

MIAMI-DADE COUNTY FINAL OFFICIAL MINUTES Miami-Dade Sea Level Rise Task Force

Stephen P. Clark Government Center
111 N.W. 1st Street
10th Floor Conference Room
Miami, Florida 33128

February 11, 2014
As Advertised

Harvey Ruvin, Clerk
Board of County Commissioners

Christopher Agrippa, Director
Clerk of the Board Division

Maryse Fontus, Commission Reporter
(305) 375-4906



**CLERK'S SUMMARY AND OFFICIAL MINUTES
MIAMI-DADE COUNTY SEA LEVEL RISE TASK FORCE
FEBRUARY 11, 2014**

The Miami-Dade County Sea Level Rise Task Force (Task Force) convened a meeting on Tuesday, February 11, 2014, at the Stephen P. Clark Center, 111 N.W. 1st Street, Miami, Florida, at 10:00 a.m. Present were Honorable Clerk of Courts Harvey Ruvin, Task Force Chairman; and members Mr. David Enfield, Ms. Sara Fain, Mr. Arsenio Milian, and Mr. James Murley; Mr. Willard T. Fair was late; (Mr. Jorge Gonzales was absent).

In addition to the Task Force members, the following staff members were present: Ms. Nichole Hefty, Chief, Office of Sustainability, Planning Division, Miami-Dade Department of Regulatory and Economic Resources (RER); Ms. Debbie Griner, Sustainability Initiatives Coordinator, Office of Sustainability (RER); Assistant County Attorney Christopher Angell; Ms. Elizabeth Soto, Executive Assistant, Clerk of Courts; and Deputy Clerk Maryse Fontus.

I. Welcome and Introductions

Chairman Ruvin called the meeting to order at 10:10 a.m., and welcomed all of the participants. He asked Ms. Hefty, Chief, Office of Sustainability, Planning Division, Miami-Dade Department of Regulatory and Economic Resources (RER), to call the roll.

Following the roll call, Chairman Ruvin noted a quorum was present. He asked the members of the audience to introduce themselves.

II. Approval of Meeting Minutes

Chairman Ruvin called for a motion to approve the minutes of the third meeting of the Task Force.

It was moved by Mr. James Murley that the minutes of the December 20th, 2013, Sea Level Rise Task Force meeting be approved, as presented.

This motion was seconded by Mr. David Enfield, and upon being put to a vote, passed by a unanimous vote of those members present.

Chairman Ruvin announced that a website had been created for the Sea Level Rise Task Force that contained all of the past presentations, and minutes of the meetings. He said that if any of the participants wished to post items from their agencies on the website they should coordinate with his office.

III. Mr. Mark Way and Mr. Alex Kaplan – Swiss Re America Holding Corporation

Chairman Ruvin noted the importance of understanding how sea level rise impacted the business community. He explained that the insurance industry was keenly aware of this issue and referred to a report from the Geneva Society, a very prestigious think-tank, which determined that the insurance industry could no longer rely on historic data to set rates or assess risk; it now had to rely on predictive data. Chairman Ruvin said this highlighted the urgency of implementing a plan to ensure that Miami-Dade remained insurable. He indicated that this was the reason he had reached out to Swiss Re, an organization that had been heavily involved in trying to propose solutions to this problem. He introduced Mr. Mark Way and Mr. Alex Kaplan who graciously accepted to make presentations on behalf of Swiss Re.

Mr. Mark Way, Director of Sustainability, Swiss Re, thanked the Task Force for the invitation to present Swiss Re's work on this issue. He said that Swiss Re shared the Task Force's concerns regarding climate change and sea level rise. He recognized that Miami-Dade was highly exposed to these issues, noting the insurance industry was also vulnerable. Mr. Way stressed the importance of building resilience, noting the insured losses for the global insurance industry in the 1980s totaled \$6.4 billion per year for weather-related impacts; however, during the first decade of this century, this amount had risen to \$40 billion. In addition, events such as Hurricanes Katrina and Sandy caused the industry multiple billions of dollars in loss,

said Mr. Way; therefore, Swiss Re took these issues seriously, and had invested time and resources to find solutions.

Chairman Ruvlin noted Mr. Willard Fair's arrival.

Mr. Way said that his presentation would include Swiss Re's approach to climate change; and research that the company had been conducting since 2008-2009 to assess the cost of adapting to severe weather impacts. He noted the aim of this research was to offer a methodology that could be used by local communities to design their own climate adaptation strategy. Mr. Way said that Mr. Kaplan would then present an overview of how governments were starting to integrate some of the insurance industry's new risk management approaches into their strategies to address the risks associated with natural catastrophes.

Mr. Way noted Swiss Re had been involved in the climate change debate for over 20 years, and this led to Swiss Re's climate change strategies with four components: assess and manage the risk; seize business opportunities; influence the business environment; and lead by example. Mr. Way indicated that Swiss Re had on-going research projects and collaborated with the scientific community to assess the risk. He noted it was crucial to convince the business community of the importance of identifying solutions to climate change. Mr. Way said that it was also important to determine Swiss Re's role in promoting the development of an international agreement to address climate change. Finally, he noted Swiss Re was striving to reduce its emissions per employee, and provided financial incentives for staff to invest in low carbon technology to minimize the company's carbon footprint.

Mr. Way displayed the Federal Emergency Management Agency's (FEMA) flood insurance rate maps for the five New York City boroughs and compared them to Hurricane Sandy's footprint, noting the discrepancy between the 100-year floodplain in blue and the inundation area due to Sandy in red. He pointed out that even though these maps were being updated, they still did not take into consideration the future of sea level rise.

Mr. Way then presented the results from Swiss Re's research to assess the cost of adapting to severe weather impacts. He explained that the research's objectives were to provide decision-makers with the facts and methods necessary to design and execute a climate adaptation strategy; and to offer an approach that would help decision-makers think through climate change issues. He said that the company followed a rigorous risk management approach to assess local total climate risk, and proposed and prioritized a basket of adaptation measures to address total climate risk on an economic basis. Mr. Way noted this methodology had been tested over the last six years in 18 regions around the world, and had produced some very interesting findings. He said that in the original eight locations studied during the first phase of the project, the annual expected loss from severe weather events was the equivalent of between 1 and 12 percent of local gross domestic product (GDP). Mr. Way pointed out that even if these estimates were partially accurate they demonstrated the potentially huge impact of climate change.

Mr. Way noted one of the initial regions studied was South Florida, because Swiss Re wanted to test the methodology against hurricane risk. He said that the study focused on three of the most populated and economically successful counties in the State: Miami-Dade, Broward and Palm Beach. Mr. Way pointed out that it was not possible to rely on historical data for this type of research; rather, it was necessary to use predictive scenarios. He said that the expected losses by scenarios and by hazard ranged from \$17 billion, or 8.5 percent of GDP in 2008 to \$33 billion or 10 percent of GDP in 2030.

Referring to the study conducted in New York City last year, Mr. Way said that the risk of sea level rise and altered hurricane frequencies significantly increased the expected annual losses in that location. He noted the potential losses could range from \$1.7 billion today to \$4.4 billion in 2050. Mr. Way indicated that the losses could be aggregated at the zip code level from today to 2050, noting it was estimated that by 2050, 90 percent of power stations would be in a 100-year floodplain zone.

Mr. Way noted the study identified the most cost-effective ways to minimize loss. He presented a resilience (adaptation) cost curve, and explained that in an ideal situation the cost-benefit ratio would be below 1.0. He noted the cost/benefit curve in the three counties of South Florida demonstrated that approximately \$30 billion of total expected loss in 2050 could be averted if adaptation measures were adopted. Mr. Way said that Swiss Re developed a list of adaptation measures that could be adopted in any given location, noting climate risk was best tackled with a portfolio of adaptation measures. He indicated that the purpose of insurance would not be to prevent the loss, but rather to provide funding to rebuild.

In conclusion, Mr. Way noted the study suggested that in every location throughout the world, currently available measures could help to massively reduce the expected losses between 40-68 percent. However, he pointed out that risk transfer may be more cost efficient than physical measures in addressing low frequency events, such as the disaster in the Gulf Coast. He referred the members of the audience to Swiss Re's website if they wished to find out more about this study.

Mr. Alex Kaplan, Vice President of Global Partnerships, Swiss Re, discussed the insurance industry's role to close the massive financial protection gap between the insured and the uninsured losses. For example, in 2011 \$403 billion worth of losses occurred due to natural and man-made disasters, and only \$126 billion was covered by insurance, noted Mr. Kaplan. He stated that homeowners, corporations and governments paid the difference.

Mr. Kaplan stressed that disasters placed a significant burden on the public sector, and governments were struggling with how to pay for the losses. He said that in order to pay for these losses governments could raise taxes, take money away from other projects, or issue debt post-event. However, he pointed out, these were inefficient ways to pay for costs that could be anticipated, and pre-financed. Mr. Kaplan noted the inclusion of instruments into the overall risk financing strategy before a catastrophic event allowed homeowners, corporations and governments to have liquidity, or cash on hand to fund the recovery.

Mr. Kaplan explained why Swiss Re decided to undertake work around the globe to close this financial protection gap. He noted the company was in the reinsurance business, which meant that it provided insurance for insurance companies; therefore, it absorbed global risks. Mr. Kaplan said that Swiss Re also insured major corporations. He recalled that in 2004, 250,000 people died as a result of the Sumatra earthquake and Tsunami; however, less than \$7 billion was available to pay for the recovery. He compared this disaster to Hurricane Katrina, in which the insurance pay-off was \$50 billion, although there were approximately 2,000 deaths. Mr. Kaplan explained that these two events were the impetus behind Swiss Re's decision to undertake this work around the globe. He said that in cooperation with governments, the World Bank and non-governmental organizations (NGOs), the company began implementing structures to transfer the risk from the tax payers to the private capital markets.

Mr. Kaplan presented the Caribbean case studies, noting these countries experienced tropical cyclones and hurricanes every year. He explained that 16 CARICOM countries pooled their resources into a common fund for potential catastrophes. Mr. Kaplan said that the program had been in place since 2006, and offered parametric hurricane and earthquake insurance policies to participating governments. He noted it was one of the largest cash infusions to the Haitian government after the earthquake.

Mr. Kaplan presented the Uruguayan case study, noting this country was highly dependent on hydro-production. He explained that this country had been suffering from drought, and the insurance payments were to be used to purchase energy from alternative sources when drought conditions caused lack of hydro-power. Mr. Kaplan said that Swiss Re worked with the World Bank to design a structure to evaluate the amount of rainfall and produced a payout.

Mr. Kaplan presented the United States case study, noting the government of Alabama was the first in an industrialized country to receive a parametric insurance cover to offset the economic costs of hurricanes. He explained that if a Category 3 storm or higher passed through a defined geographic area along the coast it triggered a payout to the State.

Mr. Kaplan presented the Haitian case study, noting micro-insurance institutions offered lending to micro-entrepreneurs. He said that if a natural disaster occurred the borrower might lose his/her business and be unable to repay the loan. Mr. Kaplan explained that payments were made to microfinance borrowers post-disaster through the program to reduce their loans, provide emergency cash, and recapitalize a new loan.

Mr. Kaplan pointed out that the program provided macro-insurance to governments and micro-insurance to micro-entrepreneurs, thus attacking the uninsured risk at both ends of the spectrum.

Mr. Kaplan presented the Miami-Dade County public schools case study, noting the public school system recently implemented a hurricane program to protect itself against windstorms and associated floods. He said that this was a customized multi-year structured risk transfer, which provided budgetary certainty.

In conclusion, Mr. Kaplan emphasized that disaster risk financing was a priority on the global agenda. He said that the role of financing mechanisms should be in the menu of options that groups such as this Task Force consider to build a resilient community.

Chairman Ruvlin asked the Task Force members if they had any questions.

Mr. Enfield noted it was projected that sea level rise could range from two to 15 feet by 2100. He asked at what point would vulnerable properties, such as the ones along the South Florida coast, be considered uninsurable, or at what point would the premium become unaffordable.

Mr. Way noted if a risk was a certainty it was uninsurable, which is the reason sea level rise itself was not insurable. He said that if the level of the sea rose to 15 feet by 2100, and nothing was done to keep the homes and buildings insurable, it would be impossible for the insurance industry to continue providing its services. Mr. Way pointed out that Swiss Re wanted to ensure that it would be able to continue to offer its products; therefore, it was in its interest to hold the risk at an acceptable level.

Referring to Mr. Way's statement that sea level rise was not insurable because it was a certainty, Mr. Murley noted this was possibly not applicable to South Florida which had a porous terrain, and where it was possible to envision a scenario in which there would be no storm, yet there would be flooding.

Mr. Way emphasized that no insurance company would sell a policy against sea level rise, because there was no randomness to this event.

Mr. Kaplan noted the insurance industry had the following guiding concept: "In order for something to be insurable, it must be predictable and random".

Chairman Ruvin pointed out that this statement was at the heart of the Task Force's charge; sea level rise was inevitable, but to ensure that the community remained insurable it was important to begin implementing a plan. He said that going forward the Task Force would like to recommend a process to implement a robust capital improvement plan, which would allow the community to adapt to sea level rise. Chairman Ruvin noted the challenge was to demonstrate to the business community that this was a business decision, which required investment over a reasonable period of time. He said this was the reason he wanted to encourage Swiss Re and the insurance industry as a whole to participate in the planning process and thus have ownership in that plan.

Ms. Fain said she believed that the decisions taken by the federal and New York governments after Hurricane Sandy to rebuild what was destroyed were reactive. Referring to the map shown by Mr. Way depicting the 100-year floodplain versus Hurricane Sandy's footprint, she asked at what point Swiss Re would recommend that certain infrastructure not be rebuilt because they were no longer insurable, as the risks were no longer random.

Mr. Way noted this was being done in New York where the government was buying out some of the properties that were highly exposed and no longer insurable. He said that should the predictions regarding sea level rise materialize to their full extent, it would have to be recognized that some

properties were not worth keeping as they would be uninsurable; hence, the necessity to create certain plans to prevent this from happening. Mr. Way pointed out that generally the funding flows to the last disaster, and this was not the optimal approach to risk management. He said that the funding should be used in a pro-active manner to ensure that if a disaster were to happen it would not have such a severe impact.

Ms. Fain recalled how devastating Hurricane Sandy was, noting when officials reacted to such an event, they made the wrong decisions. She said that the laws and structure were in place to make the right decisions, but it would be necessary to have the political will to make hard decisions.

Referring to the cost/benefit curve presented by Mr. Way, Mr. Millian asked for the rationale behind some of the adaptation measures recommended for Miami-Dade County.

Mr. Way said that they were based on expert opinion. Nevertheless, he emphasized the importance of securing the community's consent before implementing these measures, noting in the study, the decisions were made after consulting local experts.

Mr. Millian highlighted the necessity of convincing the commissioners and other officials that it was important to begin implementing a plan now to avert major loss in the future.

Chairman Ruvin announced that Mr. Christopher Agrippa, Director, Clerk of the Board Division, had just joined the meeting.

Ms. Karen Bolter, a member of the public, noted the majority of subsidies were being given to coastal properties in high-risk areas. She asked what could be done if property values were limited by insurance rates.

Mr. Way pointed out that it was necessary to give the property owner an accurate view of the risk.

Mr. Kaplan said that the National Flood Insurance Program (NFIP), through which the federal government subsidized the rates, was the second biggest liability of the US government, and the program was \$24 billion in debt.

Responding to a question from Ms. Julie Dick, a member of the public, as to whether incentives could be provided to property owners to improve their properties' resilience, Mr. Kaplan explained that in evaluating a portfolio, the insurance company considered the building, the historical losses, the risk profile, and all of these factors were reflected in the rates.

Ms. Laura Reynolds, a member of the public, pointed out that it was crucial for property owners to decide how much they should invest to take into account the risk of sea level rise.

Mr. Kaplan observed that the insurance industry was the only industry in which both the buyer and seller were on the same side of the transaction and had an interest in considering the same factors to eliminate risk.

Discussion ensued between Captain Dan Kipnis (a member of the public), and Mr. Kaplan as to whether it would make more sense to insure areas that were at great risk differently; to consolidate all of the homeowners insurance policies into a multi-peril policy; and to provide the funds to homeowners to move if their homes were severely damaged due to sea level rise.

In response to a question by Ms. Lauren Ordway, a member of the public, as to whether eco-systems could be integrated into the economics of climate adaptation, Mr. Way said that Swiss Re staff became keenly aware of this issue when they were working in the Gulf Coast, because one of the measures which they were considering was wetlands restoration. He said that from a purely economic point of view, it was possible to value the wetlands as a barrier to storm surge; therefore, it could be seen as a loss reduction investment, although it was not possible to assess the full value of that investment. Mr. Way noted Swiss Re was working with the environmental community to discourage the development of properties in the most environmentally-sensitive locations.

IV. Mr. Jeb Brugmann, former Secretary General, ICLEI – Local Governments for Sustainability

Chairman Ruvin introduced Mr. Jeb Brugmann, former Secretary-General, International Council for Local Environmental Initiatives (ICLEI), and current President, ICLEI's US Branch.

Mr. Brugmann thanked Chairman Ruvin for inviting him to present his research regarding how to motivate the real estate and property development community to make decisions that consider sea level rise, even though they would not bring a return on their investments immediately. He noted city builders had traditionally innovated and designed robust capital improvement plans in high-risk contexts. Mr. Brugmann said it was important to learn from that experience to address the risk of sea level rise in a manner that was responsive to the unique vulnerabilities of different communities within a metro area.

Mr. Brugmann pointed out that city developers did not place a high priority on natural risks when designing cities. He said that the market system did not encourage investment decisions based on catastrophic risks, and referred to San Francisco as an example, noting it was extremely vulnerable to the risk of earthquakes, even though it benefited from robust public and private capital investments over the past century.

Mr. Brugmann said that his research team asked the chief planning officers of all of the major stakeholders in the urban development process (local governments, infrastructure development agencies, utility companies, banks, developers, property owners/managers, and real estate companies) what risks drove their business decisions. He noted from their answers it was clear that sea level rise was not a factor in their decisions; instead, they were concerned about short-term risks involving aging infrastructure/failure, as well as the physical risk to the assets they managed.

Mr. Brugmann said that the challenge was to learn from urban development processes in the past in order to convince the developers to adopt certain

beneficial improvements that they were not currently implementing because they wanted to allocate their capital to higher-return investments. He noted it was necessary to shift the emphasis from encouraging the developers to absorb more risk, to working with them to create higher-performing buildings, infrastructure and neighborhoods.

Mr. Brugmann noted typically local governments went through a process of innovation in urban development through trial and error. He said that policies were then put in place to encourage others to adopt the new practices; and a market eco-system was created, which led to an environment in which performance was enhanced with predictable market outcomes.

Mr. Brugmann referred to a study of brownfield sites in urban regions conducted in the United States in the 1980s. He explained that urban areas were being abandoned, and the challenge was to convert these liabilities into attractive investments opportunities. He said that massive innovation occurred in liability law, taxation, financing, urban planning, the building trade, and business partnerships, which made it investment-worthy to redevelop these sites. Mr. Brugmann pointed out that the clean-up of the brownfield sites affected the property values within five miles of these sites, noting this could be replicated to tackle sea level rise.

Mr. Brugmann noted a similar process occurred with regard to green buildings, which transformed some areas without anyone being relocated. He said that Toronto underwent a similar process, in which the buildings were improved through innovation. As a result, he noted, Toronto now had a booming eco-buildings industry, with a much higher return on investment than for standard buildings.

Mr. Brugmann pointed out that a similar framework could be applied to resilience-building. He used the example of downtown Toronto, which experienced brown-outs in the midst of the summer. He said that this created a political environment that encouraged a decision to create a high-performance energy district with fixed prices for energy bills for 20 years.

Mr. Brugmann noted in order to redevelop brownfields, and to create eco-districts, or a highly-resilient energy district it was necessary to innovate with regard to policies, institutions, engineering, business models, and communication. He provided the example of Curitiba, Brazil, which had a bus-rapid transit system – a unique system that was made possible through incentives. He also mentioned Barcelona, in which the districts had been re-generated through a similar model.

Mr. Brugmann suggested that communities adapt to climate change through the resilience zone concept, which drew upon other North American traditions of local area management, such as business improvement areas, downtown partnerships, empowerment zones, district utilities, enterprise zones, and community improvement districts. He explained that the resilience zone concept meant that at the level of the neighborhood or district, mechanisms would be created to transform these areas according to new performance criteria. Mr. Brugmann stated that the resilience zone concept involved a four-step process:

1. Develop mechanisms to support action by the asset owners themselves;
2. Design the mechanisms and measures for local area risk management;
3. Upgrade resilience for long-term operating cost predictability; and
4. Develop a communication strategy to facilitate market recognition.

Mr. Brugmann referred the audience to a report by CERES entitled “Building Resilient Cities – From Risk Assessment to Development”, for more information.

Responding to a question from Mr. Josh Gelfman, Deputy Director of Miami-Dade Dept. of Regulatory and Economic Resources (RER), as to the reason the residents of Curitiba seemed to be so adept at civic innovation, Mr. Brugmann noted leadership was crucial. He said that the institutions that were created in cities such as Curitiba and Barcelona were fundamentally innovative, and this helped them accelerate the re-

development process. Mr. Brugmann emphasized the importance of creating institutional mechanisms that would outlive good leaders.

V. Discussion/Public Comments

Assistant County Attorney Christopher Angell announced that the Board of County Commissioners (BCC) had granted the extension request for submittal of the Task Force's report, which was now due on June 22nd, 2014.

VI. Proposed Topics and Date for Next Meeting

Chairman Ruvin asked the Task Force members for their suggestions regarding future presentations. He recalled that it had been suggested that Mr. Dan Kimball, Superintendent of the Everglades National Parks, and a representative from the Environmentally Endangered Lands (EEL) program be invited.

Ms. Fain suggested that Mr. Richard Grosso, a Professor at Nova Southeastern University Law School, be invited to make a presentation before the Task Force, as he could be asked to work on a legal framework for the Task Force's recommendations.

In response to Mr. Enfield's comment that he did not believe the Task Force had gathered sufficient information regarding the steps taken in Broward to address sea level rise, Chairman Ruvin recalled that the Southeast Florida Regional Climate Compact had made a presentation.

Ms. Hefty explained that through the meetings of the four-County Compact, she obtained information on the efforts of the other counties to address sea level rise. She provided some examples of projects including the Adaptation Action Areas; and the South Florida Climate Change Compact's Transportation Vulnerability Assessment pilot study, conducted by the Metropolitan Planning Organizations (MPOs) and funded by the Federal Highway Association (FHWA). She said that the Compact was compiling a report on these projects. However, Ms. Hefty expressed concern regarding

the timing for the Task Force's report, which she noted would need to be completed by April to meet the June deadline.

Chairman Ruvlin pointed out that the U.S. Army Corps of Engineers must be part of the solution. He said that it was important to invite all of the important stakeholders whose input was crucial to lay the groundwork to formulate a solution.

Mr. Fair said he was concerned about the timeframe for the report. He suggested that the Task Force members agree on what important information was still missing in order to move forward.

Ms. Hefty recalled that in past meetings, the Task Force members had suggested presentations on the Everglades National Parks; County programs, including the Environmentally Endangered Lands program, and the Beach Restoration and Dune Preservation programs; the Coastal Oceans Task Force; projects considering sea level rise and storm surge in planning, including the City of Miami Beach Storm Water Master Plan and the Investment project, the South Florida Climate Change Transportation Vulnerability Assessment, and the Adaptation Action Areas.

Mr. Kipnis noted the City of Miami Beach Storm Water Master Plan would be considered by the Miami Beach Commission tomorrow (2/12), and it seemed likely that the commissioners would recommend some radical changes.

Ms. Reynolds, a member of the public, pointed out that a number of projects that were moving forward in the County had been discontinued due to cost considerations; however, these projects should be allowed to proceed as they were beneficial to address sea level rise. She suggested that some of these decisions be revisited.

Ms. Cindy Lerner, Mayor of Pinecrest, said that she had been encouraging the Miami-Dade League of Cities to adopt Broward County's model to address sea level rise. She noted there was much to learn from Broward County in that regard and she assumed this was valid for Palm Beach County, as well. Mayor Lerner emphasized that it would be critical for this

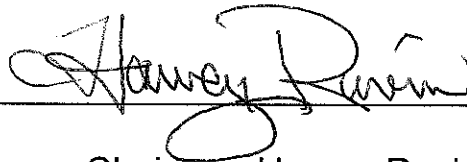
Task Force to hear presentations on Broward and Palm Beach counties' efforts to develop a resilient system.

In response to Ms. Hefty's question regarding the date of the Task Force's next meeting, Chairman Ruvin said that he would select three or four dates that were convenient for him, and consult the other Task Force members before deciding on a date for the next meeting. He noted there would be another meeting fairly soon.

Mr. Fair said that it would be helpful to know how many more meetings were planned before the report was due.

VII. Adjournment

There being no other business to come before the Sea Level Rise Task Force, the meeting adjourned at 12:30 p.m.

A handwritten signature in black ink, appearing to read "Harvey Ruvin", is written over a horizontal line.

Chairman Harvey Ruvin
Sea Level Rise Task Force



**Miami-Dade County
Sea Level Rise Task Force
February 11, 2014**

Prepared by: Maryse Fontus

EXHIBITS LIST

NO.	DATE	ITEM #	DESCRIPTION
1	2/11/2014		Attendance Sheets
2	2/11/2014		Agenda
3	2/11/2014		Climate Change and resilience building: a reinsurer's perspective
4	2/11/2014		Kick-starting the Resilient City
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EL RISE TASK FOR

Four (4) members constitutes a quorum

Sea Level Rise Task Force Meeting

February 11, 2014

10:00 AM

Stephen P. Clark Government Center
10th Floor Conference Room

Name	Organization	Phone Number	Email Address
1 Dan Kipnis		786-325-8518	captain.dan.kipnis@atl.net
2 John Proulx	FIU	305-282-0685	JProulx@fiu.edu
3 Elaine Mills	Arquitectura Geo	305-372-1812	emills@arquitectonica.com
4 Katie Carpenter	Yale CCP	417-573-3715	katie.carpenter@yale.edu
5 Mariana Filomeno	Office of the Mayor	305-576-4696	vamp@mayoridade.gov
6 Robert Correll	FIU & GBTE	413-994-3643	global@dmv.com
7 David Adams	Thomas Reuters	305-3368452	david.c.adams@thomsonreuters.com
8 Al Macfar	GSB CONSULTING FOR LNU	305-349-2300	AlMacfar@GSB-LNU.com
9 Virginia Walsh	MD WASD	786-552-8266	walshv@miamidade.gov
10 Isabel Villalón	Southern Alliance for clean energy	305-878-0180	isabel@cleanenergy.org
11 Joan Cuécel	FWWM (MOC)	305-372-6424	cuiecel@fwwm.moc.gov
12 Macias Strehlman	" (MOC)	305-372-6529	strehlman.moc.gov

	Name	Organization	Phone Number	Email Address
13	Cindy Lerner	Mayor, Finance / LEADER	3659923433	MayorLerner@miamicity.com
14	Josh Gelman	MDC	3/375-1805	gelman@miamicity.com
15	Julie Dickel	BANK	312-399-4052	jdickel@abrahamlaundry.com
16	Jim, Fire	CMB	305-377-2080	Jim.Dickel@miamicity.com
17	Bobby Mendel	FAW/CCS	954-963-3564	bobby@miamicity.com
18	Nina Lerner	Miami TRAC	510-717-9296	nina@miamicity.com
19	J. Rosen	MDC	3/375-5680	jrosen@miamicity.com
20	Lucretia Ordway	MDC	305-445-8352	lucretia@miamicity.com
21	Alvaro Murgiz	BCC Dist. 11	3/375-5511	alvaro@miamicity.com
22	James Lynch	Mayor's Office	786-593-1926	director@miamicity.com
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February 11, 2014
10:00 AM
Stephen P. Clark Government Center
10th Floor Conference Room

10:00 AM

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Miami-Dade Sea Level Rise Task Force Meeting

February 11, 2014

10:00AM

Stephen P. Clark Building

111 NW 1st Street, 10th Floor Conference Room (CITT)

Miami, Florida 33128

- **Welcome and Introductions**
Honorable Clerk & Sea Level Rise Task Force Chair, Harvey Ruvin
- **Approval of Meeting Minutes**
 - December 20, 2013
- **Mr. Mark Way and Mr. Alex Kaplan**
Swiss Re America Holding Corporation
- **Mr. Jeb Brugmann, former Secretary General, ICLEI – Local Governments for Sustainability**
- **Q/A and Discussion**
- **Public Comment**
- **Proposed Topics and Date for Next Meeting**

Climate Change and resilience building: a reinsurer's perspective

SWISS RE
150
YEARS



Swiss Re's climate change strategy

Coping with climate change requires both mitigation and adaptation measures

Swiss Re assesses and manages the risk



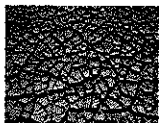
- Advance (our) knowledge about climate change risk
- Quantify climate change risk
- Integrate climate change risk into underwriting and risk management framework

Swiss Re seizes business opportunities



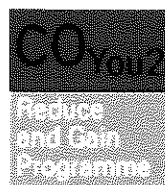
- Develop appropriate solutions for adapting to and mitigating climate change
- Traditional catastrophe insurance
- Weather risk solutions

Swiss Re influences the business environment



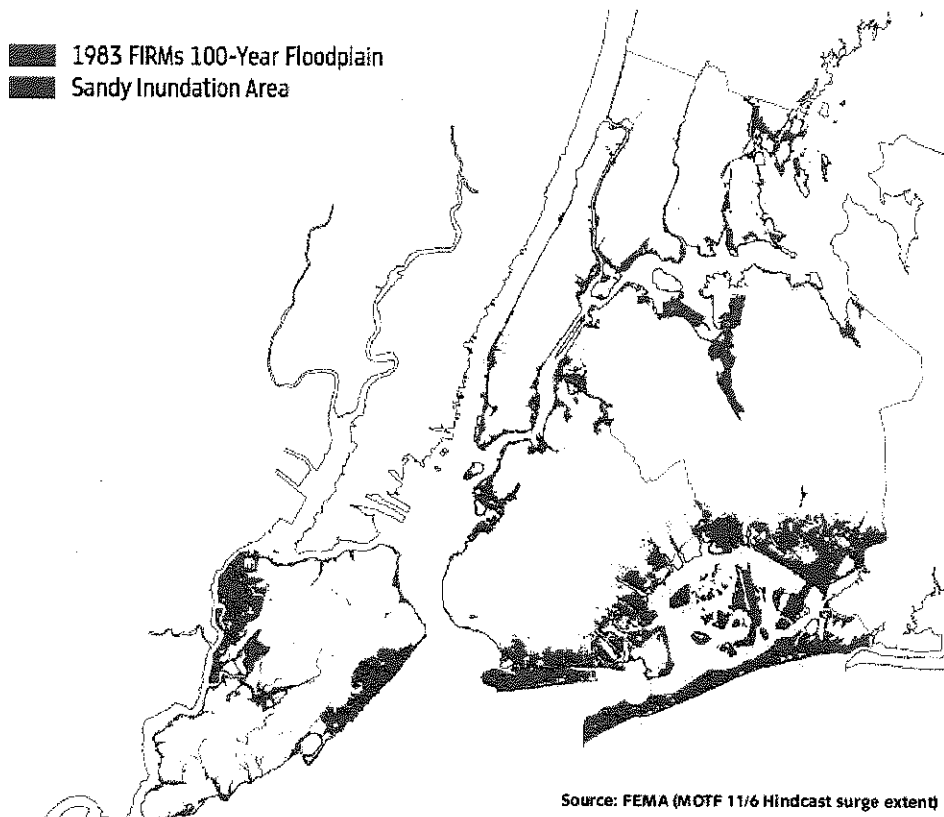
- Raise awareness, actively disseminate knowledge to all stakeholders and advocate a long-term, market-based policy framework, through:
- Publications, platforms (e.g. World Economic Forum), Centre for Global Dialogue, speaking engagements

Swiss Re leads by example



- Greenhouse neutral since October 2003
- Reduced emissions per employee by 54.4% by 2013
- CO₂you2 Programme since 2006

FIRM maps vs Sandy Footprint



Climate-resilient development needs to **assess** and **address** total climate risk



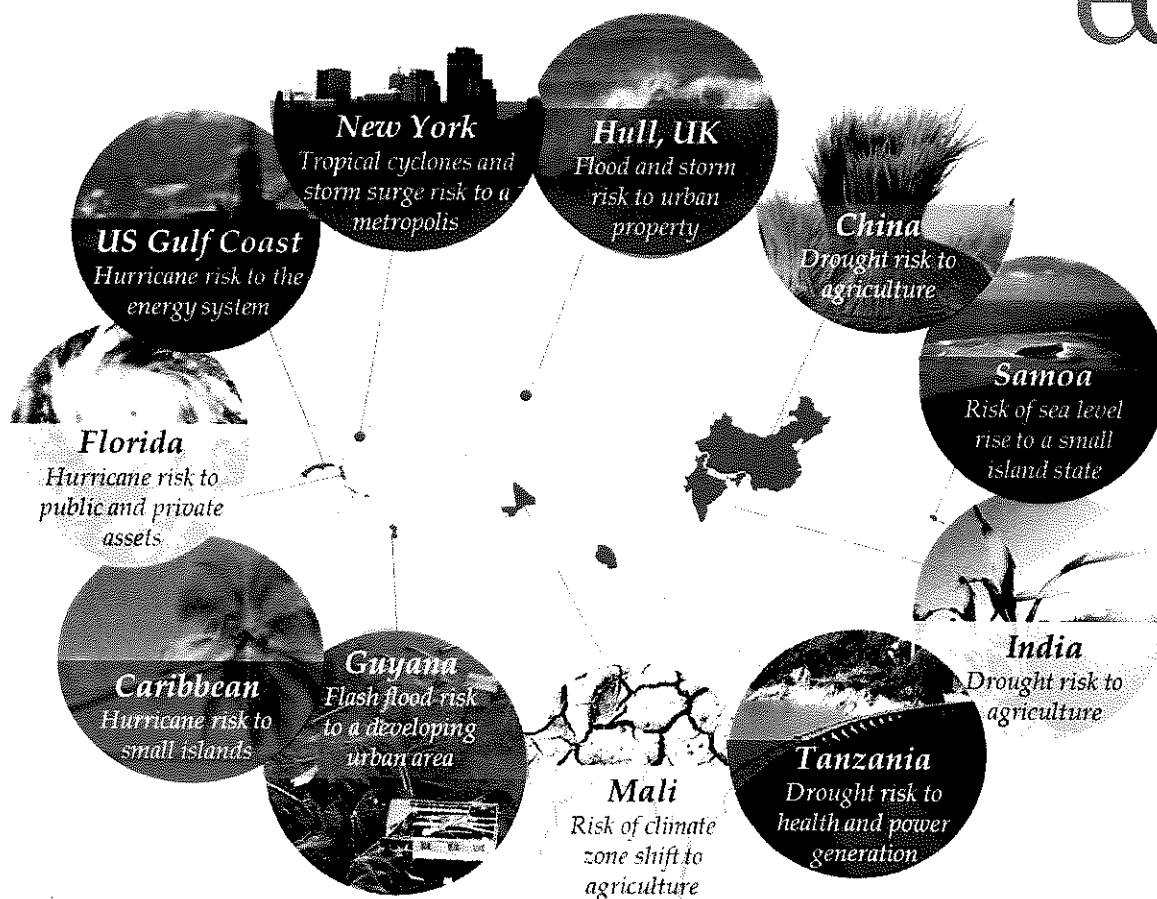
Objectives

- Provide decision makers with the **facts and methods** necessary to design and execute a climate adaptation strategy
- Supply insurers, financial institutions, and potential funders with the **information** required to unlock risk prevention funding and deepen global risk transfer markets

Methodology

- 1) Follow a rigorous risk management approach to assess **local total climate risk**, the sum of
 - today's climate risk,
 - the economic development paths that might put greater population and value at risk
 - the additional risks presented by climate change
- 2) Propose and prioritize a basket of adaptation measures to address total climate risk on an economic basis

The working group studied 18 regions with diverse climate hazards

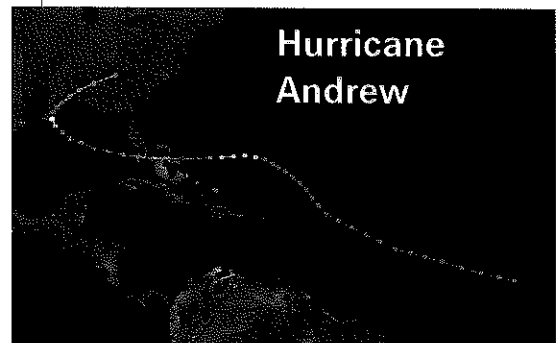
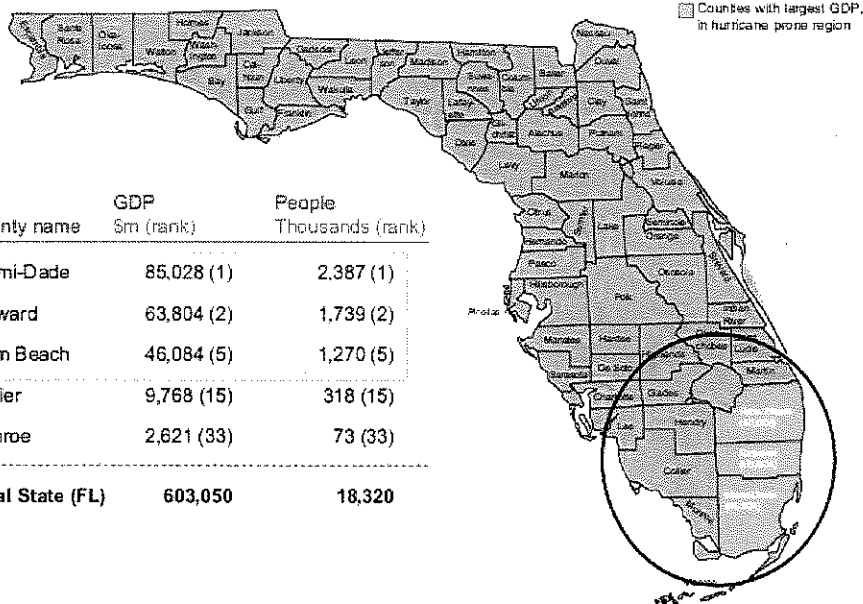


Economics of Climate Adaptation (ECA) Working Group, a partnership between the Global Environment Facility, McKinsey & Company, Swiss Re, the Rockefeller Foundation, ClimateWorks Foundation, the European Commission, and Standard Chartered Bank.

South Florida Case Study: Focus on Risk from Hurricanes

The case study area is home to some of the most populated and economically successful counties in the State

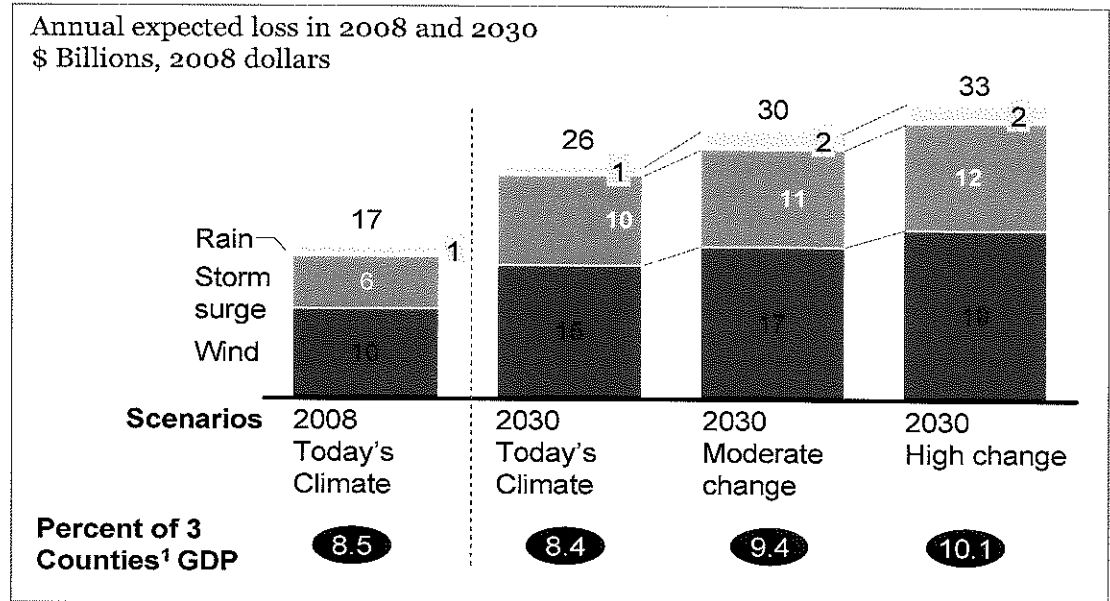
02



Result: Expected losses by scenarios and by hazard

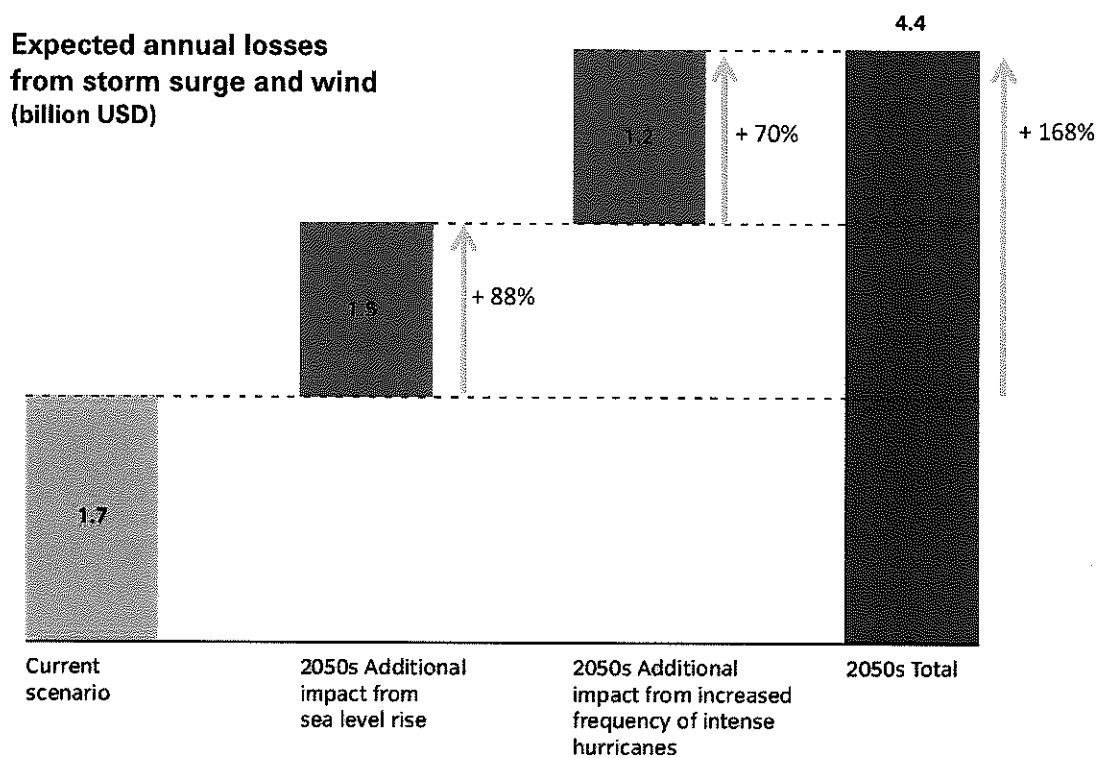


Example Florida:



¹ 2008 Moody's
SOURCE: Swiss Re; team analysis

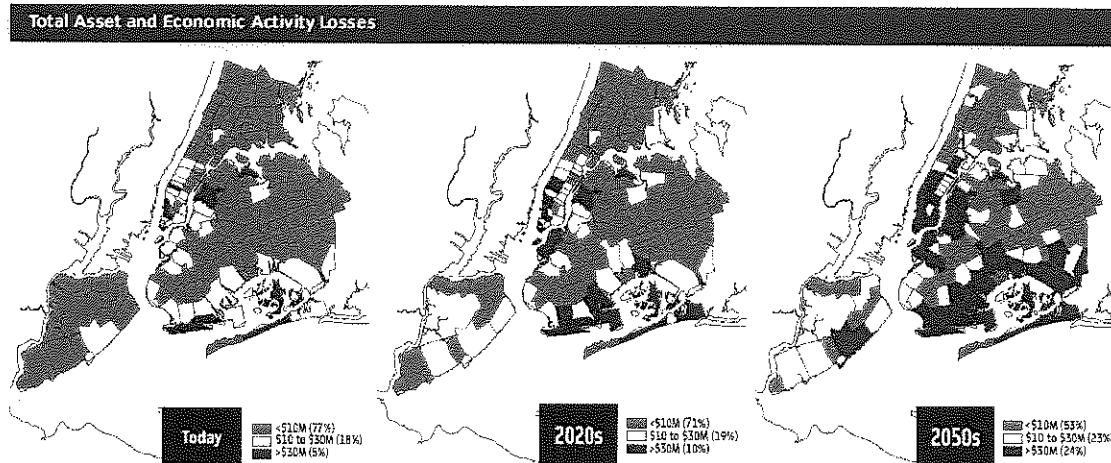
Sea level rise and altered hurricane frequencies significantly increase losses in New York City



Source: www.nyc.gov: A Stronger More Resilient New York

Results

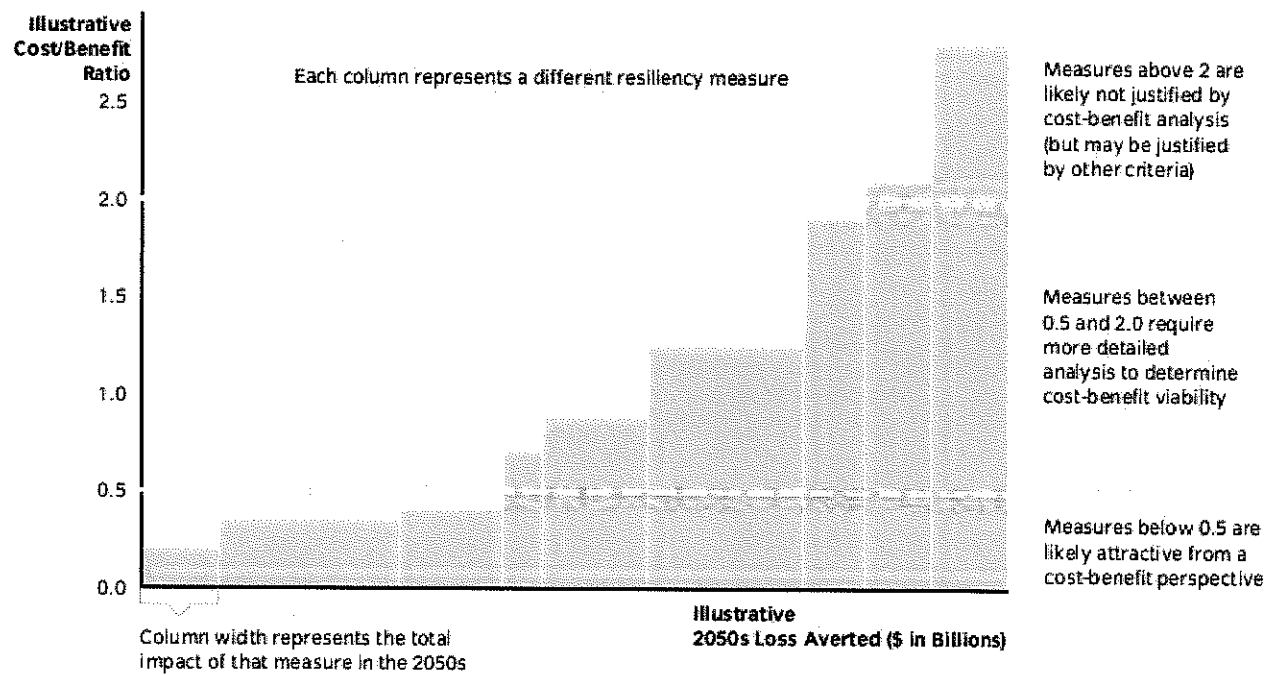
Annual Expected Loss by ZIP code



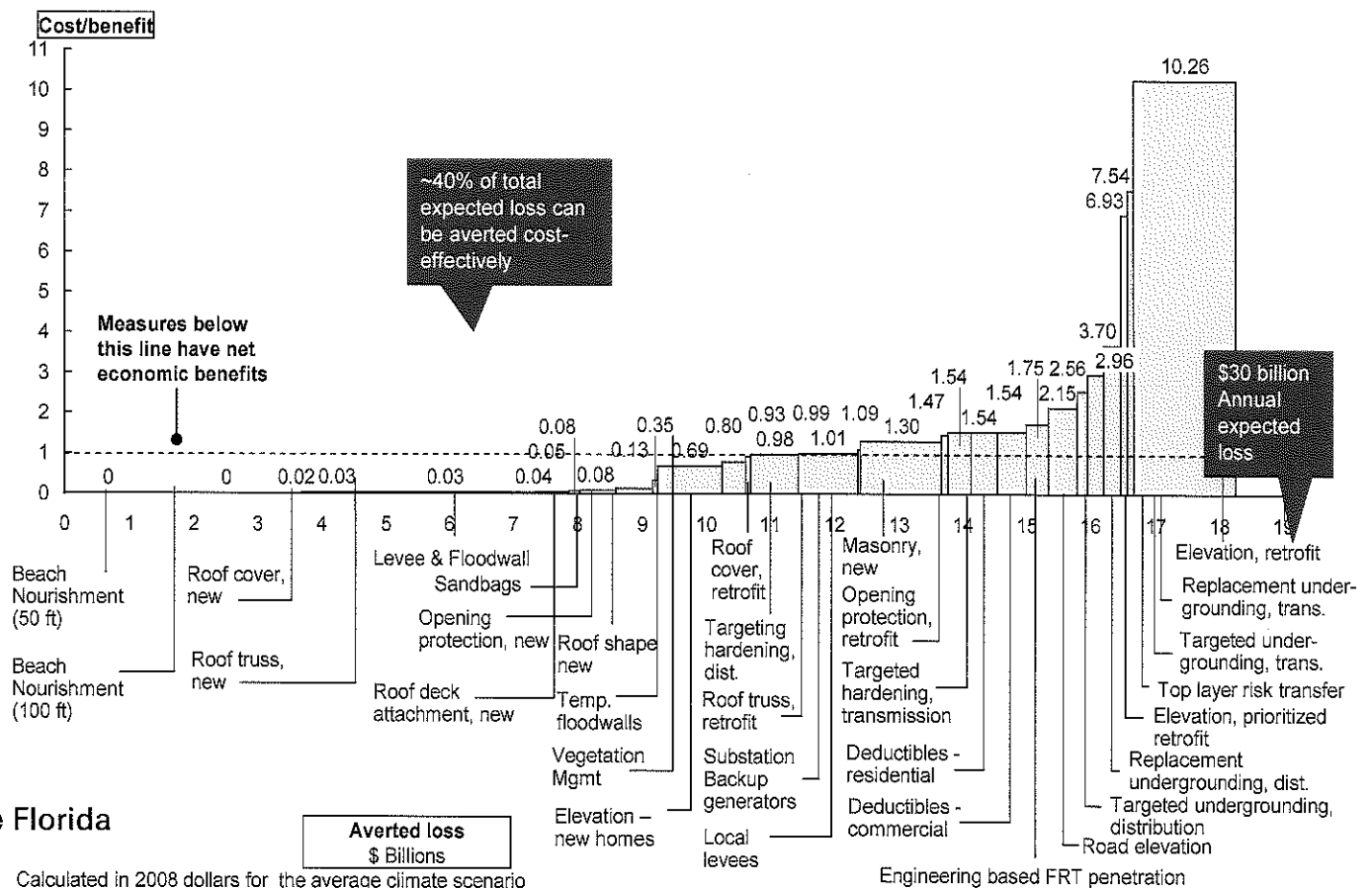
Source: A Stronger, More Resilient New York

- Current drivers of loss: east and south shores of Staten Island, southern Brooklyn and Queens, Brooklyn and Queens waterfront and southern Manhattan.
- Under future scenarios: Same geographic regions, plus northern Queens and the Bronx
- Under 2050s scenario: 400% increase in ZIP codes which have an AEL of USD 30 million

A resilience (adaptation) cost curve



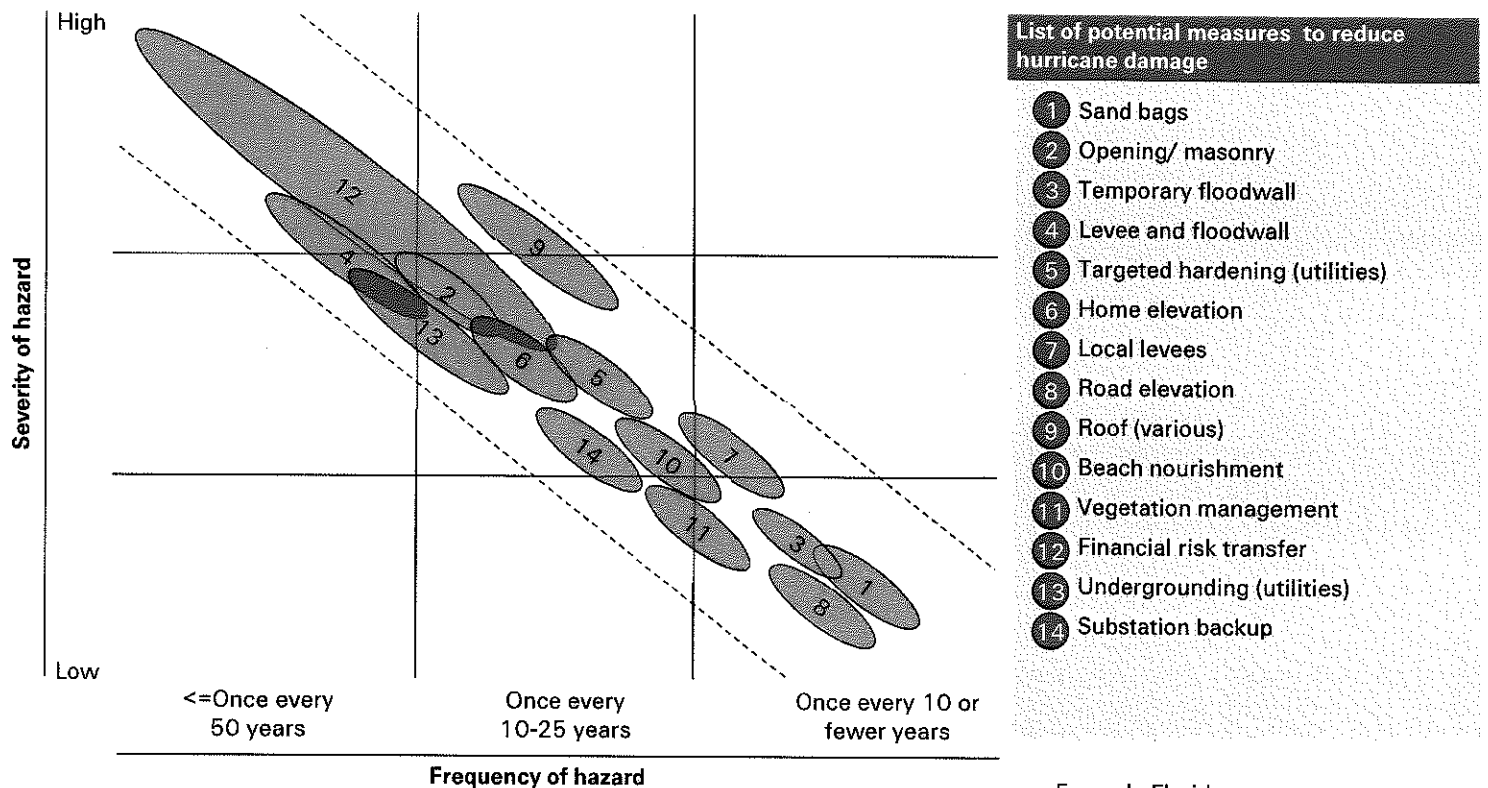
Locally specific adaptation cost / benefit curve



Example Florida

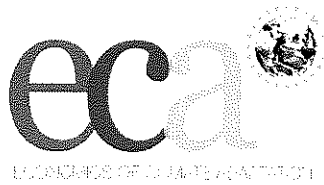
Calculated in 2008 dollars for the average climate scenario

Climate risk is best tackled with a portfolio of adaptation measures



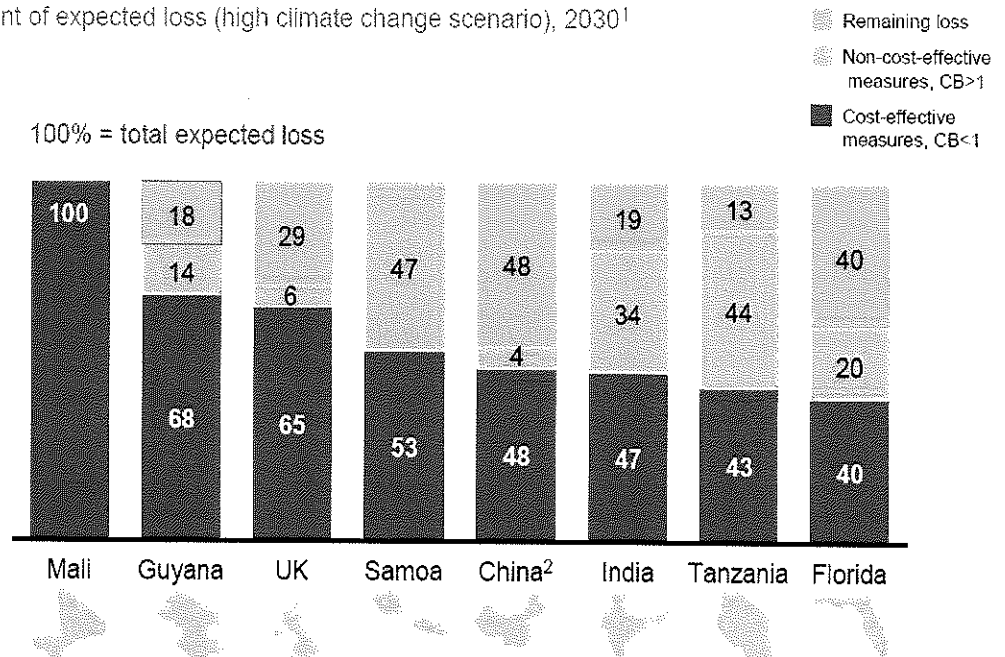
Source: Team analysis

Global overview: Expected loss averted by adaptation measures



Percent of expected loss (high climate change scenario), 2030¹

100% = total expected loss



¹ Based upon select regions analyzed within the countries (e.g., Mopti, Mali; Georgetown, Guyana; Hull, UK; North and Northeast China; Maharashtra, India; Central regions of Tanzania; Southeast Florida, U.S.)

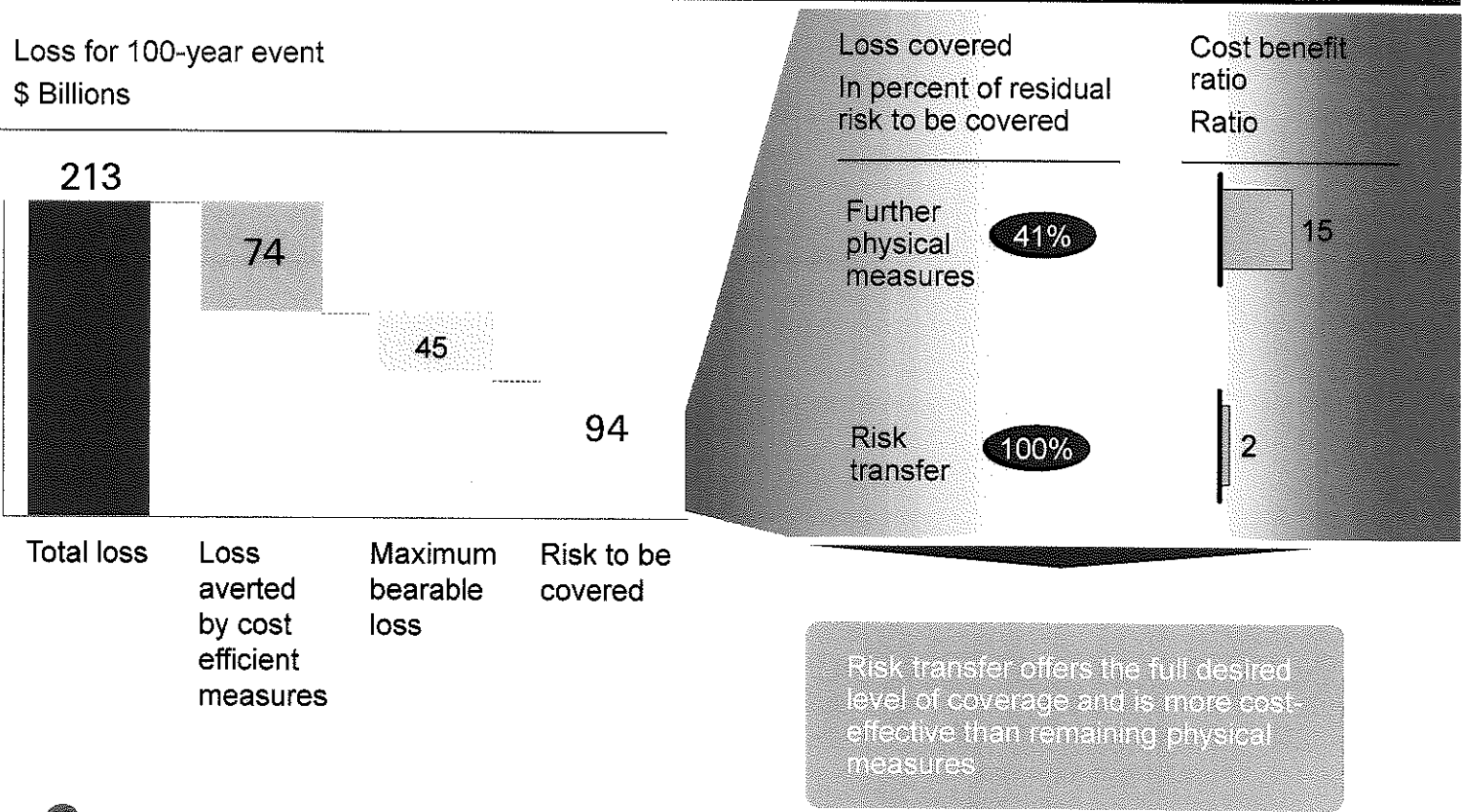
² Based upon moderate scenario data and analysis

Gulf Coast case

Risk transfer may be more cost efficient than physical measures in addressing low frequency events

ILLUSTRATIVE

Example of evaluation of alternative options to cover residual risk



ECA full report featuring
the first 8 case studies,
164 pages

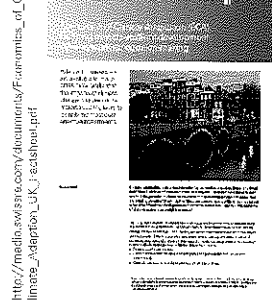
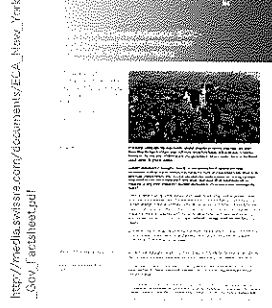
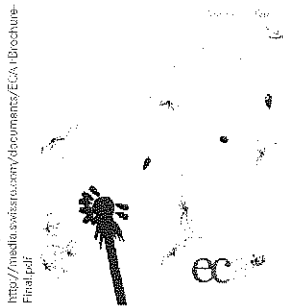
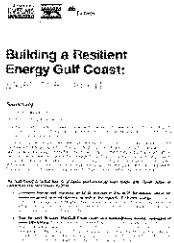
New York: Tropical
cyclones and storm surge
risk to a metropolis

Hull, UK: Flood and
storm risk to urban
property

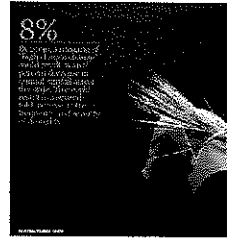
Swiss Re
iii

US Gulf Coast: Hurricane
risk to the energy system

http://media.swissre.com/documents/Intactec_s_tudy_sec_report_20101014.pdf

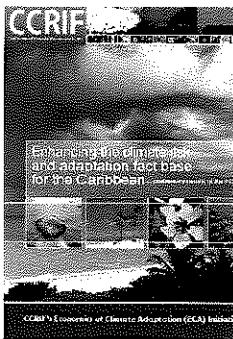


China: Drought risk to
agriculture



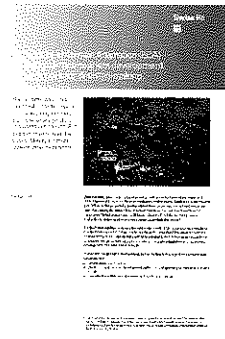
Caribbean: Hurricane
risk to small islands

http://media.swissre.com/documents/ECA_FullReport_Final.pdf



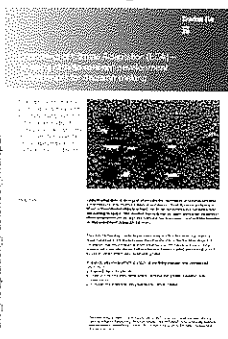
Guayana: Flash flood risk
to a developing urban area

http://media.swissre.com/documents/Economics_of_Climate_Adaptation_Guayana_Factsheet_en.pdf



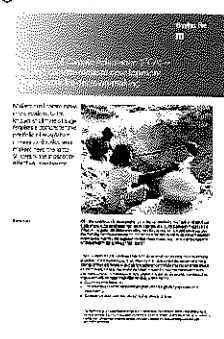
Mali: Risk of climate
zone shift to agriculture

http://media.swissre.com/documents/Economics_of_Climate_Adaptation_Mali_Factsheet_Mali.pdf



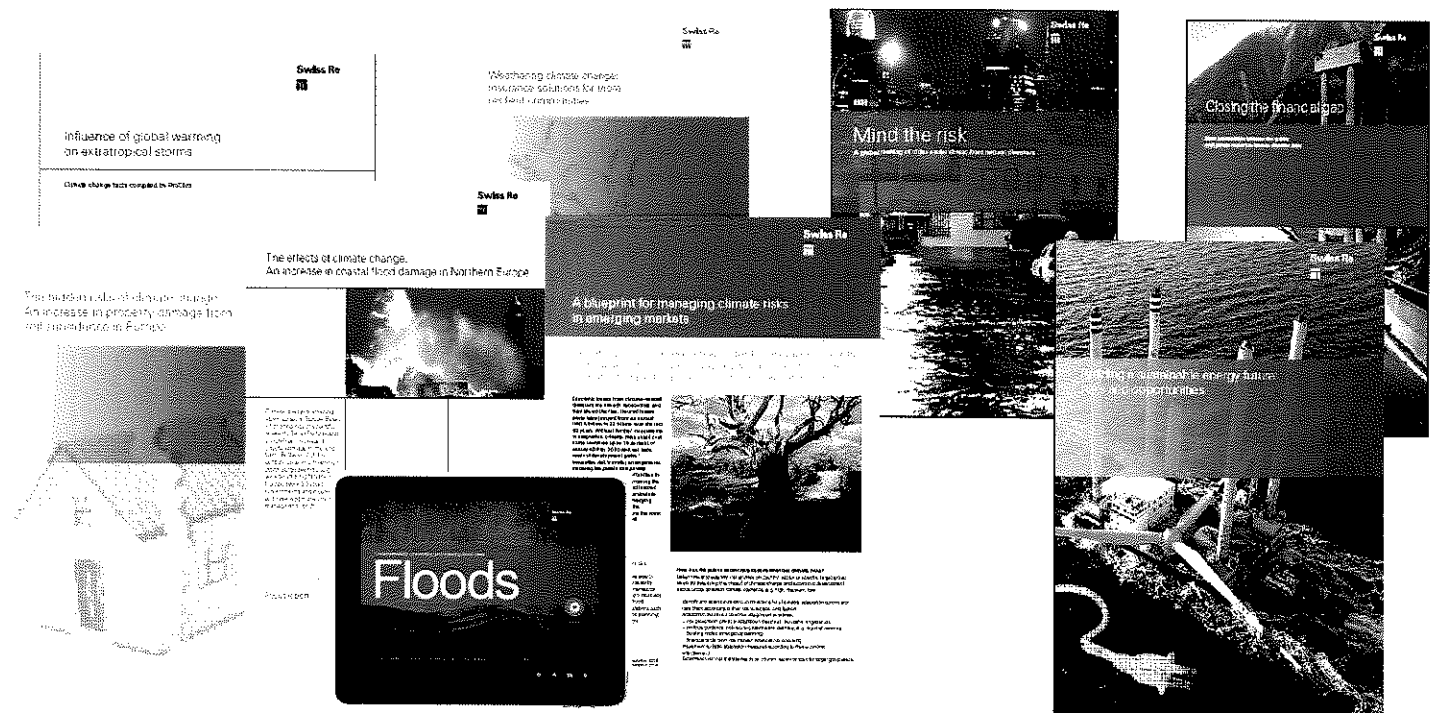
India: Drought risk to
agriculture

http://media.swissre.com/documents/Economics_of_Climate_Adaptation_India_Factsheet.pdf



Advancing Knowledge on Climate Risk

Climate risk research and publications

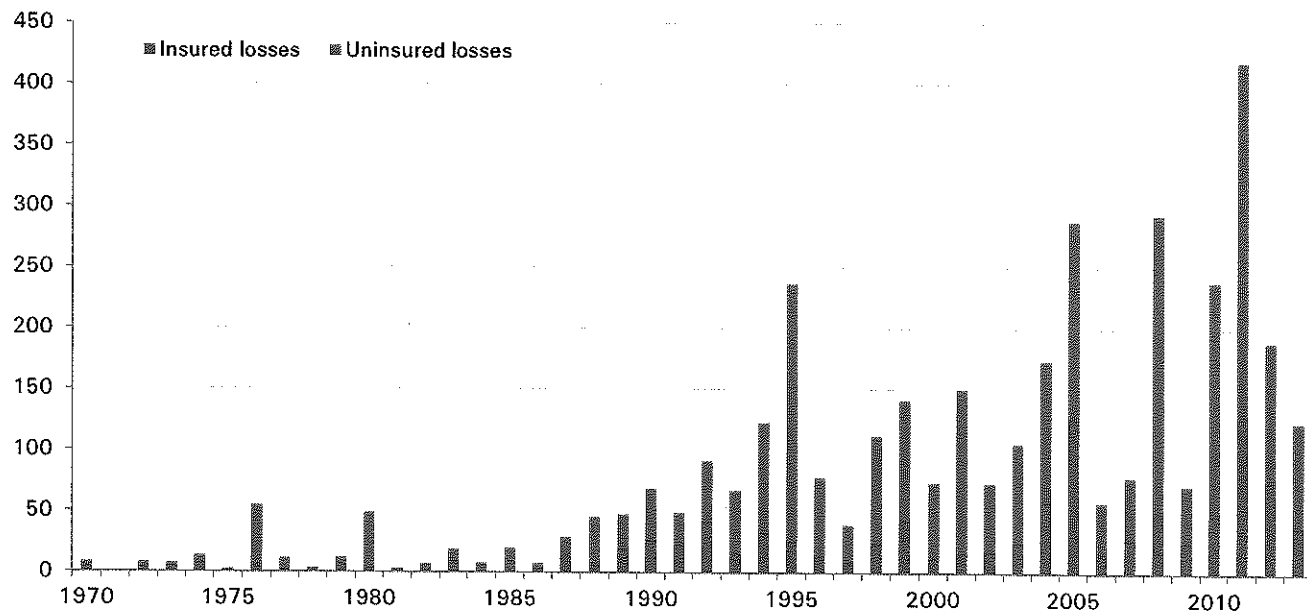


Closing the protection gap

SWISS RE
150
YEARS

Massive gap between total and insured losses shows insurance potential

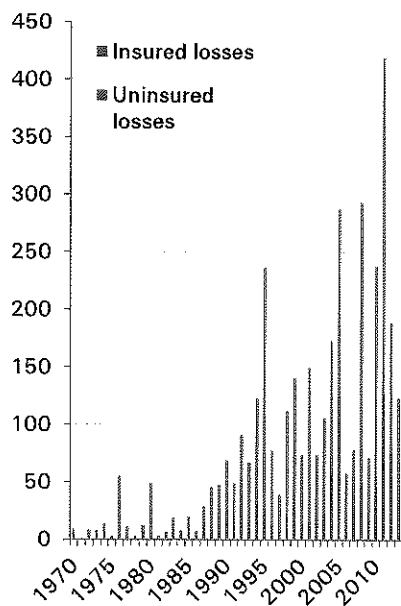
Natural catastrophe losses 1970-2013, in USD billion (2013 prices)



Source: Swiss Re Economic Research & Consulting, *sigma* catastrophe database

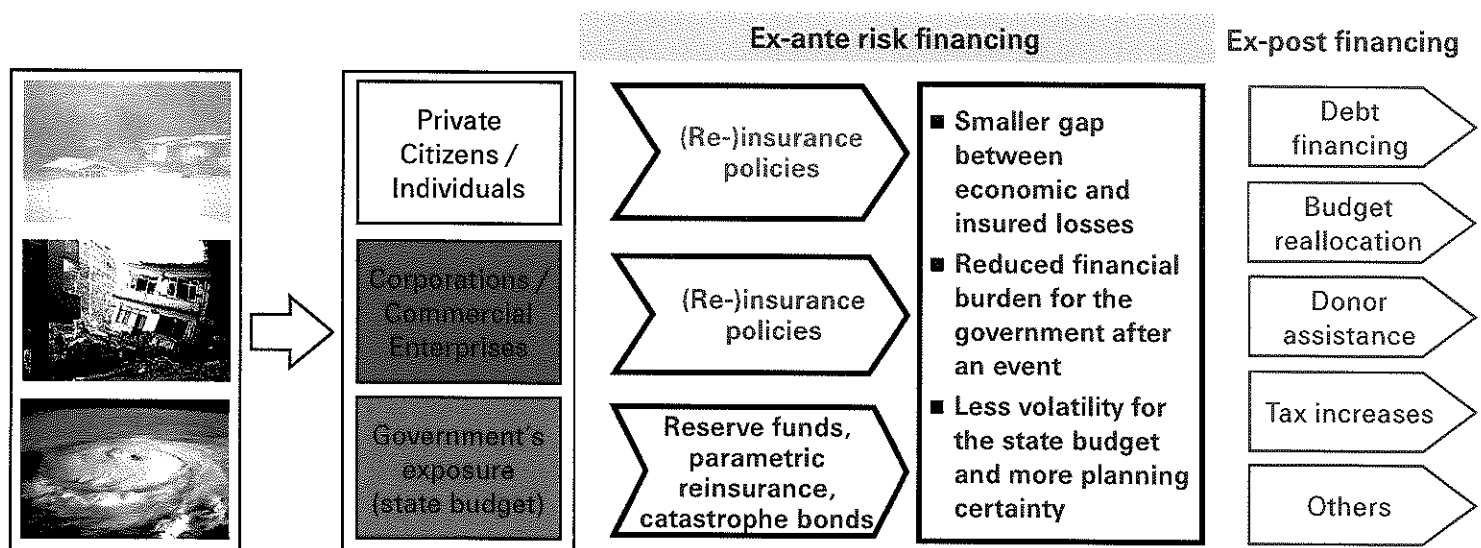
Disasters place a significant burden on the public sector

Natural catastrophe losses



- Despite prevention and mitigation efforts, no country can fully insulate itself against extreme natural disasters
- The brunt of economic losses from natural disasters ends up with individuals, corporations and governments, both on national and sub-national level
- Government budgets are impacted by:
 - Primary effects include immediate expenses for emergency relief efforts, costs for rebuilding public infrastructure or loss of capital and durable goods
 - Secondary effects, for instance, include lower economic growth, lower tax and non-tax revenues, budget deficits, increased indebtedness and costs from refinancing, higher inflation or currency movements

Closing the Gap: Including ex-ante instruments into the overall risk financing strategy



Including ex-ante instruments in the overall risk financing mix helps a government to lower its financial exposure to catastrophic risks, natural and man-made.

Case study Caribbean: Caribbean Catastrophe Risk Insurance Facility (CCRIF)



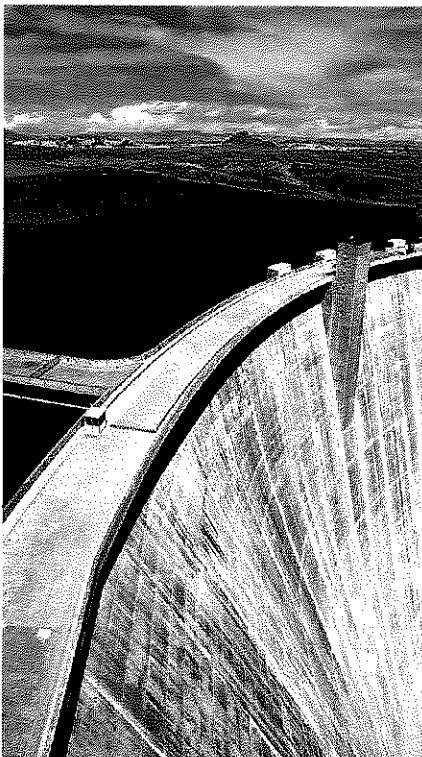
Solution features

- The CCRIF offers parametric hurricane and earthquake insurance policies to 16 CARICOM governments
- The policies provide immediate liquidity to participating governments when affected by events with a probability of 1 in 15 years or over
- Member governments choose how much coverage they need up to an aggregate limit of USD 100 million
- The mechanism will be triggered by the intensity of the event (modelled loss triggers)
- The facility responded to events and made payments:
 - Dominica & St. Lucia after earthquake (2007)
 - Turks & Caicos after Hurricane Ike (2008)
 - Haiti, Barbados, St. Lucia, Anguilla and St. Vincent (2010)

Involved parties

- Reinsurers: Swiss Re and other overseas reinsurers
- Reinsurance program placed by Guy Carpenter
- Derivative placed by World Bank Treasury

Case study Uruguay: Largest Energy Risk Transfer to Protect Against Drought Risk



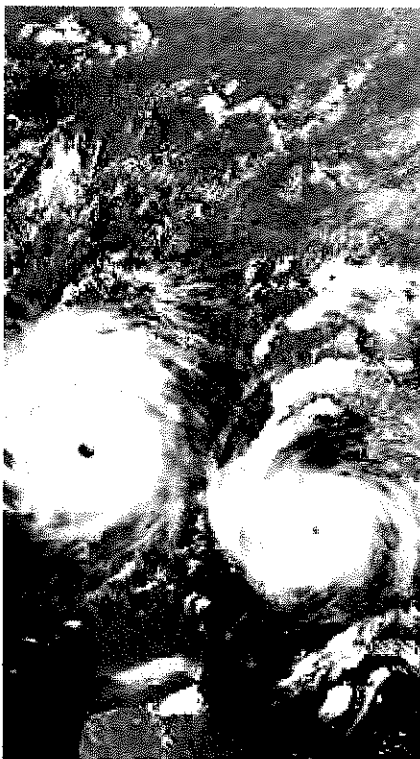
Solution features

- Insured peril: Drought
- Payments to be used to purchase energy from alternative sources when drought conditions cause lack of hydro power
- Derivative contract: between UTE, Uruguayan state-owned hydro-electric power company, and World Bank Treasury. Risk is then placed in the market
- Payment mechanics:
 - Trigger: Level of rainfall monitored at weather stations
 - Settlement: Market price of Brent crude oil
- Time horizon: January 2014– July 2015
- Transaction Size: USD 450 million
- Largest of its kind in the weather risk management market

Involved parties

- Client: UTE (Uruguayan state-owned power company)
- Arranger: World Bank Treasury
- Risk Takers: Swiss Re and Allianz

Case study United States: Alabama – First parametric cover for a government in an industrialized country



Solution features

- Insured peril: Hurricane
- Payments to offset economic costs of hurricanes
- Trigger type: Disaster occurring within a defined geographic area ("box") along coast ("cat-in-the-box")
- Trigger based on wind speed of hurricane eye as it passes through pre-determined box
- Payout in as little as two weeks
- Time horizon: July 2010 – July 2013
- First parametric catastrophe risk transfer for a government in an industrialized country

Involved parties

- Insured: State Insurance Fund of Alabama
- Swiss Re: Lead structurer and sole underwriter

Case study Haiti: The Microinsurance Catastrophe Risk Organization (MiCRO)



Solution features

- Insured perils: Hurricane, earthquake and rainfall
- Payments are made to microfinance borrowers post-disaster to reduce their loans and provide emergency cash
- Parametric and basis risk policies are distributed through a local Haitian microfinance institution, Fonkoze
- Trigger: Index measured at Fonkoze branches in Haiti
- Basis risk absorbed by new donor funded company, MiCRO
- Inception: March 2011

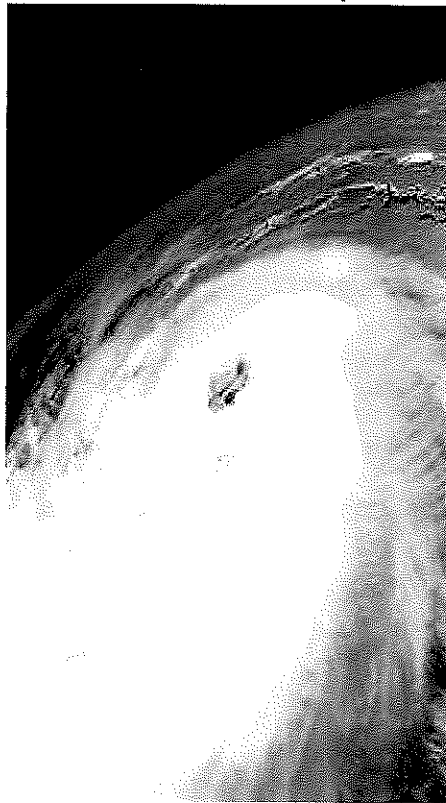
Involved parties

- Insured: Fonkoze
- Sole Reinsurer: Swiss Re
- Other partners: MercyCorps, CaribRM, Guy Carpenter

Background information

- Haiti is a nation that is susceptible to catastrophes and is unprepared for the costs of response
- Prior to the setup of MiCRO, Fonkoze's clients bore 100% of natural disaster risk
- MiCRO was named "Company Launch of the Year" at The Review magazine's annual Worldwide Reinsurance Awards in September 2011.

Case study: Miami Dade County Public Schools– Custom multi-year structured cover



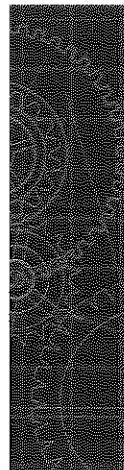
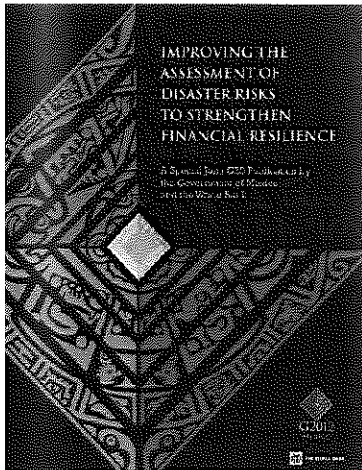
Solution features

- Insured peril: Named Windstorm and associated flood
- Multi-year structured cover: USD 100m
- Covering indemnified losses from NWS to soften impact to broader school system
 - 3 year coverage with unlimited reinstatements
 - Term Aggregate Deductible
 - Fixed premium over term
 - No claims bonus
- Time horizon: May 2013– May 2016
- Customized multi-year structured risk transfer for major school district

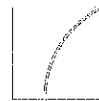
Involved parties

- Insured: Miami-Dade County Public Schools
- Swiss Re: Lead structurer and sole underwriter
- Broker: AJ Gallagher

Disaster Risk Financing - a priority on the global agenda



Disaster Risk Assessment and Risk Financing



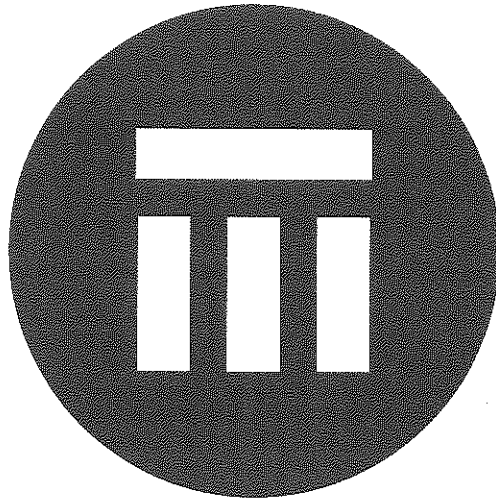
BIS Working Papers
No. 354
Unmitigated disasters?
New evidence on the
macroeconomic cost of
natural catastrophes
by Robert A. Anderson, David A. Brown,
Muel Kaptein and Rüdiger Kohn
January 2012

INTERNATIONAL MONETARY FUND
WORKING PAPER
2012/001

IMF Working Paper
WP/12/045

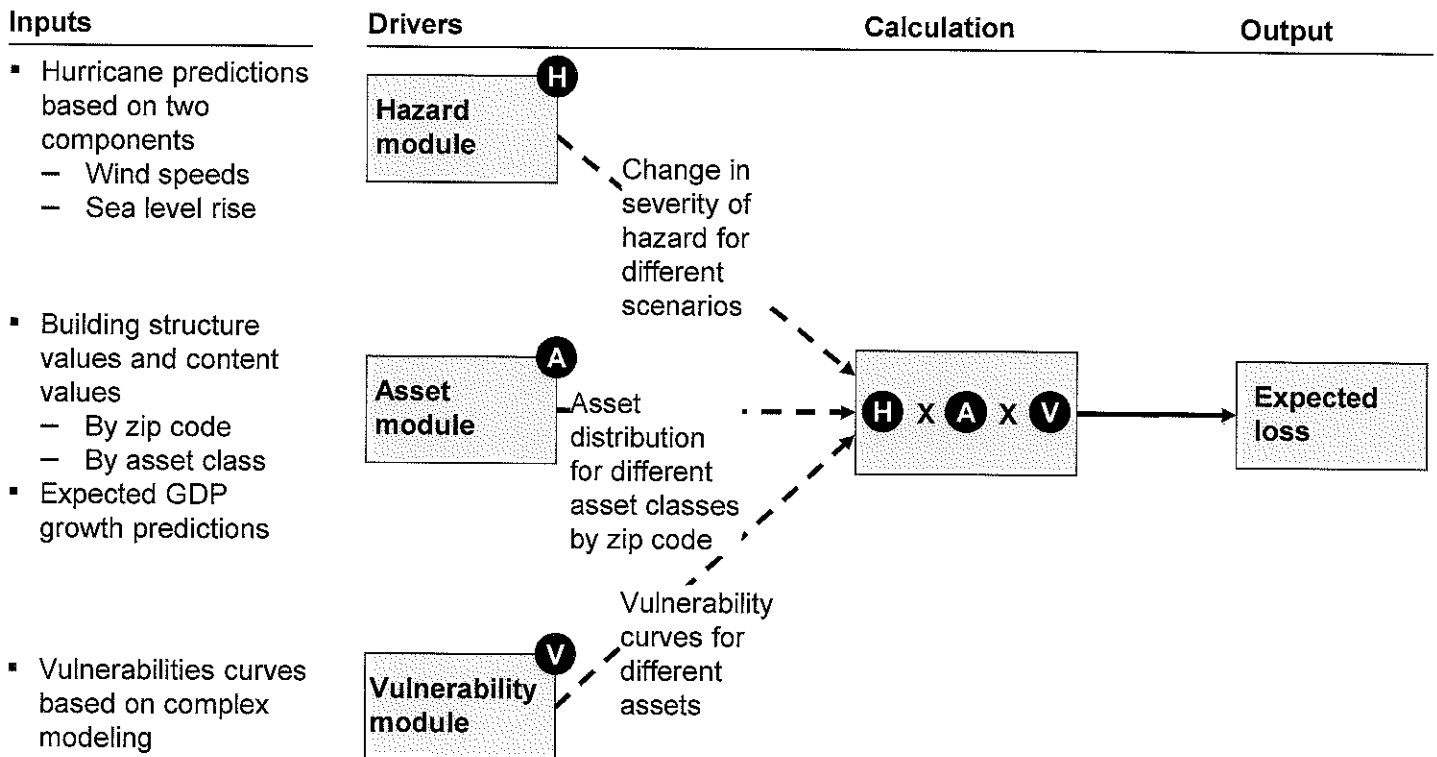
Natural Disasters: Mitigating Impact,
Managing Risks
Nicola Fankhauser and Rüdiger Kohn

INTERNATIONAL MONETARY FUND

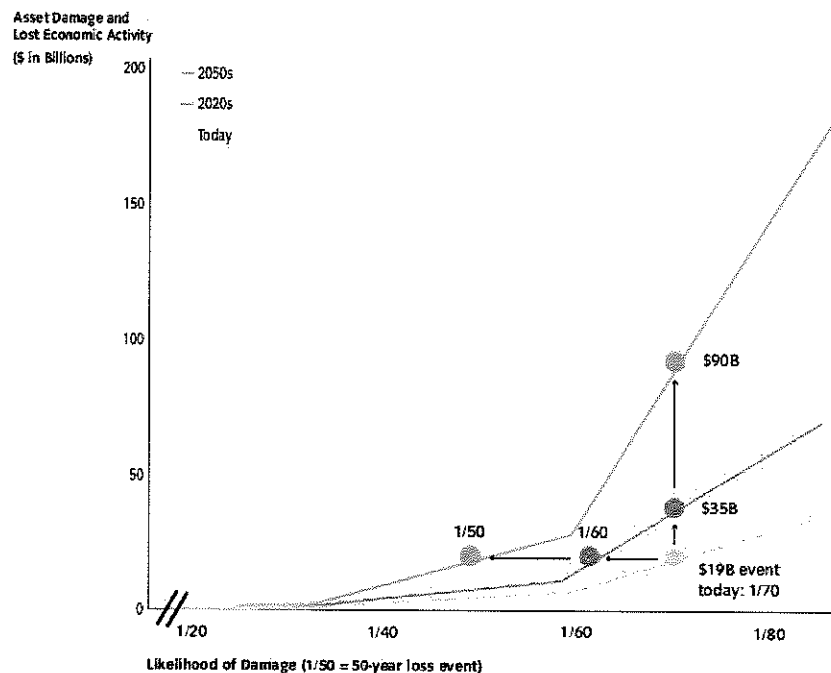


Appendix

Modeling severe weather impacts



Loss frequency curves (the frequency of a loss equaling or exceeding a specific value)



Source: www.nyc.gov: A Stronger More Resilient New York

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KICK-STARTING THE RESILIENT CITY

Jeb Brugmann

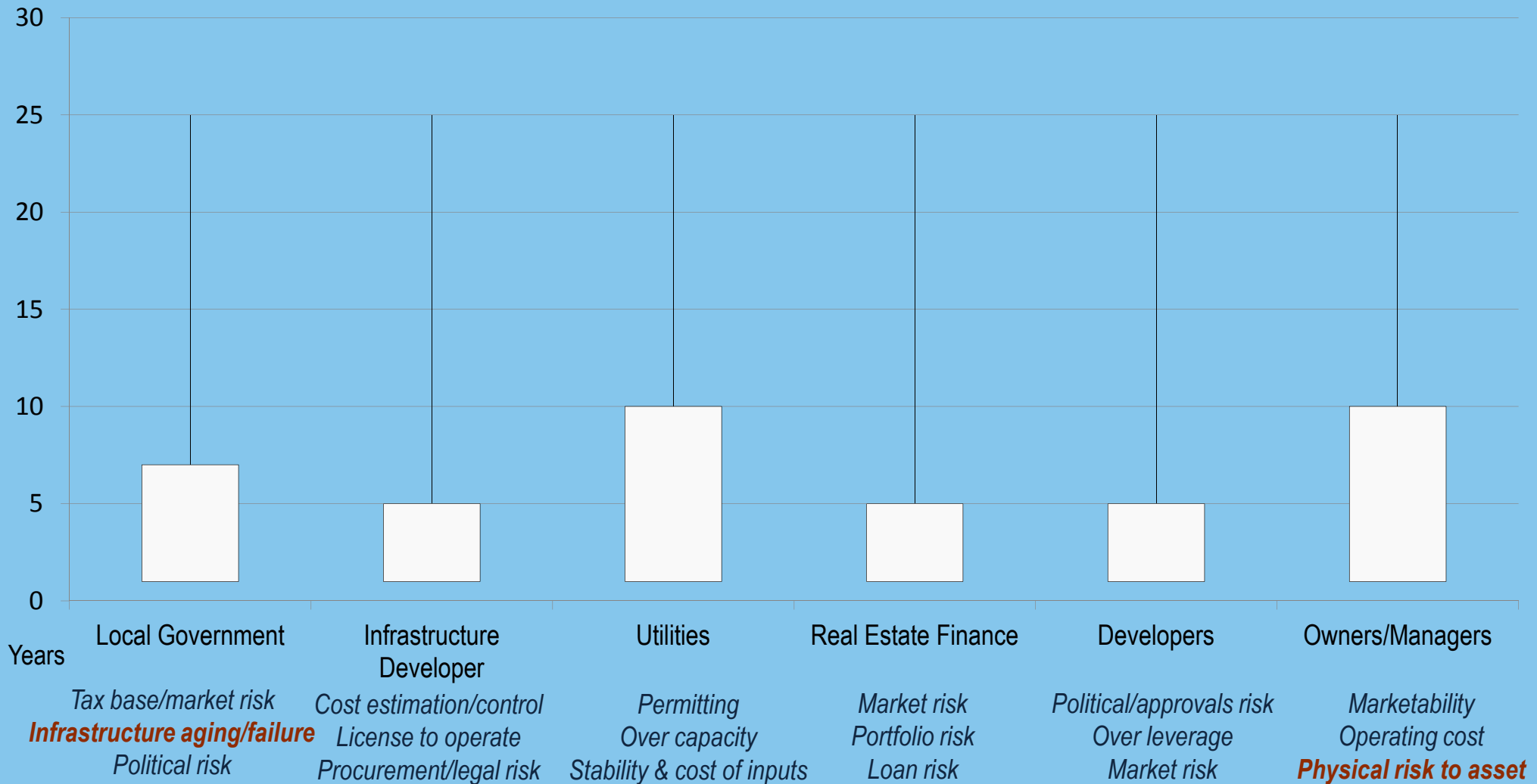
**Managing Partner, The Next Practice
President, ICLEI-USA**





*Cooperative Research & Development between Pacific Gas & Electric Company and
the U.S. Geological Survey on Earthquake Hazards in the San Francisco Bay Area*

PRIORITY CITY-BUILDING RISKS & TIMEFRAMES



Source: Ceres/ClimateWise/The Next Practice (2013)

RISK  **PERFORMANCE**

RESILIENCE 

Resilience is the ability of an urban area or system to provide predictable benefits to residents and users, and predictable returns to investors, under a widening range of circumstances.

PRACTICES

MARKET 'ECOSYSTEMS'

ENHANCED PERFORMANCE

PREDICTABLE MARKET OUTCOMES

Regulation/
Standards/
Liability

Finance/
Taxation

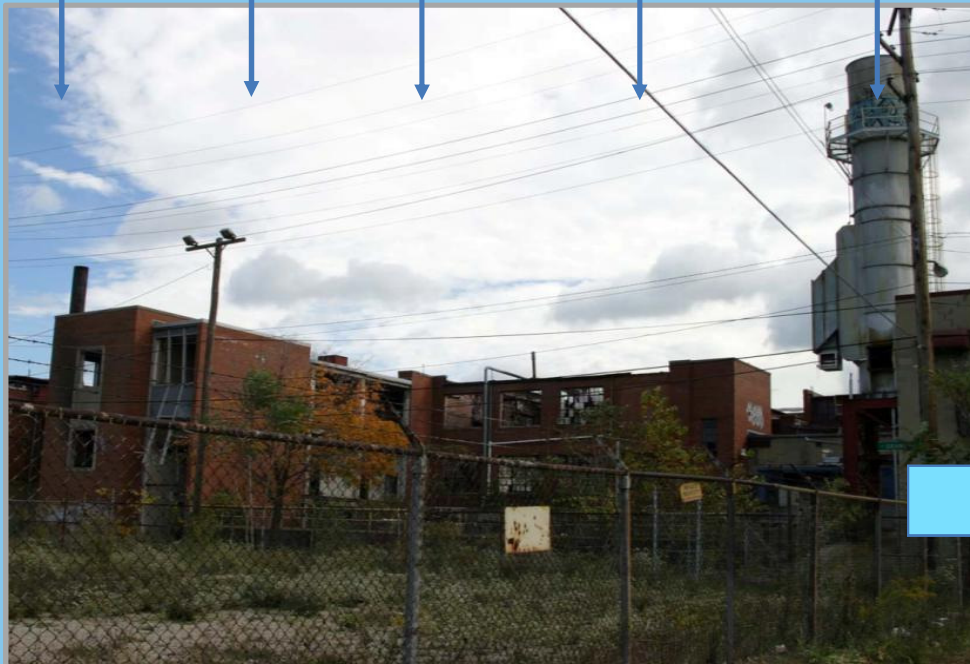
Planning

New
Technology,
Products &
Business Models

Institutions &
Business
Partnerships

- Increased land supply
- Fully re-developed central city precincts
- Growing tax base

Clean-up = housing
prices \uparrow 5.1-12.8 %
over 5km radius*



PRACTICES

- Building codes
- Carbon protocols
- Revolving loans
- Feed-in tariffs
- Design standards
- New Technology, Products & Business Models
- Business Partnerships

MARKET 'ECOSYSTEMS'

ENHANCED PERFORMANCE

- Affordable Green Residences
- Infrastructure Optimization
- GHG Reductions

PREDICTABLE OUTCOMES

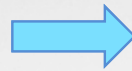
+10.9% \$ values
+9.9% ROI (new)
+19.2% ROI (retrofit)*



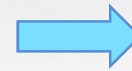
PRACTICES



**MARKET
'ECOSYSTEMS'**



**ENHANCED
PERFORMANCE**



**PREDICTABLE
OUTCOMES**



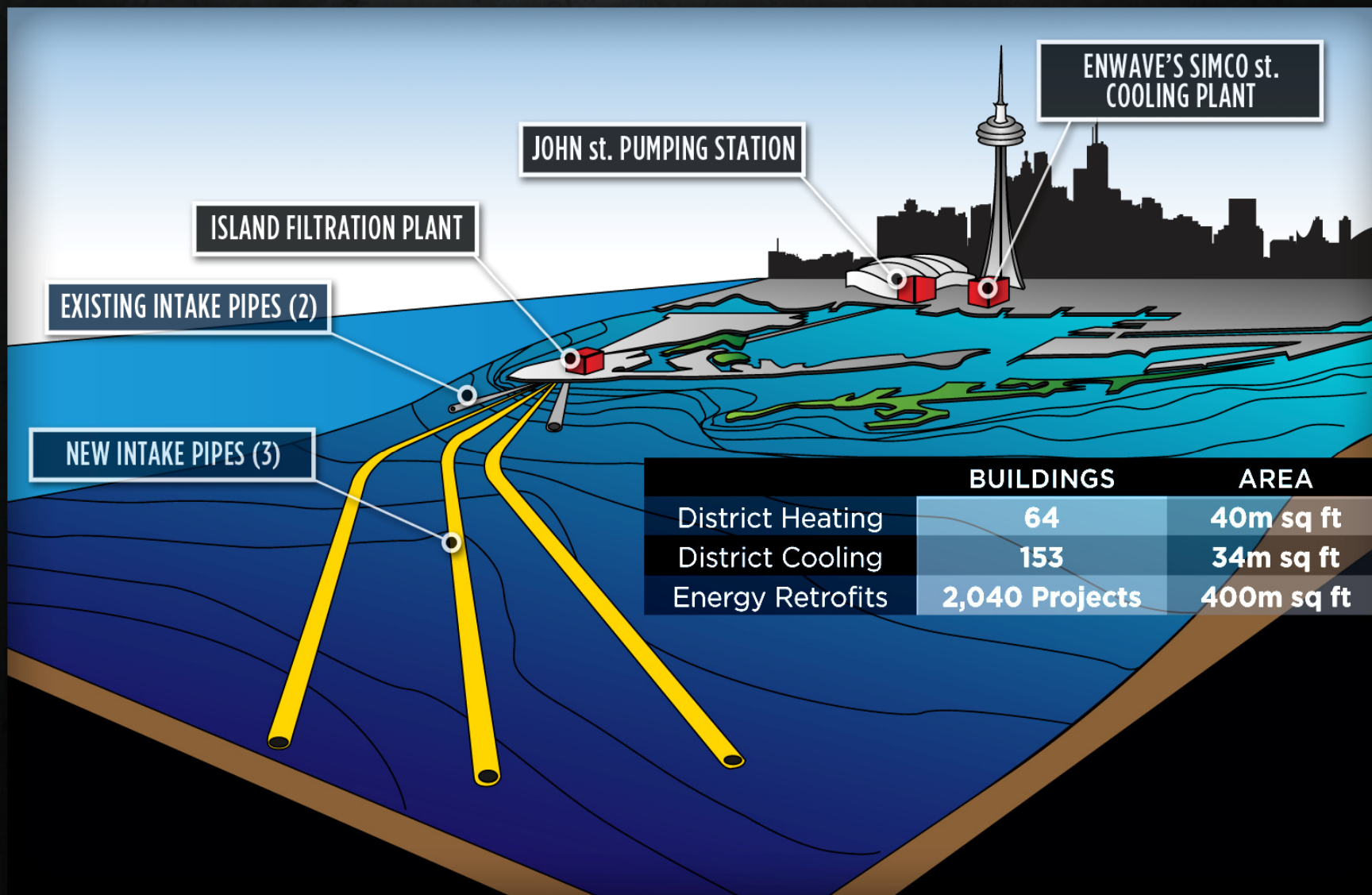
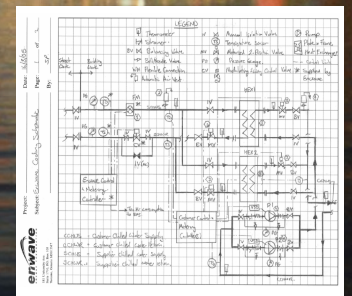


FIGURE: ENWAVE / ADRIAN MORRIS

POLICY INSTITUTION PRODUCT BUSINESS MODEL COMMUNICATION

PHOTOS: ENWAVE, MEGHAN JANUSHEWSKI







FOTOS DE BARCELONA.com | Institut Cartogràfic de Catalunya



FOTOS DE BARCELONA.com | Institut Cartogràfic de Catalunya



©radhika chalasani

THE RESILIENCE ZONE CONCEPT

**draws upon other North American traditions
of local area management**

Through collaboration, new market dynamics have been established to address other urban risk areas: brownfields redevelopment, downtown revitalization, and community safety.

- *Business Improvement Areas*
- *Downtown Partnerships*
- *Empowerment Zones*
- *District Utilities*
- *TIF Districts*
- *Enterprise Zones*
- *Community Improvement Districts*
- *RESILIENCE ZONES*

1. LOCAL AREA RISK MANAGEMENT

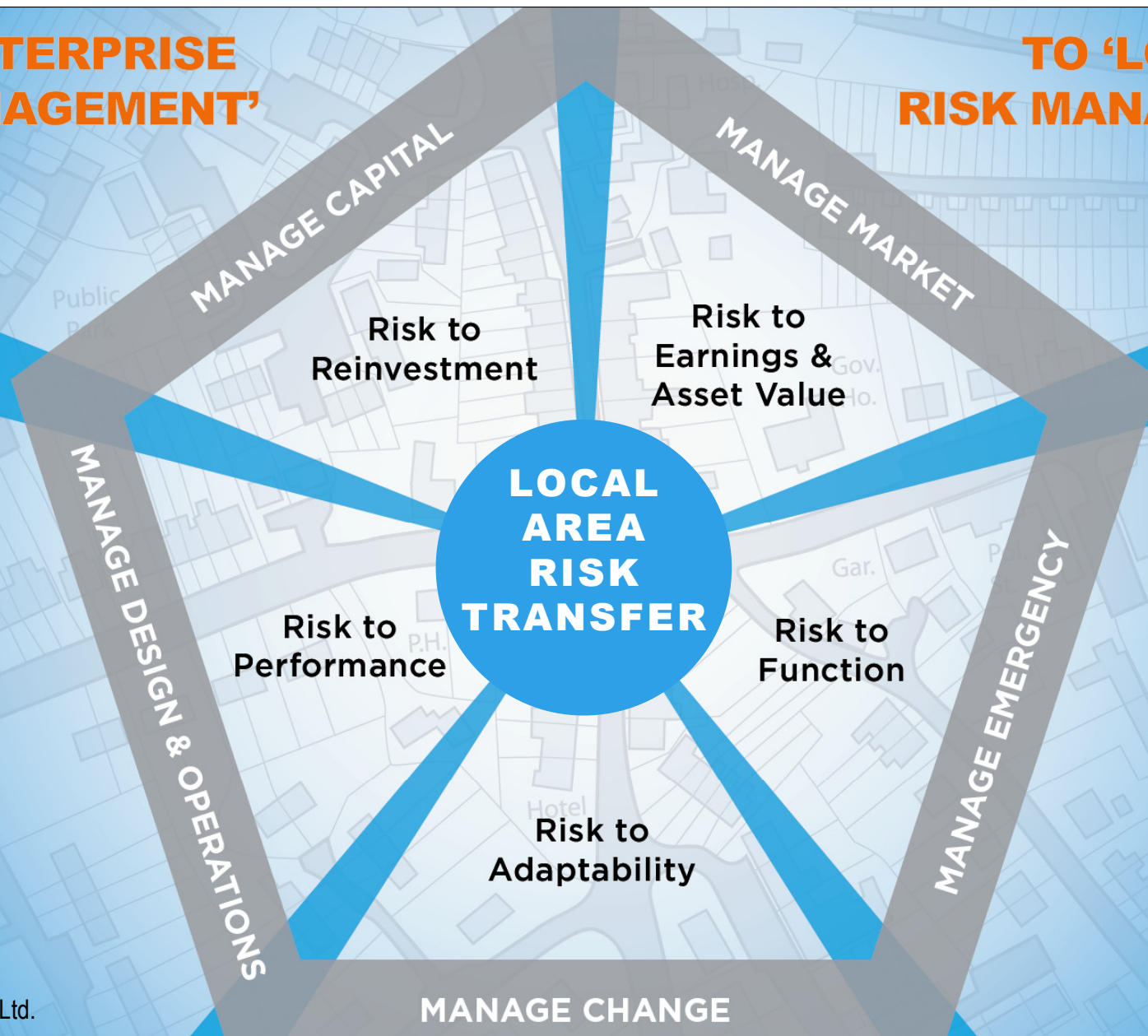
Design the mechanisms and measures for local area risk management

The logic of Enterprise Risk Management can be applied to local areas. Local Area Risk Management is a collaborative effort to devise customized solutions to risks that are distinct to the Resilience Zone. This involves establishing redundancies and mechanisms for responsiveness, safe failure and rapid recovery to current and emerging risks.

- *An area risk management strategy & institution*
- *Risk data collection & analysis*
- *Insurance innovation*
- *Associated planning amendments, investments, and redevelopment*
- *Risk management coordination and support*

**FROM 'ENTERPRISE
RISK MANAGEMENT'**

**TO 'LOCAL AREA
RISK MANAGEMENT'?**



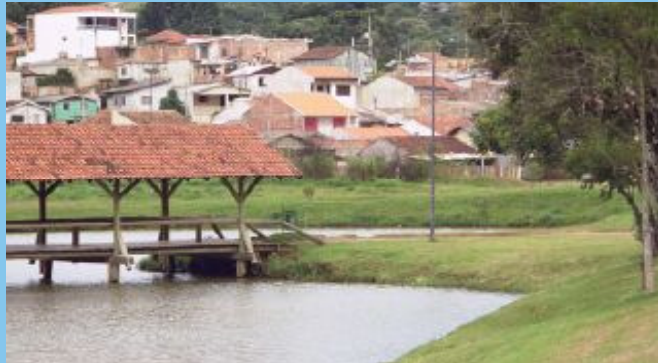
2. RESILIENCE UPGRADING ('2+2=5' SOLUTIONS)

Invest in premium performance

While reducing risks, cost effective measures can also be identified to enhance the overall performance of the area for living and business:

- *Long-term operating cost predictability*
- *Enhanced health, safety & emergency services*
- *More responsive planning, improved landscape and urban design*
- *Improved facilities, increased amenities*





3. COMMUNICATION STRATEGY

Facilitate market recognition

Enhanced resilience—reduced exposure, increased performance—must be carefully and thoroughly communicated to deliver benefits to users and to secure market recognition. Performance benchmarking and place branding are key communications elements.



THE FOUR CORNERSTONES OF A 'RESILIENCE ZONE' STRATEGY

1. ASSET-FOCUSED RISK MANAGEMENT

Develop mechanisms to support household & enterprise level action.

2. LOCAL AREA RISK MANAGEMENT

Develop mechanisms for risk management & transfer at the scale of the local area.

3. RESILIENCE UPGRADING

Design risk reduction measures to enhance today's performance and benefits.

4. COMMUNICATING RESILIENCE BENEFITS

Ensure understanding of benefits and effective use of the new 'Resilience Zone'.

STRATEGY QUESTIONS FOR STAKEHOLDERS

How could we motivate and support asset owners to more fully manage their climate and disaster risk exposures?

Factoring the above, to which risks will the local area remain exposed over the near / medium term?

How could we manage, pool, spread & transfer the remaining risks on a district or other local area basis?

How could such new approaches be developed into market opportunities for insurers and other city-building enterprises?

Could risk management investments be designed so as to improve the area's benefits today?

How could the area's increased amenities & resilience be measured? How could they be compared with competing locations?

How would users be supported to fully secure new benefits? How would the area's unique benefits be communicated to the market?

How do you help establish resilience as a new standard in city-building and location choice?

CORNERSTONE #2: LOCAL AREA RISK MANAGEMENT

(Examples of measures for: extreme heat, flooding, wildfire, sea level rise)

Policy, Regulatory, Legal & Fiscal Innovation	<ul style="list-style-type: none"> Establish detailed GIS-based risk documentation for the area. Form partnership to increase data exchange on climate risk exposure between insurers and public entities. Develop local area emergency management plans that include: provision for emergency water supplies, food delivery programs, cooling rooms, public water taps Implement incentives for local business continuity planning Organize collaborative cross-sector efforts to collect data, e.g. collective funding for flood plain mapping. Neighborhood scale flooding vulnerability assessments could be undertaken to build community-level awareness and buy-in for individual property and local area mitigation expenditures Plan & design areas of 'herd immunity' with wildfire buffers, flood and storm surge protection barriers etc. on their peripheries Apply the use of maintenance assessment districts to allow homeowner groups to establish collective assessments for common risk mitigation investments. Finance open space and coastal buffer protection with watershed and open space protection fees.
Product, Technological & Business Innovation	<ul style="list-style-type: none"> Establish decentralized police, fire, and emergency medical service units , catering to unique vulnerabilities or designated zones Engage a local community development corporation or business improvement area association to develop an insurable entity in collaboration with a large insurance broker to establish a single neighborhood risk pool. Utilities research the potential benefits of collaborating with property owners on a power circuit basis. Invest in circuit area back up power supply. Explore using the Joint Powers Authority legal structure (California) to establish a group captive insurance mechanism for a district. Include system reliability in evaluations undertaken for infrastructure capital planning. Establish clear protocols for triaging customers during water and power shortages. Provide incentives to elevate electrical and HVAC systems in flood prone basements, or to upgrade basements generally
Institutional Innovation	<ul style="list-style-type: none"> Establish a local coordinating body to champion existing risk management measures and incentives to the area, e.g., installation of sewer backwater valves, brush clearing norms. Establish a special purpose vehicle for designated 'resilience zones' to serve as the area's risk reduction and transfer agency.
Communications Innovation	<ul style="list-style-type: none"> Organize local area 'communications hubs' in instances of brownouts, extreme storm and heat events, power outages, etc. Establish special protocols to communicate preparedness and emergency routines for an area's more vulnerable populations. Provide public access to aggregated local area risk data, to provide a sounder basis for making investment and design decisions. Communicate the risk posed by perimeter properties to other properties. Communicating success of risk reduction activities already adopted (e.g., white and green roofs on local area micro-climates).

CORNERSTONE #3: RESILIENCE UPGRADING

(Examples of measures for: extreme heat, flooding, wildfire, sea level rise)

Policy, Regulatory, Legal & Fiscal Innovation	<ul style="list-style-type: none"> Create a Special Assessment District or Tax District, or institute a Local Improvement Charge, associated with the establishment of the Resilience Zone with specific focus on financing redevelopment projects that reduce priority risks and increases local area resiliency Evaluate the issuance of municipal resilience bonds for upgrading of designated Resilience Zones Develop a city- or region-wide resiliency standard and measurement protocol Undertake economic and planning studies to evaluate the impacts of resilience on local business sectors, vulnerable populations, social equity etc.
Product, Technological & Business Innovation	<ul style="list-style-type: none"> Focus on building more resilient infrastructure Establish local community power storage/generation, e.g., micro power generation and alternative power sources localized to a community rather than individual structure Establish micro power grids in particular at business park and campus scales, tailored to the demand patterns of tenants Scale demonstrated "best practices" to establish cooled micro-climates, such as white and green roofs, and green area restoration Develop amenities enhancements that also serve as refuges during extreme weather events: shade structures in parks, recreation facilities, capture wind Design open space and coastal buffer protection areas so that they serve as parks and include recreational and other community facilities Develop or re-design community facilities that serve as everyday hubs for local retail, health clinics, recreation, shared workspaces, and/or continuing education classes but also provide emergency shelters and back-up water, power and communications during emergencies Develop food delivery services in partnership with grocery chains and food service companies to provide emergency food delivery for vulnerable populations in instances of public transit failure Re-landscape parks, gardens, and roadways for resilience in extreme heat and drought as well as for storm water retention and percolation Upgrade building facades and create/implement new maintenance procedures for structures, reflecting changing climatic conditions and extremes Establish a service to install smart meters that automatically triage certain power usage (e.g., bedroom lighting) during brownout periods but maintain priority uses (e.g., refrigeration). Establish a power pricing gradient that rewards reduced consumption at peak periods or for low priority uses.
Institutional Innovation	<ul style="list-style-type: none"> Establish a special purpose vehicle for one or more Resilience Zones to manage the redevelopment process in each, integrating local area risk reduction measures into the overall upgrading of the area for current residents, businesses, and users
Communications Innovation	<ul style="list-style-type: none"> Develop a community rating and accreditation system to enable the comparative rating of the resilience of local areas and buildings



Building Resilient Cities

FROM RISK ASSESSMENT TO REDEVELOPMENT

<http://www.ceres.org/resources/reports/building-resilient-cities-from-risk-assessment-to-redevelopment>



BUILDING RESILIENT CITIES

THE RESILIENCE OPPORTUNITY

A Resilience Zone initiative establishes the market support for a new form of urban performance: resilience. Through collaboration, a mix of customized solutions can be designed to manage risks that still confront the local area after options have been exhausted at the individual property and enterprise scales. Solutions at the scale of the zone can also be purposefully designed to increase the area's function, amenities, and economic performance.



Source: Ceres/ClimateWise/The Next Practice (2013)