



Resiliency Workshop Report

Resiliency Session #1

- I. Joel Bruneau, French Mayor of Caen
 - a. Have flood risk prevention plan, stormH2O and wasteH2O plans in place
 - b. Special organization building commission that overlooks Caen's flood prevention plan
 - c. Role of Mayor in crises, is management and enacting of the city safety plan – provide a special outlet in order to speak within crises.
- II. Mayor Euille, Alexandria
 - a. Need to be proactive – determine the vulnerabilities, costs of action or inaction; consult citizen committees
 - b. Washington DC chair of COG – necessity of sustaining core services and functions in events within communities
 - i. Need to study sustainability measures, and share responsibilities
 - ii. Pull resources to get job done for entire region in situations
- III. Mayor Cedar Rapids, Iowa
 - a. Cedar Rapids is affected by flooding
 - b. Different definitions of resiliency due to locational context
 - i. Importance of specific systems to maintain core principles in dire circumstances to repair, adopt etc. to regain original capacities
 - c. Disaster Resilience National Operatives
 - i. Pilot program that works with several communities across the U.S. with different risks and perspectives
 1. Charleston S.C. -> sea rise impact
 - a. Tends to be resistant to climate change,
 - b. Economic imperatives of tourist industry, it is a low-lying flood prone city
 2. Seattle, Wa -> volcanic activity, tsunami, flooding risks
 - a. Liberal / progressive city
 3. Cedar Rapids, Iowa -> collaborative approach, 3rd highest FEMA recipient state since 1953 due to flooding and tornadoes
 - ii. Hope to provide measures / metrics to help communities produce own ideas on resilience with care to specific risks
 - iii. Get communities to understand what is personally at stake and at risk in regards to resilience
 - d. Planning in Iowa for 100 and 500 year flood events
 - i. Floods in '93, 2008 were extreme; some people say 2008 flood was a 2500 year flood event (the note taker personally thinks this is a little extreme)
 - ii. Need to liken this to a mortgage, within a 30 year mortgage lifetime, a home owner has a 25% chance to experience a flood



- iii. Need to engage people to take out flood insurance, until more resilient measures can be adopted -> insurance as a reactive tool; cities need to be more proactive in disaster mitigation
- iv. Significant infrastructure is at stake and this is comparable between France and the U.S.
- e. Questions to be considered
 - i. How do we engage communities?
 - ii. How do we use social media more effectively?
 - iii. What are the benefits of resiliency vis-à-vis the tax dollars spent?
 - iv. Iowa is urban and rural, not a lot of suburbia, with critical natural resource areas, where does the flooding happen? Where are the trees, and where do we plant them? What areas do we want to protect? Where should we not allow building?
 - v. In the mid-west land is best used for agriculture and not towards development – people like to live on i.e. 5 acres of land -> How do we motivate people to understand appropriate urban and rural development?
- IV. Elisabeth Toutut-Picard, Deputy Mayor of Toulouse, France
 - a. Toulouse is already being affected by flooding
 - i. Pyrenees Mountains in between France and Spain; weather can change abruptly, within a several hour timeframe (up to 6 hours)
 - ii. Paris and other cities have about 2 days to feel the change in weather due to the geography
 - iii. Toulouse and the region share the flooding possibility, and are setting up provincial plans, with regular maintenance of levees
 - iv. Designate certain areas in and around Toulouse that are 'no-build' or 'no-construction' zones, these are around rivers that are potentially dangerous,
 - v. Maintenance plans revolve around these at risk rivers
 - vi. Also conveys risks of flooding involving the local population and water use, as drinking water usually comes from these rivers
 - vii. Issues of water supply also include intense droughts, we have the need to manage water: flood-> excess of water; drought -> shortage of water
 - viii. Air Quality and temperature increases
 - 1. Concern in SW France; weather in Toulouse will have a greater impact vis-à-vis most other places (in France); if the globe experiences a 2* centigrade shift, Toulouse will feel a 3* shift
 - 2. If we do not mobilize now, at the end of the century, the climate in Toulouse will be that of southern Spain: droughts, lack of sufficient access to water
 - 3. Toulouse is 25% agricultural, which is reliant on water
 - 4. If global temperatures rise 3* Toulouse will feel a 4* rise and possible a 6* rise in the downtown areas vis-à-vis the suburbs due to the urban heat shield effect.
 - 5. This increases our need to bring plants into the city, change the coloring of buildings, more gardens



6. These temperature rises will also bring health risks due to lower air quality: 750K population in region, adding 15k every year
 7. Air quality will deteriorate -> a lot of road traffic and transit, and transportation produces 50% of local GHGs
 8. Need protection plan for vulnerable populations, especially seniors
 - ix. Some have an energy climate air plan that has several levels of intervention; we need this as we will feel the impacts of climate change, and the impacts of more GHGs on new populations
 - x. We are losing as much biodiversity as DC is; very similar rates, we had 750 different flora species in urban territories
 - xi. Resiliency – also protection of species and vulnerable species, need to determine inventory; currently doing an inventory of fauna and flora, and need to gauge change in species over time
- V. Guadeloupe (Ferdy Louisy, Mayor of Goyave)
- a. Guava – 8 thousand people (?) mountains and islands, affected by flooding, earthquakes, volcanic eruptions, landslides, cyclones, and storms
 - b. Hugo '89 and Marilyn in '95
 - c. Need to focus on prevention and action
 - i. Understand phenomena, and active monitoring
 - ii. Outreach – planning for hazards, and reduction of vulnerability
 - iii. Prepare – need feedback
 - d. Information to citizens –
 - i. Have big roles for different disasters
 - ii. Many people do not prepare for disasters, these citizens are not resilient
 - iii. Need people to be more concerned
 - e. Crisis preparedness
 - i. To build good plans; expect risk and be able to prepare for it
 - ii. Try to build a resident society
 - f. Emergency Management
 - i. Less – we have a situation
 - ii. More – we have a situation
 - g. Let government think about building, because if the buildings and built environment is not resilient, why is it worth building?
- VI. Question / Answer session
- a. How are you thinking about preparing to protect most vulnerable? Are we up to the task of preparing for a storm like Katrina?
 - i. Mayor Euille, Alexandria is prone to flooding, snow, t-storms, hurricanes, falling trees
 - ii. After 9-11 Alexandria initiated a city wide E-Prep program to train citizens / coordinate city officials for family and self-security:
 1. Where to go to be safe
 2. Training on social media sites
 3. Constant reminders on electronic news sources
 4. Need for citizens to buy into and subscribe to these services
 - iii. Mayor of Caen



1. Pay people if they lose their house, and have to prepare to prevent these events: there was a big event 2 years ago and 6 people lost their house. We have a national tax to pay these people, but what if the next storm destroys 60 houses? 600 houses? We do not have the resources for that
- iv. Grand Rapids, Iowa
1. FEMA – last year and a half, Prepare-athon to increase number of people that are engaged
 2. Need to focus on different hazards at different times of the year i.e.
 - a. Spring: Floods
 - b. Fall: Tornados
 - c. Winter: Earthquakes
 3. Doing large drills and having people play along in the drill in order to develop typology into how to react in disaster situations
 4. Extreme Risks Game
 - a. 20-35 people draw roles with different resources in order to spur cooperation in a disaster event
 - b. Found that teens, and youngsters that did this exercise were far more successful vis-à-vis older people
 - c. Younger people were more successful because they were less inhibited about trading resources
 - d. I.e. could play as garbage man, what to do with the garbage after the disaster
 5. GIS modeling; internally; saved lives, own solar powered monitoring system of streams and rivers on all water bodies in an area in order to quickly tell if a stream or two will experience flooding
- v. Toulouse
1. Vulnerable to heat waves
 2. Need to gather people in A/C rooms, can't A/C all rooms
 3. Problem is population of the city is not managed or is under control, need a census in order to locate elderly and lonely people – need mapping and to use social media to figure out where these people are
 4. As temperatures peak, neighborhood mayors are mobilized to assist elderly people to ensure they have enough water, and food; a couple years ago several thousand fatalities due to heat.
 - a. Impact of nature on health
 - b. Try to prevent the consequences of C.C.
 - c. Silver economy (economy of elderly) need to develop – i.e. everyone has a button to push if they are in need of help
 5. Life expectancy is increasing, need to look at population pyramid



6. It is valuable to keep a database in every community of elderly
 7. Not everyone has the capability to have or use generators – diabetes or people on O2; a loss of electrical systems could be fatal
 8. Need to better address equity issues, most people are disenfranchised
- b. How do you justify rebuilding in a flood prone area?
- i. France has learned development with tourism
 - ii. In a flood prone area, if there is no house, there is no risk, we have and need other places to develop
 - iii. Federal level FEMA – development of higher requirements in order to build
 1. N.O. levees broke it is not a coastal city (note taker disagrees here)
 - iv. Local community needs to focus on determining why are we building here; let's not build here if it is flood prone
 - v. Where do you want your tax dollars to go? If you locate someplace and the sewers overflow everyone pays
 - vi. Flood insurance is financially unsustainable – need to figure out how to get people back into sustainable measures and avoid living in i.e. flood prone areas
 - vii. In Guadeloupe, cannot build in several places, as we have chosen human development over economic development

Resiliency Session #2

- I. Onset of discussion
 - a. New extreme weather events
 - b. Lots of case studies about adaptation
 - c. Electrical infrastructure is at risk
 - d. California droughts 20% of Cali power in 2003 was hydro; down to 10% in 2014
 - e. Issues of water cooling
 - f. Building infrastructure, retrofits, developing how to ensure effective infrastructure
- II. Alexandria
 - a. Preempt or control change at the policy level:
 - i. Alexandria has an aggressive flood plan and management system (one of the best in Virginia, as witnessed by lowest flood insurance rates)
 - ii. Redevelopment of Potomac Yard, adjacent to Potomac River
 - iii. Need to put in infrastructure before moving forward with the development
 - iv. If a risk is known, need to emphasize it more, and maybe increase the requirements within that new development i.e redundant support to ensure safety



III. Caen

- a. Flooding – infrastructure to prevent problems, but there is not enough infrastructure
- b. Need to adopt more to prevent flooding
- c. 12km from the sea, have a system of rivers and canals to divert flooding events and it is forbidden to build in the middle of the river and canal
- d. This canal system helps the river divert water into the sea during extreme events
- e. With the canals and river there is less flooding than before, all this infrastructure was built about ten years ago at a cost of 50-60\$million US.; it is not big infrastructure but it is effective for now
- f. Landslides; survey subterranean caverns since 1955 in order to understand where to and where not to build -> some areas are banned for building due to the underground quarries and landslides from storms
- g. Sinkholes – city was built on marsh land with many underground cavities – it is like Swiss chees
- h. N.O. is like a sponge with an insane asylum built on top

IV. Boulder

- a. 2013 evacuation due to flooding; city of 80k people about 25 miles from Denver
- b. C.C. -> scary are its effects on water in the case of extreme events
- c. Boulder part of 100 resilient cities; city is reliant upon water
- d. Flood / droughts all come back to too much or too little water
- e. Joke of the city building an Arc (Noah), when the city made record receiving 9 inches in one day, 16.9 inches in 7 days this is an entire years' worth of rain in one week ~ similar to that of a tropical storm (in Colorado) and were not prepared for it
- f. $\frac{1}{4}$ of all Boulder is in floodplains
- g. Floods here are flash floods triggered by the proximity of the mountains and the short timeline of events – 3 inches of rain in an hour in the watershed produces a lot of destruction without any warnings
- h. Have strict flood rules – high hazard zone where you can't do anything
- i. The city has been buying properties in floodplains in recent years
- j. Much of the city was laid out in these floodplains before anything was understood about flooding (no GIS etc)
- k. The city has a defined western and southern edge
- l. Most of space around city is open space, and all flood creeks run west to east; these creeks and open spaces also provide running and bicycle infrastructure (multiuse and right of ways) used for flood mitigation and transit
- m. Retainer walls soften the landscape, not like the L.A. river
 - i. More resilient – softer scape absorbs more water and does not speed up the flow of water
 - ii. Although roads were still obliterated, sewers were overwhelmed and overflowed, with lots of big debris and silt deposits
 - iii. Water treatment facility 1000 feet above the city on the outskirts
 - iv. The watersheds are above the continental divide
 - v. Power went out, had back-up generators and supplies, but 6.5 of the 7 servicing roads to the station failed and were impassible, city



- almost lost the entire treatment plant, but people were able to get supplies in just in the nick of time
- vi. It was able to be saved due to the employees were able to take own actions, and figured out resolutions themselves – they did not have to wait for delegated powers to arrive or instruct them. This directly saved the system
 - n. Waste water station is lower in elevation, and was also saved in the same event by several hours
 - o. Boulder is also at risk to fires and droughts
 - i. Fires
 1. Close to the foothills, practiced tree thinning
 2. Caught in open space that buffers the city from the forest; left this as grassland in order to more effectively fight fires
 3. In winter winds can exceed 100mph and a fire can come down the hills, and no one can do anything to stop the fire with those winds, but the buffer offers a little help
 - ii. Droughts
 1. Own watershed to west that goes up the mountain can experience droughts
 2. Major study of tree ring data looks at historical information
 3. Important to note that past behavior will not predict future behavior
 4. Applied C.C. models to past data to determine if we have enough water for the next 100 years. Boulder does not have enough water for everyone for every year – rationing will have to happen
 5. Resilience – you need money in order to be resilient usually it is either too little or too late
 - p. Boulder has reserve funds in order to help out with resilience; if the city did not remove silt from the creeks before that last major storm, the city would have sustained much more damage
 - q. It is good to be resilient
 - r. You never get things you plan for
- V. APA and Applied Research Program
- a. Theoreticians and practitioners come together
 - b. National Centers for Planning; everything is connected
 - i. Need to break down silos; between public and private and within government need to foster dialect (role of APA)
 - ii. Resiliency is emerging just like sustainability did, hopefully it will not be a fad sort of how sustainability became
 - iii. Resiliency -> economy + social + environment
 - c. Green Infrastructure (GI)
 - i. Costs a lot of money, you need to spend money to save money; long term investments (LTI) takes time, GI is not an alternative, it needs to be part of every plan
 - ii. NYC 10 years ago had to decide between installing a 3rd water treatment plant, or added GI – they chose added GI – rain gardens, green roofs, etc. GI provides multi-facet solutions to problems
 - d. Role of public health research –



- i. Research priorities – active living / food system, health in all planning policies
 - ii. Hazard planning center PAS Report 576 (resilient communities)
 - e. Integrated process – all aspects of planning hazard mitigation
 - i. Public participation is important
 - ii. Pre-disaster – operation
 - iii. Pre-disaster – goals and policies
 - iv. Post disaster – design oriented
 - v. Short term solutions: how to increase resiliency, building hiatuses
 - vi. Long term solutions: leadership, organizational roles and responsibilities, establish action schedule
 - vii. Resiliency – incorporate new thinking into and integrate with planning processes, integrate with schools etc.
 - VI. Question and Answer session
 - a. Fracking. Any data to share with citizens on harmful nature? Any international legislation in place?
 - i. Not one solution fits all – different places, different monsters
 - b. Community involvement in process?
 - i. Needs to be proactive and managed
 - ii. How to manage well is to share information (transparency)
 - iii. Make sure public understand demands on city, i.e. basic services economy, development
 - iv. How incremental decisions play into big picture i.e. need to make nexus between school roofs in Ward 8 (DC) and development downtown
 - v. Social media is expanding opportunities to reach citizens; facilitate a two way conversation
 - vi. Community development benefits (new term)
 - vii. From Guadeloupe –
 1. We are consulting with people with what to do in each zone – participatory democracy
 2. Everyone to give their own opinion
 3. Associate and involve constituents up stream of any development
 4. Doing it sustainably with stringent French regulation
 5. Most needs to be done according to standards
 6. There is a huge cost for developing social longevity
 7. Equity – people who can and can not afford it
 8. As a politician you are to make choices to help those that are not as well off
 9. No such thing as 0 risk, so you need to mitigate the harmful events
 10. Blend – cohabitation – social, equity, economy, plan as if the island is cut off from the rest of the world
 - c. How do you reconcile goals of sustainability and resiliency with disaster mitigation, Boulder vs. Guadeloupe?
 - i. Have own water bills and utilities, everyone plays in and it is important to the city as a whole
 - ii. Can not just focus on people in the floodplains, but everywhere



- iii. A lot of private property was flooded and damaged, not just in the floodplains rich individuals were able to cope
- iv. People renting in basements lost a lot of what they had, they have no savings and we had to take care of them “deal” with them
- v. Boulder did not plan enough for the have-nots
- vi. All of this comes under the sieve of sustainability
- vii. Resilience and sustainability are complimentary and are almost the same
- viii. Alexandria EAP
 - 1. Let it be a roadmap / guidance in order if a disaster comes along it will help you
 - 2. Rebuild and readdress based on that plan
 - 3. Developers come into mayors office and want to build, the mayor tells them you have to contact the community and let them guide your process; everyone needs to be onboard
 - 4. Engaging community takes a good deal longer – micro and macro work in order to construct the big picture

Resiliency Session #3

- I. Opening remarks
 - a. Discussion about best management practices (BMPs)
 - i. Approach resiliency and investment to improve:
 - 1. I.e. DC H2O building a seawall to protect the Blue Plains water facility
 - 2. Incorporate resiliency into planned infrastructure and capital planning projects
 - ii. Funding:
 - 1. EPA revolving funds
 - 2. HUD development block grants
 - 3. DC 5 cent plastic bag fee – may not stop the bags from finding their way into the Anacostia River, but the fees help fund GI, i.e. with retrofits
 - 4. Tiger Grant Fund
 - b. Incorporate future projections into funding
- II. Cedar Rapids, Iowa
 - a. What is the cost of doing nothing?
 - b. Figure out what is most important to the public, and engage them in those ideas
 - i. Become responsive to the money available -> floodwalls -> need to see cost/ benefits analysis done by Federal Government
 - c. In Cedar Rapids,
 - i. East bank of river is corporate offices
 - ii. West bank is worker housing
 - iii. Engineers said it was cost effective to put infrastructure up only on east bank
 - iv. This brought up equity



- v. Communities need to talk to businesses and this needs to be discussed as a workplace issue
 - vi. Private Public Partnerships (P3s)
 - d. Introduce permeable pavers, if not then face higher development fees
 - e. Take an example in San Francisco
 - i. 3 story buildings are prone to earthquakes, it was found that if you only reinforce the basement or lowest level, the entire building can be suitable to withstand earthquakes
 - ii. This retrofit would cost on average 1200\$ US, the private home owner would invest 600\$ and the government would subsidize the other 600\$
 - iii. How do you engage with developers if people build on potentially hazard areas? Need to discuss that up front
- III. Broad Level
- a. A lot of Colorado cities are built up to the forest wall – this poses a big risk, need to have open space buffers in order to help mitigate fire damage; look to Boulder’s building practices
 - b. 1953 – 20.9 million which averages 19 cents per person in disaster relief funds
 - c. 2014 – 1.4 billion which averages 14 cents per person in disaster relief funds ; this trend is unsustainable
 - d. Every one dollar invested in resiliency before an event saves 4-5\$ post event
 - e. San Francisco taxes for safety – it is not if an earthquake happens, it is when an earthquake happens, because it will happen
 - f. Side note on March 5th 2015, Anchorage Alaska will be warmer than Washington, DC
 - g. Need to instill adaptive behavior in our children
- IV. Nature Conservancy
- a. Nature Pays; nature is the most effective way to mitigate C.C. effects i.e. sea level rise, floods, etc.
 - b. This is a business case for nature, natural systems
 - c. Oyster reefs, coral reefs, marsh, wetlands, mangroves, all much more effective at mitigation than anything man-made
 - d. Good science -> good policy -> good funding
 - e. Reduce risk and build resilience and how to pay for it
 - f. Conservation finance trust for public land -> creating funding sources for public conservation
 - g. Florida is the largest single exposed risk (insurance) in the world
 - i. Expense would be 3.2 trillion dollars of damage if the last 3 southeast counties in Florida were to go underwater
 - ii. Florida has its pants down; how does Florida pull its pants up and reduce its exposure to risk?
 - iii. Quantified risk avoided by specific reef or mangrove forest, i.e. 200 million people worldwide are protected by coral reefs
 - iv. Reef construction:
 - 1. 20.9 thousand US dollars per square meter of man-made reef
 - 2. 1.2 thousand US dollars per square meter of natural reef



3. Seawalls and levees erode over time
 4. Oyster reefs and coral reefs expand over time
 5. Coral reef construction can cost up to 94% less than traditional break water construction
- h. Natural infrastructure and insurance:
- i. Flood plains by design -> Puget Sound Wa. -17 rivers that are getting reengineered – price you pay linked to infrastructure put in place i.e. flood insurance rate affects
 - ii. Flood Insurance market is 42 billion dollars over extended (which the author of these notes, notes is illegal) – if you are in a flood zone you have to have flood insurance, politics deflate rates
 - iii. If you fortify city infrastructure you can charge lower flood insurance rates (premiums)
 - iv. Products: different places require different products
 - v. Potential natural insurance on a reef – reef protects beaches a claim on a policy would pay for infrastructure retrofits etc.
- i. Toe / foreslopes in between road and agricultural land – prairie grass more beneficial on toe slopes vis-à-vis foreslopes in mitigating environmental actions... floods etc.
- j. An increase in the community rating system will lower insurance premiums
- V. Questions and Answers
- a. Coral reefs can expand and grow even with bleaching events
 - b. Florida re-nourishment is not sustainable (re-sanding the beaches)
 - i. Creates a bigger problems for extraction and infill sites
 - ii. Alabama does not allow hotels to rebuild on waterfront property, to stymie erosion (Orange Beach)
 - c. Guadeloupe
 - i. A lot of coral reefs, lots of money, other countries contribute to science
 - ii. Compare mortality of Guadeloupe with other Caribbean countries, Cuba etc. different rates can judge different pollution levels
 - d. Mangroves: Rostov Convention to put together coalitions and policies in order to mitigate affects while staying within the limitations, trying to make an eco-corridor from Florida to South America around the Antilles
 - i. Pollution starts in Florida, travels to Guadeloupe – pollution knows no borders or boundaries;
 - ii. Algae from South America and lionfish from U.S. all make it to Guadeloupe
 - iii. Everyone is in jeopardy
 - iv. Hurricanes start in Africa, go to the Caribbean, up to Florida, NYC, and back over to Europe (everything is cyclical)
 - v. There are no borders, just Humanity
 - e. Guadeloupe there are no more than 4 stories, if you build more than 4 stories it will be destroyed with the next earthquake
 - i. Lessons from Hugo -> to change architectural design of all houses in order to have reinforced sloped walls in order to anticipate and protect against the big one.
 - ii. Natural and man-made both help to make resiliency work



- iii. Need to bring safety to people and structures, two towns have already done this
- f. Mississippi river; if it were a full river, (i.e. spring) and huge earthquake would equal a major disaster
- g. Iowa is one of the largest polluters of the Gulf of Mexico (the author notes, this may be behind BP in pollution of the Gulf)
- h. How to frame the picture in order to understand the bigger picture and global context
- i. McDonalds is to stop using anti-biotic treated chicken in food, this will change a big picture in the food industry for the better
- j. BMPs blend of economic incentives and policies
- k. Monsanto and Pioneer not resilient – single strain dependency
- l. Oyster beds clean so much water – thinking of putting oysters in Hudson River on piers growing them in order to clean the water; oysters are just like trees, air and water scrubbing
- m. Louisiana cannot install underground utilities due to high water table
- n. Iowa is one of the most altered landscapes in the US.

Note takers: Allen Grace (Virginia Tech) - allen.grace.04@gmail.com

and Madeleine Holland -M.A. Candidate, International Economics & International Relations
Energy, Resources & Environment -Johns Hopkins University, School of Advanced International Studies (SAIS)
Madeleine Holland mholla16@jhu.edu