

Second, the National Flood Insurance Program (NFIP) is a system of publicly provided flood coverage that fails to properly price risks or to operate as an insurance fund. The premiums charged by the NFIP are far too low to cover the risks of flooding, in part because rates are not set with regard to the reconstruction costs of exposed property but also because of a hidden set of transfers that deliberately subsidize high flood risk states by imposing excessive charges on low flood risk states. Table One below presents the level of average flood insurance premiums and payments between the year the NFIP first began operations in 1978 and December 31, 2004, when the most up to date figures were available prior to 2005 (thereby excluding the massive payments made in the wake of the 2005 trio of Hurricanes Katrina, Rita and Wilma).[4]

[4] One way to approach to this question is to use data from the Census Bureau and NFIP to construct an estimate of the cost of flood insurance that reflected flood risk exposures as well as the associated costs. One, admittedly imperfect, measure of risk exposure as well as the risk-adjusted price of providing insurance is suggested by NFIP data on the number flood insurance policies and premium payments by state. Table A-1 in the appendix provides these data as well as the average premium for NFIP flood insurance and the flood insurance coverage rate in 2004 while Table A-2 shows the total number of closed claims and total payments, by state, from 1978 through September of 2004. The flood claims data provides a reasonable estimate of the incidence of flood damage by state and thus the need for flood coverage: states with a higher fraction of total flood claim payments over the period 1978-2004 can be expected to be at greater risk of flood damage than those with a small fraction of total claims.

Table One below gives a sense of the extent of the cross-subsidies involved by calculating the average premium per policyholder than would have been paid by NFIP policyholders in each state had premiums been set on the basis of flood losses actually incurred between 1078 and 2004. The risk-adjusted premium presented in the third column of Table One is calculated by dividing the total payments made to residents in each state by the total number of claims made between 1978 and 2004. These numbers give only a very rough sense of the extent to which flood insurance prices would have to change in each state in order to properly price the risk of flooding as this is manifested in flood NFIP claims data over the life of the program.

First, the table suggests that a good many states enjoy substantial subsidies that understate the risk of flood losses. For instance, the gap between the $397 average premium in Texas in 2004 compared to the $2,610 premium suggested by the past claims payments flowing to Texas residents suggests that the federal government is willing to encourage migration to the Texas coast despite the considerable financial cost associated with floods. On the other hand, Texas' gain is paid for by a large number of states, *including Florida*, which would see a substantial decline in flood insurance premiums if the NFIP priced the risk of flood losses on an actuarially sound basis.

The purpose of this exercise is to estimate the cost of flood insurance if most at risk households were suddenly required to pay premiums. At the time, NFIP offered (and continues to offer) reasonably low cost flood insurance coverage to home owners at an average premium of $438 per policy (as of 2004). Further, 4,558,696 households (4.07%) in the US have flood insurance coverage. This may seem like a very small number until we realize that the risks of floods in, say, Wyoming are quite small compared to the brutal flood risks associated with hurricanes along the Florida and Gulf coasts. Yet, many flood prone regions had very low flood insurance coverage rates according to NFIP statistics. For instance, only 22.96% of households in Louisiana were covered by NFIP while 1.47% of households in Mississippi were covered in 2004, compared to a coverage rate of approximately 1.1% in Wyoming. Needless to say, this suggests that the people of Mississippi are terribly underinsured given the risk of coastal and inland flooding in the region compared to their counterparts in Wyoming. What would be a reasonable estimate of the cost of flood insurance per policy holder if all at risk households were to purchase insurance?

Table One

Current and Risk Adjusted Average Flood Insurance Premiums by State

State	Current Premium (2004)	Risk Adjusted Premium	Percent Change
Alabama	453.21	986.20	+117.60%
Alaska	609.75	188.46	-69.09%
Arizona	439.75	247.43	-43.73%
Arkansas	427.34	184.01	-56.94%
California	550.62	225.24	-59.09%
Colorado	611.75	81.20	-86.73%
Connecticut	734.18	524.62	-28.54%
Delaware	493.96	359.71	-27.18%
Florida	353.21	135.14	-61.74%
Georgia	497.37	284.44	-42.81%
Hawaii	334.11	190.13	-43.09%
Iowa	595.12	1,014.17	+70.41%
Idaho	102.61	26.31	+16.41%
Illinois	551.45	766.69	+39.03%
Indiana	557.43	395.49	-29.05%
Kansas	519.60	844.17	+62.47%
Kentucky	512.73	1384.31	+169.99%
Louisiana	453.34	731.93	+61.45%
Maine	639.95	608.03	-4.99%
Maryland	379.45	636.54	+67.76%
Massachusetts	779.04	869.51	+11.61%
Michigan	565.05	238.76	-57.74%
Minnesota	537.12	1,921.95	+257.83%
Missouri	605.10	3,031.61	+401.01%
Mississippi	446.54	1,055.88	+136.46%
Montana	492.18	254.30	-48.33%
Nebraska	502.19	1,010.26	+101.17%
Nevada	197.61	270.37	+36.82%
N. Hampshire	645.96	298.51	-53.79%
New Jersey	600.96	1,362.56	+126.73%
New Mexico	455.54	28.21	-93.81%
New York	692.77	591.99	-14.55%
North Carolina	484.16	987.24	+103.91%
North Dakota	498.06	4,162.13	+735.67%
Ohio	583.85	547.58	-6.21%
Oklahoma	478.87	1,158.39	+141.90%
Oregon	510.19	323.49	-36.59%
Pennsylvania	599.65	910.78	+51.89%
Rhode Island	836.09	266.29	-68.15%
South Carolina	469.76	457.58	-2.59%
South Dakota	553.74	742.47	+34.08%
Tennessee	513.74	513.53	-0.04%
Texas	397.23	2,610.29	+557.12
Utah	471.95	1,076.93	+127.13%
Virginia	461.46	2,170.89	+370.44%
Vermont	659.81	1,076.82	+63.20%

Washington	521.25	2,073.13	+297.72%
Wisconsin	547.02	1,010.42	+84.71%
W. Virginia	542.37	1,570.42	+189.55%
Wyoming	536.13	637.29	+18.87%

Table One also suggests that the majority of states in hurricane zones would see increases in flood insurance premiums if rates were set in accordance with the size and pattern of past losses: South Carolina is the only state within the hurricane zone whose NFIP premiums seem to reflect historical loss experience.

Of course, most homeowners would not care if flood insurance were priced on an actuarially sound basis because they do not buy flood insurance. Yet, the dramatic increases in the size of future coastal populations noted above strongly suggests that state governments have a powerful incentive to *require* homeowners living along the coasts to carry flood coverage, in part to promote the recovery of state economies from the consequences of flood damage caused by hurricanes. A mandatory flood insurance requirement is essentially a tax imposed to reflect the risks of flood losses that would not otherwise be included in the citizenry's calculations about where to live and work given the understandable reluctance of private insurers to cover flood risks. This type of taxation meets with the approval of economists across the political spectrum because it steps in where markets fail to properly account for the full costs of living and working in a flood-prone region like a hurricane zone.

Yet, a regime of mandatory flood insurance will substantially increase the amount spent on insurance in the hurricane zone, as illustrated by the numbers in Table Two. The second column of Table Two shows the level of homeowners payments in each hurricane zone state in 2004 while the third column is the sum of homeowners' (HO) premiums and NFIP premiums in the same year. The fourth column of Table Two is the sum of HO and flood premiums if homeowners in the coastal counties of hurricane zone states were required to purchase NFIP insurance priced on the (more) actuarially sound basis in Table One above while the final column is the percentage increase in the combined insurance cost of living along the coast that would obtain if flood insurance were mandatory.

Table Two

Insurance Coast of Living in the Hurricane Zone:
Current NFIP System and Mandatory Flood Insurance System

State	HO[5] (millions)	HO and NFIP	HO and Mandatory Flood[6]	Percent Change
AL	$917.279	$933.132	$1,092.970	17.13%
CT	789.231	808.311	1,094.213	35.37%
DE	131.233	139.264	221.393	58.97%
FL	4,496.132	5,110.658	5,090.675	-0.39%
GA	1,407.408	1,440.265	1,742.982	21.02%
LA	925.022	1,080.272	1,213.774	12.36%
ME	239.463	243.27	395.408	62.54%
MD	1,021.712	1,039.704	1,380.817	32.81%
MA	1,249.307	1,272.330	1,992.998	56.64%
MS	545.492	562.604	662.288	17.72%
NH	238.022	240.928	264.102	9.62%
NJ	1,476.516	1,578.002	3,038.550	92.56%
NY	3,192.467	3,249.912	4,632.835	42.55%
NC	1,345.637	1,393.319	1,564.016	12.25%
RI	201.894	209.975	272.718	29.88%
SC	848.922	914.922	959.391	4.86%
TX	4,519.565	4,689.561	7,662.521	63.40%
VA	1,215.501	1,251.198	1,820.091	45.47%

Table Two contains quite a few surprises. First, a program of mandatory flood insurance would have its largest effects on the insurance cost of owning homes in New England, the Middle Atlantic states – especially New Jersey, Delaware and Massachusetts – and, of course, Texas. Second, other states along the Gulf coast would experience far smaller increases in the insurance cost of home ownership and one state, Florida, could actually see a slight decline in cost. Third, an actuarially sound pricing system for flood insurance would shift the cost of an expanded and mandatory national flood insurance program onto (1) high income states like New Jersey, New York, Massachusetts and Maryland while (2) forcing Texas to bear the cost of potential flood losses in proportion to the benefit received therefrom. Taken together, this calculation suggests that the cost of living in coastal areas would rise substantially in many states under a system of mandatory flood insurance for homeowners, but that New England and the Middle

[5] The Insurance Fact Book (2005), Insurance Information Institute.

[6] The mandatory flood total was calculated by multiplying the number of housing units in coastal counties within each state by the average NFIP premium presented in Table Three in the text. This figure is a lower bound on the estimated cost of mandatory flood insurance because it *underestimates* the higher risk of flood losses along the coastal regions of each state.

Atlantic region, along with Texas, would face the greatest financial costs in adjusting to an economically rational system for pricing risks exposures along their respective coastlines.

Socializing Risk

The structural flaw in the property-casualty insurance system noted above is usually overcome by socializing risk in some manner, typically by regulating insurance markets in ways that make insurance less expensive to buyers at the same time that risk is transferred more widely than would occur if markets were left to themselves. But regulation introduces its own problems that can make matters worse, especially when policies attempt to increase the affordability of insurance by reducing the capacity of the market price of insurance or, where appropriate, the tax price of protective capital to reflect the frequency and severity of catastrophes.

Insurers regularly complain that states suppress insurance prices, thereby preventing prices from accurately reflecting the cost of providing financial protection while also reducing insurer incentives to supply sufficient amounts of insurance capital. States, in turn, try to offset the profit consequences of rate regulation by allowing insurers to reduce the cost of claims by writing very complex and stringent insurance contracts that effectively limit insurer liability, as well as various mechanisms that permit insurers to earn high returns on some lines of business, thereby offsetting low returns in other lines.[7] State regulators also have to weigh the benefits of lower insurance costs to home and business owners, contractors, real estate enterprises, banks and other stakeholders in markets for residential and commercial development, against the short and long term costs associated with excessive exposure to risk and inadequate supplies of insurance capital in the face of stringent price suppression. Regulation that results in low insurance prices relative to expected claims costs due to the frequency and severity of losses is a terrible policy that invites people to accept risks that they cannot bear on their own.

[7] Consider the extent to which insurers have been able to earn high profits in auto insurance to offset the abysmal returns associated with homeowners insurance over the past five years or so. While there is little doubt that this pattern of returns is driven by the underlying fundamentals in different lines of business, as well as by technological improvements in automobile safety, road design and other determinants of the size of auto insurance loss costs, the persistently high rate of return to auto insurance should, at least in competitive markets, lead to a gradual increase in the supply of insurance as well as a decline in prices. Basic economic theory suggests that high profits will fail to result in falling prices if markets are not competitive, and the high degree of concentration in insurance markets – especially in both homeowners and auto insurance lines in the Gulf as measured by the Herfindahl index – strongly suggests that regulators may tolerate oligopoly is some lines of business as an indirect subsidy to insurers facing tighter price controls in other, politically sensitive lines of business. Of course, academic research into the political economy of the insurance sector is limited, but this set of connections is certainly worthy of serious study in the insurance academy, and beyond.

Catastrophe will force governments to find ways to finance losses by some other mechanism than rationing-by-price in the relevant market, thereby granting a de facto subsidy to stakeholders affected by insurance prices while imposing hidden, or perhaps not-so-hidden levies on others similar to those associated with the National Flood Insurance Program's system.

One curious method of providing homeowners' insurance is Florida's system where the state is the insurer of last resort – via Citizen's Property Insurance Corporation – when even regulated private insurance is prohibitively expensive for substantial numbers of middle class homeowners. Insurers have drastically reduced the supply of homeowners' insurance in Florida in recent years in response to the outsized losses visited upon them by the hurricanes of 2004 and 2005 as well as by the hardening scientific consensus concerning the frequency and severity of storms likely to follow from global warming. Rising insurance premiums and falling availability have pushed the state to provide homeowners' insurance to approximately 16% of homeowners.[8] This is, of course, de facto socialism in the homeowners' insurance market, though the conservative political forces in control of government in the state would never admit to the economic realities following on the failure of the private sector. Still, the fact remains that private insurance cannot and will not provide insurance to a substantial number of homeowners given the high and rising cost of homes in the state as well as growing populations, rising population density and the expected escalation in the number and power of storms due to climate change.

A recent study of policies to mitigate the costs of storms in order to reduce skyrocketing insurance costs in Florida notes that insurers will offer affordable insurance to homeowners when government and various private sector stakeholders take actions that reduce the scale of insured losses, as stark a recognition of the fact that private insurance runs away from catastrophe risk as one is likely to find.[9] The study's many recommendations – including everything from strengthening Florida's already very stringent building codes to a regular system of home inspections and tax-based subsidies to homeowners electing to "harden" their homes to storm damage by retrofitting their residences – are, taken together, a demand for homeowners and property owners to bear a greater share of weather risks in the hope that private insurers can be enticed to once again supply risk capital to insurance markets at reasonable rates. The withdrawal of private insurance from Florida's homeowners' insurance markets and the aforementioned study have come to the same conclusion: homeowners choosing to live on the Florida coast are making a very risky and expensive choice that they can either bear directly (in the form of hardened homes or living without any insurance) or indirectly (in the form of very high premiums).

As a practical matter, insurers and governments along the Gulf Coast are telling the region's people that they live in an extremely risky region, so much so that millions of

[8] Insurance Fact Book (2005) Insurance Information Institute.

[9] 2007 Windstorm Mitigation Study Committee, Report to Florida Legislature: March 6, 2007.

them cannot afford to bear the risks they face. This puts government in the very difficult position of either replacing markets by becoming the insurer of last resort or standing by while homeowners and businesses are abandoned by markets in the face of escalating weather risks, with the near certainty that exposed regions will slip into long term economic decline. The Florida Windstorm Mitigation Committee's report makes a number of additional recommendations about the need for the state to strengthen water/weather infrastructure in order to reduce the scale of losses associated with storms, thereby effectively shifting the burden of storm loss mitigation onto the public purse in the forms of a mixture of higher taxes, increased debt loads and reduced public services. But Florida's decision to act as an insurer of last resort as well as to finance costly infrastructure investments simply shifts the burden of carrying storm losses without addressing the fundamental problem of limiting the extent of losses by limiting the degree to which Floridians are exposed to extreme weather risk.

Practical business people in Florida and along the Gulf Coast would respond to this point by noting that either state governments carry some of the burden of extreme weather risks by subsidizing insurance, directly providing insurance and building infrastructure, or permit the populations and economies of their states to shrink in the face of weather risk. However, hard nosed economics strongly suggests that there are sharp limits to what a state can and should do to promote economic development in risky areas. The opportunity cost of providing cheaper insurance and storm infrastructure to large populations induced to live in coastal areas by the suppression of insurance prices must inevitably rise over the next two decades if, as climate scientists suggest, the frequency and severity of extreme weather events along the Gulf rises. A repeat of the sequence of catastrophic storms like those in 2004 and 2005 could wipe out any insurance funds created by state governments to provide homeowners insurance, thereby forcing governments to either raise taxes or cut services in other areas in order to pay claims.

Any sensible government must weigh the benefits of government provided windstorm insurance against the long-term costs of both higher taxes and reduced spending in such important areas as education, health care, and other and public investment in other areas. This very difficult calculation is likely to lead to a very unpleasant conclusion: Florida, and other states along the Gulf Coast, would be well advised to limit coastal development so that the benefits of growth match the full costs of providing protection for homes and businesses as reflected in high and unregulated insurance prices or the full long term costs in terms of foregone investments in human and public capital in other areas of public policy as well as the costs of taxation required to pay claims via a state insurer of last resort. This dismal conclusion means that growth in coastal areas should be limited in the interest of economically rational risk management, and will be most unpopular with the public. One suspects that recurring episodes of severe property and human losses in the aftermath of increasingly frequent and severe storms is likely to prove even less popular with a public that is being lured into harm's way by the current wrongheaded public policy regime.

The Federal Role and Policy Recommendations

The federal government has an especially important role to play in crafting risk management policy along the Gulf Coast in the face of market and government failure in the region.

All federal policy in this area must be based on the proposition that all lives are of equal value and are therefore subject to equal protection against storm or terror-based catastrophe risks.[10] This proposition is quite unexceptional in other areas of economic and social policy, where policy in enjoined to protect the lives and rights of all members of the community with equal fervor and, in some cases, to promote maximum possible degrees of equal opportunity for development and participation in such areas as education, working and voting. The fact that persistent economic inequalities and inequality-producing customs and conflicts across racial and class lines prevents our society from promoting equal treatment and equal protection under the law does not and cannot be an excuse for government policy to ignore these imperatives in any area of policy, including extreme weather and climate risk management. Indeed, government policies in areas as diverse as education, health care, labor market policy, housing and public safety are constantly re-designed and evaluated to overcome the obstacles to equal protection and opportunity posed by structural inequalities. Yet, government policy must take full advantage of the power of the price mechanism to properly price risk, where possible, while stepping in to promote both efficient and equitable arrangements when markets fail.

Contemporary climate risk arrangements along the Gulf leave much to be desired from both an efficiency and equity standpoint, though the foregoing analysis has focused on efficiency to the neglect of fairness. Yet, the experience of the Gulf post-Katrina has been a graphic demonstration of how and why market failure in matters of insurance not only contributes to economic calamity but exacerbates the most vicious forms of social injustice by completely offending the principle that public policy must treat all persons as of equal value. The suppression of insurance prices in the interest of economic development encourages people to take risks with their lives and property which they cannot bear, yet there are millions of men and women who are so poor and of so little

[10] The principle that all lives are necessarily of equal value before the law in the liberal state has a very long history in political philosophy, despite the great gap between the stated principle and practical politics. Thinkers as different and opposed as Dworkin, Rawls, Nozick, Hayek, Nagel, Sen and G.A. Cohen all agree that this principle is a cornerstone of any coherent form of liberal political theory, law or liberal practice, no matter the sharp disagreements between classical liberals (Hayek, Dworkin), libertarians (Nozick), or egalitarians liberals (Sen, Cohen). See Sen (199s) for a detailed assessment of the core concepts of equality that unite liberals across divisions that runs from right-libertarians and classical liberals all the way to egalitarian liberals leftward to left-libertarians.

value in the eyes of local elites and ruling coalitions that they can neither afford to buy private insurance nor are they offered any social protection from Nature's fury.

The economic growth of the Gulf Coast exposes millions of poor people – native and foreign born, with and without formal citizenship rights, of all colors and ethnicities – to severe risk of lost lives, family, community and property by virtue of their poverty and outcast status. Communities whose growth and development are marred by high degrees of economic inequality in the face of extreme weather risk create significant populations of vulnerable people as a byproduct of the ordinary rhythms of commercial activity and racial/caste conflict. This class and caste based vulnerability is just another type of negative externality that has lethal consequences for the weakest members of the community when disaster strikes. Homeowners and business owners induced to live and work in high-risk regions by the distorted information about risk and loss transmitted by prices in regulated insurance markets offer low wage work to legions of desperate people in this country, thereby continually recreating circumstances of risk and loss for people who have few choices.

Social Justice Requires "Getting the Prices Right"

This tangle of difficulties can be overcome by the federal government's application of simple economics and modern mathematics.

The first suite of recommendations involves dramatic changes in the pricing of flood risk. The federal government should adopt Howard Kunreuther's recent proposal to make flood insurance mandatory for all property owners – particularly home and apartment owners, as well as all local governments managing public housing units.[11] Further, the National Flood Insurance Program should set premiums based on actuarially sound calculations of losses, without any regional cross-subsidies. In addition, flood risk calculations should not only be based on past losses, but should also include an element of projected losses linked to estimates of storm frequency and severity based on the best understanding of climate scientists, engineers and actuarial mathematicians as incorporated into the projections of catastrophe modelers. State laws prohibiting the use of catastrophe models in establishing insurance premiums should be banned as impediments to the efficient pricing of risk in an era of climate change.

The second suite of policies involve new ways of incorporating the vulnerability of poor people into the risk pricing mechanism. Contemporary computational economics and actuarial science are as capable of estimating the risks that climate change poses to the lives and well being of the uninsured as the risks facing the insured – but do not for obvious reasons. NFIP as well as the federal government should first calculate the

[11] Howard Kunreuther's proposal is summarized in a recent *New York Times* opinion piece, "Who will Pay for the Next Hurricane?", August 25, 2007. A detailed analysis of the economics of compulsory natural disaster insurance as part of a comprehensive national natural disaster is developed by Kunreuther in "Has the Time Come for Comprehensive Natural Disaster Insurance?*"* in Daniels, Kettil and Kunreuther (2006).

frequency and severity of property and human losses that extreme weather poses to poor people and then impose an insurance surcharge on both wind and flood premiums that reflects the vulnerability of poor people to weather risks. At a minimum, the proceeds from this "poverty weather risk tax" should accumulate in a special fund, managed by regional consortia monitored by the federal government, which can be used to finance investments in infrastructure that increase the weather security of the poorest residents in the area.

This policy would accomplish three goals. First, it would force all property owners to take account of extreme weather risks as they make location and business decisions on the basis of prices that accurately reflect near and longer-term losses. Second, these policies price an important but neglected negative externality – the exposure of vulnerable poor and outcast populations to weather risk – flowing from the self-interested behavior of consumers, producers and governments in societies with high degrees of economic inequality. Third, a sharp and permanent increase in the price of insurance in more risky relative to less risky regions would force local and regional governments to invest in and maintain water and weather infrastructure as a condition of economic survival in a competitive national and global economy.

There is little doubt that local elites and their publics will object to the proposed regulations because this portfolio of policies will so raise the cost of doing business in risky regions that population centers will move to safer ground. Indeed, the policy portfolio offered above is distinctly anti-populist to the extent that beautiful shorelines in risky areas will become so expensive that only the rich can afford to pay to protect themselves from disaster – so long as an anti-tax, anti-government ethos limits public investments in protective capital capable of providing real climate security for large populations of middle income and poor people. Yet, economic reason and the principle of the equal worth of citizens compel the federal government to impose an expensive regime of market-based risk pricing, large-scale infrastructure investment and tough building codes on localities and states all too willing to allow racial animus and economically illiterate forms of greed to result in large concentrations of vulnerable persons and property. Rare though it may be, this is one instance where government policies can promote both equality and efficiency by "getting the prices right" and forcing communities to address the ways that ordinary business activity and racial/class fighting expose the most vulnerable populations to dangerous weather. Above all, the federal government can never allow nor assist local concentrations of power and hatred bent on using natural disasters as mechanisms for racial "cleansing".

Restatement of Principles

Safety and equality are tightly connected in liberal democratic societies committed to the principle that all lives are of equal value and are therefore worthy of equal protection against extreme weather risk. The structural inequalities in economic opportunity, political power and social status that are the source of unequal exposure to weather risk must be corrected by forcing stratified societies to both recognize the role of markets, customs and raw political power in creating vulnerable populations, and force dominant

social groups in these communities to extend the circle of protection to include all of the community's members.

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