Sea Level Rise Tour Report 2019

Miami/Miami Beach, FL; Charleston, SC; Boston, MA

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The sea level rise tour was funded by the Castle Foundation and the Packard Foundation and coordinated by the UH Manoa to learn what 3 east coast cities are doing to adapt to climate change and sea level rise. The SLR Tour purpose was to identify, retrieve, share and apply lessons learned.

Participants included Makena Coffman-Chair City Climate Change Commission, Chip Fletcher-Vice Chair City Climate Change Commission, Marta Forero Wayne-Hawaii Philanthropy Forum, Aida Arik-PhD candidate-UH Manoa, Matt Gonser-Office of Climate Change, Sustainability, and Resiliency, Ross Sasamura-Director DFM, Lori Kahikina-Director ENV, Katia Balassiano-DPP, Sam Lemmo-State DLNR, Genevieve Sullivan-State DOT, Mike Fuke-BWS, and Barry Usagawa-BWS.

Miami: Elevating Streets and Infrastructure:

- Miami is remarkably flat. Both the City of Miami and Miami Beach developed Stormwater Management Plans to identify improvements based on data collection to monitor changes in SLR, flood model analysis, flood control and water quality.
- Improvements included the installation of backflow preventers at outfalls, stormwater pump stations, adding pumps to gravity drainage systems, stormwater storage, raising streets and seawalls. Target design is 3.7 feet of SLR. Miami deals with marine & groundwater inundation.
- City of Miami stormwater mgt plan update consultant is CDM Smith and Miami Beach update is Jacobs Engineering. NEED TO GET A COPY OF THE PLAN OR THE SCOPE.
- SLR research and modeling of the future state is essential. Miami Beach lifted streets and added pumps only after SLR flooding became a nuisance. The stormwater pumps are huge. The Miami convention center pumps are 80,000 gpm or 114 mgd, one of the largest of about 80 pump stations. The power consumption and GHG generated must also be significant. https://www.apcte.com/stormwater-pumpstation-miami-beach Is pumping cheaper than lifting?
- Miami Beach is estimating $650 Million for stormwater improvements over 10 years. They increased their stormwater fee from $9/month to $24/month based on equivalent residential units. The ERU is a measurement of the amount of impervious square footage that a typical residence contains based upon the aggregate of a driveway, garage roof, house roof, and miscellaneous paving.
- “The truest measure of any society, or any person, is the willingness to protect a future they will never personally experience” Philp Levine, Mayor of Miami Beach

Miami Beach sand replenishment was impressive, adding a couple of hundred feet of sand with a vegetative dune and boulders for protection. Where they get all that sand?

Figure Beach replenishment in Miami, Fla. This project restored a declining tourist industry and paid for itself in revenue.

Charleston South Carolina, the Low Country: Notes of Note:

Charleston created a Resilience Network:

Engaged a Dutch Dialogue Process, a collaborative effort bringing together national and international water experts working alongside Charleston's local teams to **conceptualize a Living With Water™ future**. This new way of thinking about water, land, and people with multiple benefits will provide near- and long-term value to Charleston. https://www.dutchdialoguescharleston.org/

- Climate Adaptation Planning needs to be driven more consistently at the local level where most impacts occur.
- Climate education and outreach needs uniform knowledge of how hazards affect infrastructure. Use a common vernacular and time horizons.
- "Make Room For Water"
- "There's walk through water, walk around water, drive through water and drive around water"

- Their climate adaptation planning combines SLR + Flood + Storm Surge
- Groundwater inundation is not an issue for Charleston or Boston, probably due to the geology.
- Intermediate High Scenario is 2' by 2050, 3' by 2080 and 5' by 2100.
- Graph of # Days w/ 1' or higher: 38 days by 2030 and 319 days by 2050. There is a Tipping point.
    - 2017 had 80 days of flooding and January 2019? had 19 days of flooding >1'.
- A SLR strategy needs to be incorporated into the business of the City.
- 5 critical components: Resources, Land Use, Governance, Infrastructure and Outreach
- Track initiatives On-Line: green, yellow and read
- Had a Map of Elevation Zones and an Urban Growth Boundary
- Used a Watershed Approach
- Revenues: Property Tax and Stormwater Fees. $120/year ERU, Improvement districts, bonds, tourist district fees.
- Used Federal Funding Assistance Programs through reimbursements, so need a rainy day fund.
- Zurich Insurance is watching, not actively involved yet, but need to reduce their risk profile. Insurance industry can drive actions.

Dan shared a photo like this of Battery Park. This wall was like 5' high above the street.

- Importance of Messaging:
- Water wants to be where water was. Showed old maps of Charleston that got filled in.
- Nuisance flooding is frequent and will cost just under what extreme events cost the City.
- An annual storm tide of 4-feet occurs once per year.

Flood Plain Management and Bluebelt Program: Goals to 1) promote natural flood plain functions, and 2) Reduce & mitigate flood losses.

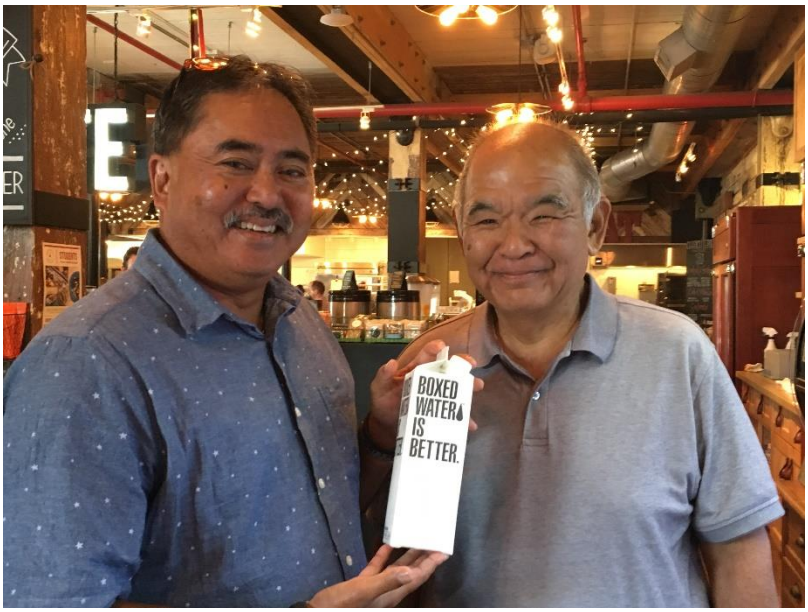
Loss/Damage Compensation: City purchases properties at Market Value using a 3rd party appraisal. Uses FEMA grants. FEMA rules is pre-damage value. Process is voluntary, No Condemnation. May tie to disaster declaration. Can't rebuild once property is purchased and buildings are demolished…

The NOAA online tools are impressive:

- Sea level rise viewer
- Tides and Currents
- Flood Exposure
- Doug.Marcy@noaa.gov
- https://nowcoast.noaa.gov/
- https://coast.noaa.gov/digitalcoast/

- "The Opportunity of a Good Disaster… or Never Waste A Good Disaster…" CF
- "If Not Hopeful, Would be Drunk…" Bud Ris

And boxed water is better… MF&BU



Climate Ready Boston: Notes of Note

- Boston established in the 1600's… The cemetery across the hotel was dated 1630. The Omni Parker House Hotel is about that old and notably haunted…
- Lot of Boston is fill. Boston built 2' above high tide. Since then, sea level rose 11" and they forecast 40" by 2070.
- Hurricane Sandy was an inflection point. Storm surge is a huge vulnerability for Boston.
- Flood Progression: a 1% storm today will be a 10% storm by 2050 – 2100 and will become monthly from 2070 on.
- Boston Airport and Harbor are flood proofing their facilities.
- Storm drains that are under water have backflow devises and/or pumps.
- Tide fluctuates like 12'.
- Kurt from Woodshole Group created an impressive MassDOT climate model, high resolution, probalistic flooding, hydro-dynamic 2-D, 1/3 second timescale. Domain takes it to the mid

Atlantic and into the East coast. Models SLR+Flood+storm surge from a Nor'Easter. Requires 4 super computers. Concerned that a Nor'Easter could sit over an area for 2 tide cycles…

  - Model provides probability based results that can be more effectively used to assess vulnerabilities and prioritize planning. Used to test various adaptation and engineering options, connect to ecological, piped infrastructure and economic models.
  - Working on an operational model that may be able to predict the track of hurricanes.

- They talked about a SLR Zoning Overlay District of 40" that would apply to new buildings >25,000 sq.ft.
- Boston has a 1970's law requiring all parcels fronting the waterfront to set aside 12' for the harbor walk, which provides a buffer zone. This reminds me of Honolulu's Ordinance 2412, which requires new and renovated buildings to set aside frontage property to widen the right of way if the roadway is too narrow. We had discussed a Vertical SLR Ordinance requiring new buildings to elevate to a specified elevations. How high depends on the Stormwater Management Plan accounting for a __% flood or Flood Insurance Rate Maps (FIRM) + SLR.

<u>Boston Water and Sewer:</u>

- Motto: *Drink with Confidence and Flush with Pride*. Affordable under all circumstances.
- Water supply is plentiful. The Quabbin reservoir has 5 months of freshwater storage. They said rainfall models indicate that the East Coast will get wetter. They have a lot of surface water storage. They are a regional water wholesaler.
- Sewer system is part separate and part combined Storm and Sewer. Deer Island WWTP can treat 300 mgd of wastewater and they raised the WWTP 2'. They send their conditioned solids to Florida to fertilize oranges groves.
- They conducted Water Master Plans, Functional Plans, Emergency Action Plans, etc.
- Words of Advice:
  - Be pragmatic. Don't be afraid to set new benchmarks, better than No Action.
  - Protect people and staff. Switch treatment plant operators regularly for flexibility.
  - Understand where repetitive losses and damages are.
  - Build in Climate adaptation over the long term. Flood proof as you go. Resilience is built-in.
  - Trade-off is level of risk vs full flood proofing.

<u>Boston Environmental Dept. Carl</u>

- The SLR Zoning Overlay District establishes conditions for elevating structures, walkways and infrastructure, creating Floodable 1st Floors. Challenge is that most of Boston is historic and building renovation is difficult.
  - At the Edges of the Overlay district, when it crosses ½ a parcel or has some high ground, he likes to sit down and figure it out. He's willing to be more flexible at the edges.
  - Is it precedence or is it still ok? It's new and evolving. He's willing to take the risk of inconsistency.
- On Implementation, get started. Look for targets of opportunities.
- Target is 40" or 3.3' or 1 meter. Even though the 1% storm will be increasing, it comes down to timing… When will 40" be reached? Also, Boston is subsiding about 6"/century.
- See Executive Summary: Coastal Resilience Solutions for South Boston.

1. **Please tell us what you think were the main takeaways from the SLR tour.**
    a. How were streets lifted and how was it funded. Streets were lifted because of existing flooding, not necessarily before. A stormwater management plan is ESSENTIAL. Infrastructure vulnerability assessments and functional plans that drive CIP and annual budget action is ESSENTIAL to address climate and SLR impacts.
    b. Everyone is resource constrained. Seek FEMA & DHLS, State, City & private funding and do a few adaptation plans & projects every year rather than wait until it becomes critical.
    c. Collaboration among agencies, with the private sector and the community is essential in order to collectively find ways and opportunities for climate resilience and adaptation. Miami said utilities cannot plan for climate change in isolation. Charleston Resilience Network. Climate Ready Boston. What is Honolulu's Climate Collaboration Network?

2. **What suggestions do you have for implementing some of the takeaways in Hawai'i?**
    a. It is critical that adaptation requirements/standards be established for new development in SLRXA areas (like the SLR Zoning Overlay Districts). We are missing huge opportunities as these buildings may last 100 years. Roads can be lifted later when the nuisance flooding trigger is reached in mid-century.
    b. Can Mapunapuna be a candidate demonstration project, since its flooding now. There is a lawsuit. A 3rd duckbill drain backflow preventer is in the works according to DDC. Some streets are subsiding. Should the City elevate or retreat and when? What is the Long Term Plan?
    c. BWS and DPP and consultants are developing the Primary Urban Center Development Plan and Watershed Management Plans, expanding climate change & SLR adaptation plans, adding policies, strategies and catalyst and demonstration projects.
    d. Working on the One Water Collaboration Framework for Climate Resilience, with a draft SLR and Stormwater check list and 5 demonstration projects.
    e. Assisting OCCSR with the OLA #28 Climate Adaptation Strategy effort.
    f. Assisting DFM in the Stormwater Utility/Fee project on the stakeholder advisory group.

3. **What types of obstacles might you expect to find when applying what you learned to practice?**
    a. Streets are not flooding yet, except for Mapunapuna
    b. We need to focus on today's problems first.
    c. BWS should maybe stay in its own lane… but we have to wait for low tide to repair coastal main breaks now and it will only get worse…
    d. Funding constraints

4. **Are there any specific projects that you look at differently now as a result of the SLR tour and why?**
    a. Those cities are worse off than Honolulu. We got some time, but we need forward momentum to reach critical mass, a plan, elected official leadership and community support.
    b. Storm surge is not being addressed here. Should it be?