UNISDR Disaster Resilience Scorecard Preliminary Review:

IBM / AECOM Workshop with the City of Stamford, Connecticut | March 17, 2015

Moderators

Peter Williams (IBM) / Allan Klindworth (AECOM)

Attendees

- Mayor David Martin (City of Stamford)
- Adam Whelchel (Director of Conservation Programs
- The Nature Conservancy CT)
- Joe McGee (The Business Council of Fairfield County)
- Erin McKenna (Planner, City of Stamford)
- Rob Sachnin (Planner, Western Connecticut Council of Governments)
- Tom Lombardo (Police Captain, City of Stamford)
- Ted Jankowski (Director of Public Safety, Health and Welfare, City of Stamford)
- Nancy Pipicelli (Energy/Utility Manager, City of Stamford)
- Lou Casolo (Engineer, City of Stamford)
- David Killeen (Planner, City of Stamford)
- Thomas Madden (Director of Economic Development, City of Stamford)
- Tracey Alston (Community Relations Manager, EverSource Energy)
- Ed Goldberg (Manager, BC,DR & Threat Assessment for Northeast Utilities)
- Norman Cole (Land Use Bureau Chief, City of Stamford)
- Caroline Vary (Director, Connecticut Office, Jonathan Rose Companies)
- Chris Bruhl (President, The Business Council of Fairfield County)
- Andrea Pinabell (Vice President Sustainability, Starwood Hotels)
- Lisa Mercurio (Communications, The Business Council of Fairfield County)
- Megan Saunders (Director, Stamford 2030)

Introduction

This document summarizes the discussion in a workshop held to construct an overview of the resilience of the city of Stamford, CT to natural disasters. The workshop was structured with discussion headings provided by each of the "Ten Essentials" of Disaster Resilience published by the UN's International Strategy for Disaster Reduction (UN ISDR)[1]. In the time available (one day) there was not time to fully apply the UN's accompanying City Disaster Resilience Scorecard, although the assessment criteria in this were used as discussion prompts. Scoring was carried out against each "Essential", by simple consensus of those attending, the intention being to provide a preliminary "sighting shot" pending detailed completion of the scorecard by the city over the summer of 2015.

This document is purely a summary of a discussion based on the participants' knowledge and understanding, and their collective first impressions. It should on no account be regarded as a complete coverage of Stamford's resilience positioning and issues. No part of it has been separately or empirically validated, and no part of it should be regarded as accurate or correct until so proven.

Executive Summary — Major Conclusions

"We're excited to be the first city in the U.S. to use the UN Scorecard to measure the resilience of our City. Stamford is uniquely located on the Long Island Sound, where the need to address infrastructure resiliency and adapt to extreme weather events is imperative. We are working on programs and infrastructure improvements to increase energy efficiency of municipal buildings, as well as, to improve reliability of local electricity generation in order to lessen the impacts from future storm damage. The workshop helped us to identify strategically where we need to put our focus in order to move forward with the right projects to make our City better prepared." Mayor David Martin, City of Stamford.

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[1] The Ten Essentials can be found at www.unisdr.org/campaign/resilientcities/toolkit/essentials; and the Scorecard at http://www.unisdr.org/campaign/resilientcities/. Note that both are in the process of being updated as part of the renewal of the Hyogo Framework for Action (HFA) in Sendai, Japan, in March 2015.

The consolidated scores from the Stamford workshop are summarized below.

Stamford Summary
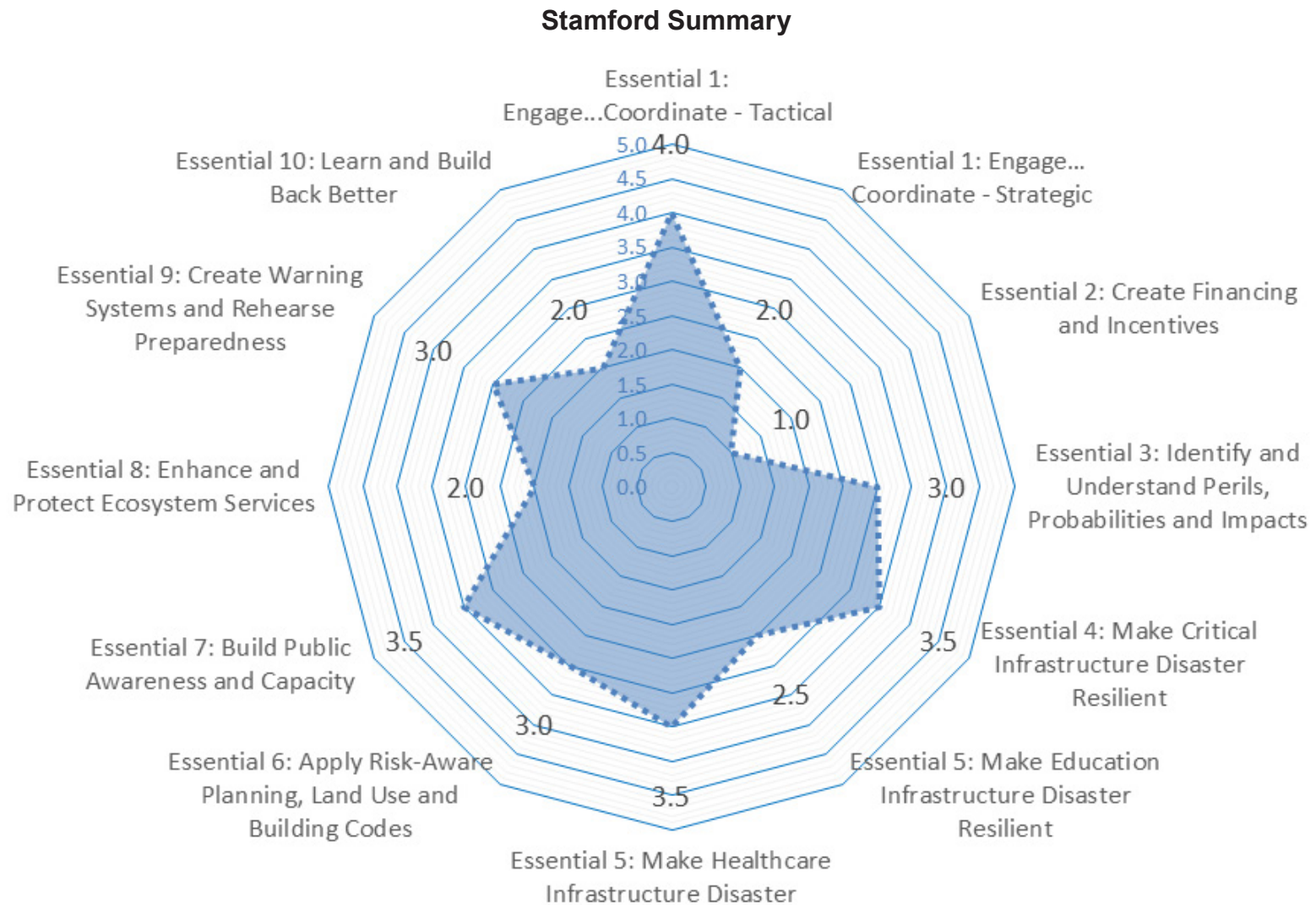
(Note that the score for Essential 4 represents an average over a large number of sub areas. In reality some areas should probably be scored higher than others, with telecommunications or fuel supply (as examples) perhaps representing more significant weaknesses than the average shown here would imply. Details are set out below).

UN ISDR
Ten Essentials
For Disaster Risk Reduction

ESSENTIAL 1:
Engage, Share Understanding and Coordinate

ESSENTIAL 2:
Create Financing and Incentives

ESSENTIAL 3:
Identify and Understand Perils, Probabilities and Impacts

ESSENTIAL 4:
Make Critical Infrastructure Disaster Resilient

ESSENTIAL 5:
Make Education & Healthcare Infrastructure Disaster Resilient

ESSENTIAL 6:
Apply Risk-Aware Planning, Land Use and Building Codes

ESSENTIAL 7:
Build Public Awareness and Capacity

ESSENTIAL 8:
Enhance and Protect Ecosystem Services

ESSENTIAL 9:
Create Warning Systems and Rehearse Preparedness

ESSENTIAL 10:
Learn and Build Back Better

Key conclusions included the following:

- **ESSENTIAL 1:** Stamford is stronger tactically (ie in immediate emergency response) than strategically. Long term resilience plans, integration with the State, engagement with business and engagement with community organizations, could all be strengthened.

- **ESSENTIAL 2:** Stamford's financial planning for resilience, its assessment of the returns from resilience investments and its use of incentives, collectively represent the weakest of the "Ten Essential" areas reviewed.

- **ESSENTIAL 3:** Stamford has a good core of hazard data from the WCCOG, but some improvements are possible and the city has to date struggled with getting its citizens and businesses to engage with the data.

- **ESSENTIAL 4:** The most significant weaknesses and unknowns in Stamford's critical infrastructure systems seem to concern communications (in particular cell-phone) systems, separately and together; and its diesel fuel supply. While Eversource (the energy utility) is clearly very engaged in Stamford's disaster planning, there would be value in trying to elevate the engagement from water and cellphone companies (including tower owners) to the same level. Many infrastructure systems suffer variously from age, maintenance shortfalls and other issues specific to each. The diesel fuel supply is prone to disruption.

- **ESSENTIAL 5:** Stamford's schools stock does not appear to be structurally adequate to withstand more than a category 1 storm, which is especially problematic because it is planned to use schools as shelters. The health system appears to be better placed, but the components of it should be stress tested against the city's planning scenarios rather than just relying on the operators' own data (which may in any case be based on different assumptions than the city's).

- **ESSENTIAL 6:** Stamford's probable future population growth in its downtown and elsewhere needs to be factored into its resilience and emergency planning; it needs to investigate the impact of the hurricane barrier being overtopped; and it needs to work with other bodies to strengthen the resilience aspects of the regional Master Plan.

- **ESSENTIAL 7:** Outreach materials need to be available in the major languages used in the city besides English. Stamford could also investigate the scope for more "upward" communication from citizens to government to assist its disaster management activities.

- **ESSENTIAL 8:** Stamford should continue to take such opportunities as exist to protect coastal ecosystems. It also needs to focus on urban "green-scape" as a way to manage heat island effects and also help control storm water run-off.

- **ESSENTIAL 9:** Stamford should investigate creating MoUs with private companies in the city to provide resources for disaster response as is done in other countries such as Japan and the Netherlands. It should investigate re-installing flood sirens to add to its existing array of warning methods.

- **ESSENTIAL 10:** By its own acknowledgement, Stamford is relatively under-developed in this area and should formulate more complete and more specific post-event recovery plans, especially as these address longer-run recovery.

ESSENTIAL 1: Engage, Share Understanding and Coordinate

Put in place organization and coordination to understand and reduce disaster risk, based on participation of citizen groups and civil society. Build local alliances. Ensure that all departments understand their role in disaster risk reduction and preparedness.

Stamford operates a top-down organization and coordination structure with the following features:

• Emergencies are managed from the Office of Emergency Management (OEM), which runs a multidisciplinary Emergency Operations Center (EOC). The ultimate head of emergency management is the Mayor.

• The energy company (Eversource), mobility and transportation organizations (CT Transit, Metronorth, business community shuttles), are part of this multi-disciplinary approach. Communications companies are not embedded in the city EOC however - their representatives are available to the city but are only embedded in the state and electricity EOCs.

• The energy utility (Eversource) makes calls to customers about weather and anticipated outages, but does not currently communicate specific power restoration priorities to the City.

• Communication comes from the OEM via elected neighborhood representatives. Some of these walk the streets although some do not, preferring to rely on e-mails – therefore the consistency of delivery will be variable. There is no standard of practice.

Regarding links with other government tiers in CT, there are no counties in the state, so the chain runs directly from the State to cities or groups thereof, arranged into regions. Stamford benefits from regional initiatives, such as hazard maps from WCCOG, but tends to be a net supplier of information and equipment to other regions.

A general level of comfort was expressed with the knowledge and skills available to the city, and in the ability to locate those when needed.

Needs and aspirations that were reported under Essential 1 include the following:

• **Strategic (relative) weakness:** Stamford has a stronger focus tactically than strategically. The city has shown that its immediate response capabilities are strong, but:

– Willingness to share information across City Departments and some external organizations, though generally high, is not universal.

– The State's DEMHS ESF (emergency support function) is fairly robust could be far more robust.

– State level planning and master planning are not as strong on resilience provisions as they need to be (see Essential 6).

• **Business links:** the business interests represented in the workshop felt that communication with business in general could be improved, both in frequency and content (although see essential 3 below – when events have been created for business, they have been poorly attended). In addition:

– Individual businesses themselves each need a disaster management and continuity plans and these need to be coordinated with the City's plans. Sikorsky is known to be worried about its ability to evacuate rapidly its 2,500 workers from its plant in the city.

– The City could offer the Fairfield Business Community a seat at the EOC.

– Interest was expressed in the idea of co-opting local businesses with MOUs that they would supply equipment, facilities etc in the event of an emergency. United Rentals was mentioned – they have their HQ in Stamford; others might include Tarex, hotels, IT Companies, Priceline, AirBnB.

• **Community outreach and engagement:** the variability in the approach of elected representatives has been noted. There is a need to exploit more systematically relationships with bodies such as the Red Cross; and to formalize relationships with churches and community groups, particularly in low-income communities.

• **Warnings and notifications:** early notification of weather events reduces casualties, although the forecast may be of variable accuracy and there is a risk of unnecessarily causing panic at the last minute. Better understanding of the exact risk in each case – perhaps based on local knowledge of past events – would allow better pinpointing of where and when to evacuate.

– Related to the previous point, while there is a desire to discourage people from remaining on site, the City cannot require people to leave: there was accordingly interest in using tags to alarm next of kin.

• **Integration:** resilience is not routinely considered as a factor in all day to day decisions (even if only to confirm it is not an issue). Integration tends to come after events, when attention is focused on the issue and may lead to some re-prioritization.

– In lieu of a universal approval step of considering whether there is a resilience aspect in every resource and land use decision, the suggestion was made that the City should specifically convene every quarter or six months to address issues.

Score: **Tactical Readiness 4/5**; **Strategic Readiness 2/5**

ESSENTIAL 2: – Create Financing and Incentives

Assign a budget for disaster risk reduction and provide incentives for homeowners, low-income families, communities, businesses and public sector to invest in reducing the risks they face.

The financial structure for resilience in Stamford seems to be the weakest of the "Ten Essential" areas reviewed in the workshop:

- There is no compiled list of resilience spending priorities, even as a "wish-list"; nor a single view of the resilience implications (or benefits) of existing capital spending plans.
- There is no atlas/list of funds and funding sources available, or of criteria for grants.
- The State of CT is about to implement a $100bn plan to renew many elements of the transportation infrastructure, but there is no specific consideration of resilience needs – either to make the infrastructure itself more resilient or to help with resilience needs such as evacuation.
- There are no specific incentives to business or homeowners to invest in their own resilience.

Financing needs and aspirations include the following:

- **Assessment of return on Investment (RoI):** when assessing RoI for any project, the "R" needs explicitly to include resilience benefits and implications. As part of this, Stamford should begin to track economic value at risk given known event scenarios (see Essential 3) and thus enable a baseline with which to assess resilience implications of investments.

  – One possibility was for Stamford to levy a "resilience premium" for investments and developments that would necessitate remediation to retain the City's overall resilience position.

  – The City should seek to work with the insurance industry to assess the scope to reduce premiums as the city becomes more resilient.

- **Speed of appraisal process:** there needs to be a process to fast-track resilience investments.

- **Resilience certification:** Just as there is an ordinance that buildings should have LEED certification for sustainability, there needs to be something similar for resilience of both buildings and infrastructure (it was acknowledged that sustainability and resilience are similar, but necessarily the same).

  – Further, just as buildings need a "continuous commissioning" process to ensure that sustainability benefits such as energy conservation continue to be delivered over time, something similar is needed to ensure that the anticipated level of resilience continues to be offered as the building or infrastructure ages, as they experience new demands, and as change takes place in the environment around them.

- **Training:** there is a need for training for City staff on the appraisal of resilience benefits.

It was noted that much of the above is not ground-breaking, and that there should be examples to copy from elsewhere. The private sector may offer some models: both IBM and Starwood (represented in the workshop) reported that they do not discount investments for any environmental benefits, yet those investments still are made as there is a willingness to identify where they also enable cost or risk reductions or top line growth.

Score: 1/5

ESSENTIAL 3: Identify and Understand Perils, Probabilities and Impacts

Maintain up-to-date data on hazards and vulnerabilities, prepare risk assessments and use these as the basis for urban development plans and decisions. Ensure that this information and the plans for your city's [disaster] resilience are readily available to the public and fully discussed with them.

Stamford is a member of the Western Connecticut Council of Governments (WCCOG) which has produced, in collaboration with The Nature Conservancy, hazard maps for coastal inundation that also show critical assets, and a hazard mitigation plan. The workshop did not evaluate these as such, but assumed both from appearances and from the comments of attendees who participated in their creation that they offer a robust basis for resilience planning; as such, they show both 100 and 500 year events (100 year is a Cat 3 hurricane) which can be taken as corresponding to the "most probable" and "most severe" scenarios required by the UN Scorecard. Data from the WCCOG activity is included or informs, in turn, zoning decisions, flood insurance incentives, building codes and Connecticut Coastal Management Act (CCMA). With this robust core as the background, needs and aspirations included:

- **Combined events:** it would also be beneficial to construct and test the City's plans against some "combined event" scenarios – for example, the impact of snowfall or inland flooding combined with coastal inundation; or the impact of wildfires combined with drought and depleted water-tables.

- **Cyber-threats:** need to asses impact of cyber-threat, perhaps building on what Eversource does today with the local energy grid.

- **Regular review:** hazard maps should be reviewed every 5 years as more data becomes available on sea-level rise and other threats, as the population grows and changes, and so on.

- **Asset "failure chains":** The critical assets identified by WWCOG need also to have their interdependencies mapped, to enable potential "failure chains" to be identified in advance (an example of a failure chain might be where the loss of a part of the energy grid disables a water treatment plant, which in turn disables a hospital).

  – Eversource has a process to identify what is critical from a restoration priority perspective. It would make sense to establish this for all critical assets, taking account of the interdependencies, and revisit annually.

- **Digitization of maps/GIS:** some of the relevant hazard maps are paper based. It would be beneficial to have these set up in a GIS so that they can be shared and more easily version-controlled; and so that they can also be incorporated by other organizations within their own resilience planning.

- **Engagement:** the major issues in Essential 3 appear to be around dissemination of the information they contain and ensuring a consistent business and public understanding of it. Not that Stamford has not tried – meetings have been set up only to be very poorly attended by the public and by businesses. There is a tendency for "sunny-day thinking" – that disasters are not an issue until they happen; and when they do, the possession of insurance equates with resilience, and therefore there is no need for other preparation.

  – A comparison was made with plans and awareness around the nuclear plant at Waterford – those within a ten mile radius of it are given potassium iodide pills, and hear a monthly test of sirens. Likewise, Stamford itself conducts monthly terrorism drills. Something similar is needed for flooding beyond the brochure that Stamford sends out every year.

  – There would be value in integrating all emergency and resilience information into a single source, consumable by web, phone/mobile device – this would also set out citizens' responsibilities.

- **Insurance industry**: as noted in Essential 2, there is a need to work with the insurance industry to add financial "impact" to the hazard maps.

Unknowns:

- The resilience of the city's water supply remains something of an unknown, being under the control of a neighboring city (see essential 4).

- The impacts of a 500 year event have not to date been explored in as much detail as the 100 year.

Score: 3/5

ESSENTIAL 4: Make Critical Infrastructure Disaster Resilient

Invest in and maintain critical infrastructure that reduces risk, such as flood drainage, adjusted where needed to cope with climate change.

Summary and General issues

The most significant weaknesses and unknowns in Stamford's critical infrastructure systems seem to concern communications (in particular cell-phone) systems, separately and together; aspects of the water system; and the diesel fuel supply.

While Eversource is clearly very engaged in Stamford's disaster planning, there would be value in trying to elevate the engagement from water and cellphone companies (including tower owners) to the same level.

Many infrastructure systems suffer variously from age, maintenance shortfalls and other issues specific to each.

Protective infrastructure

Critical protective infrastructure includes sea walls, the hurricane barrier and 4 pumping stations, storm water system and dams.

Protective infrastructure needs and aspirations include:

- Maintenance is a continuous challenge especially where maintenance is state- or Federally-funded – there simply isn't funding to create a comprehensive, proactive maintenance program, and often the decision isn't in Stamford's control anyway.

- Salt exposure monitoring (from seawater infiltration of sewers, conduits etc.) was an issue with Sandy. Monitoring is required and some upgrades have been carried out. Cable ducts are designed to deal with it.

- Vegetation management is needed on natural berms, banks etc.

- **Stormwater:** North of Merritt Parkway there is no defined draining system, just holding ponds. Manholes flood due to tidal flooding. Nuisance flooding happens regularly. Sewers are usually sized for water quality, not quantity: they are old, undersized and the City does not want to overtax them.

Telecommunications Infrastructure

Much emergency management traffic relies today on 2-way radio.

Schools have an emergency alert system with buttons that put out audible alarms and call the police for an instant response. This is currently only in elementary schools in Stamford, but will expand to other K-12 schools, including private schools – there will be 700 buttons in total.

There seem to be significant questions over the cell-phone system. Its performance has been heavily affected in previous events and criticized for that. Many cell towers are privately owned, and parts of the system failed after Sandy, usually due to towers having inadequate back-up batteries (36 hours' capacity, only), or generators that had to be refueled. Weaknesses in this system may prove to be especially critical, as cell-phones are today a huge component of the public's immediate preparation for, and response to, a disaster; system outages preclude the use of crowd-sourced data on issues and status; and because some infrastructure sensors and meters may also use the cell-phone system for their communications.

It was noted that the need to recharge cellphones, as well as the use of cordless land-line phones which require a power supply, increase the interdependency of the energy and communications systems.

Telecommunications infrastructure needs and aspirations:

- An overall plan for telecommunications resilience, addressing the unknowns below.

- Definition of "telecommunications": the inclusion of internet connectivity in communications management, which at the moment is often overlooked (both web traffic and VOIP).

- Infrastructure communications: The inclusion of the communications networks for SCADA systems controlling infrastructure such as traffic or water distribution – both cell-phone and other.

Telecommunications infrastructure unknowns:

- The percentage of cell-phones vs landlines (has major implications for how to reach people and where to prioritize investment).

- The intended performance of each phone system (especially cell phones, including towers) and its target recovery times – and required investment to maintain a resilient cellphone system.

- Whether anyone actually regulates the cell-phone system, and if so whom.

Electricity

Stamford's utility, Eversource, is highly regulated for costs, service levels and reliability; it also has a statutory recovery process and targets defined and filed with the state for system recovery within 24 hours. The utility has a dashboard giving the status of all the city's electricity system; and it has a view, not made public, of critical connections (for example those on which other critical services depend). The government segment of the city center is also due to have a natural gas powered/CHP micro-grid, intended to be a model for other parts of the city.

There is a pole replacement program: as many poles are over 40 years old and life-expired. Poles were formerly creosote soaked, but are now pressure treated.

Electricity system needs and aspirations:

- **Supply diversity:** there is a need for greater diversity of energy supply through local generation - but there are also worries about the resilience of renewable sources.

Water

Stamford's water infrastructure is run by Aquarion. As with many cities in the US and Europe, the system is elderly and repair/replacement budgets are constrained. One key reservoir is controlled by another city (Bridgeport); and the city's drainage system is known to be under-sized for current meteorological and climatic conditions.

Water system needs and aspirations:

- **Alignment:** there needs to be an alignment of priorities as between Stamford's resilience needs and the water company's asset upgrade and replacement activities. This would include power supplies for water pumping and treatment.
- **Awareness:** While there seems to be evidence that citizens plan for their own water needs (after Sandy, when an insurance company provided a truck with bottled water, only 10% of that was taken), there is a further training and education requirement, to get people to fill bathtubs and buckets.
- **Smart infrastructure:** Stamford should investigate the role of smart metering for water both to save water leakage and as a system operation/resilience tool that can report where a water system has actually been damaged.

Water unknown

- The resilience of that part of the water supply that is dependent upon Bridgeport.

Gas

As with electricity, gas is supplied by Eversource. Although the system does not supply the whole city, where it reaches it has proven relatively reliable in the face of the types of events that Stamford experiences. It has undergone significant upgrades recently and has many fairly new assets. The same level of emergency communication takes place (from the same team) as for electricity.

Transportation

As in much of the NE USA, Stamford's transportation road and rail systems are heavily used and in some cases elderly. I-95 is known to have some flooding issues, although MetroNorth is currently working on its flood vulnerabilities: The rail line is located along the coast and vulnerable to storm surge events.

The city has well established plans for co-opting busses from schools and other sources for evacuations.

Transportation needs and aspirations:

- **Gas stations:** a focus is needed on the role of gas stations in enabling evacuation: data for the public on gas station status and also back up power supplies so that they can pump gas.
- **Smart traffic systems:** Investigate role for smart traffic controls both to improve traffic day to day and to ensure maximum performance of evacuation routes.

Transportation unknowns:

- As noted above, the State plans to spend $100bn on renewing and upgrading transportation links: while the upgrades may well confer increased resilience by improving carrying capacity and strength, it is not known to what extent resilience has been explicitly factored into planning this.
- The group did not know whether a full highways evacuation plan exists. Sikorski's concerns have already been noted; and a further issue would be a forced mass evacuation in the event of an accident at one of the two nuclear power plants in the region.

Fuel Supply

Stamford's diesel fuel comes from the port of New Haven and is very vulnerable to hurricane disruption – this could hinder the operation of emergency vehicles, as it did in New York after Sandy.

Fuel supply needs and aspirations:

- **Alternative supply:** the city should establish an alternative supply for diesel fuel.

Law and Order

Law and Order resources in CT are relatively fragmented, but there is an established modus operandi of fall-back mutual-aid agreements where different police forces will help each other as needed. This arrangement is felt to work well, and (in keeping with the theme that Stamford is stronger tactically than strategically) it appears to have enabled good sectoral coverage in Stamford during past emergency events. Mutual aid arrangements also exist with local court houses and jails.

Law and order needs and aspirations - while they should be seen in the above context, the following were identified:

- **State coordination:** It was stated that regional/State coordination of resources needs to be faster and more comprehensive.
- **"Siloes":** Some towns and cities in the area remain "siloed" – these need to be encouraged to join the mutual aid framework, with a view to strengthening both their position and that of the whole.
  - In a similar vein, work needs to continue to break down remaining barriers to cooperation with fire departments and first responders.

Fire and First Response

The pattern for fire and first response mirrors the tactical strength seen above for law and order – capacity to respond to major events is ensured through mutual aid arrangements, supported in this case by State aid as required. Drills and rehearsals are carried out regularly.

Fire and first response needs and aspirations:

- Effectively, as for law and order

Administration

Each department in Stamford's city administration has undertaken continuity of operations planning (COOP) with, for example, key roles defined and multiple transportation options identified for getting the individuals concerned to their places of work if needed during emergencies. These key roles include social welfare and food services functions.

In addition the planned gas-powered microgrid will help ensure that the city government keeps operating after an emergency. The city government also has systems back-up arrangements both at and away from the government center, and is looking for another upstate for redundancy.

Administration needs:

- **Telecommunications integrity:** this is essential for COOPs to be realizable. As set out above, the City appears to be in need of validating its communications position.

Administration unknowns:

- It was not known whether departmental COOPs were sized to deal with the 100 or 500 year events discussed in Essential 3

- The exact scope of the remote back-up arrangement is not known – is it data only, or does it include systems support with mirrored images of Stamford's own systems with processes and workflows embedded?

  – Similarly, the availability of high resilience telecommunications links to the back-ups needs to be confirmed, as without these the remote back-ups may be inaccessible until normal communications are restored.

(Note that this score represents an average over a large number of sub areas within Essential 4. In reality some areas should probably be scored higher than others, with telecommunications (as an example) perhaps representing more significant weaknesses than the average shown here would imply. Details are set out below).

Score: **3.5/5**

ESSENTIAL 5: Make Education & Healthcare Infrastructure Disaster Resilient

Assess the safety of all schools and health facilities and upgrade these as necessary.

Education

Stamford's schools are used as shelters, and both they and teachers are part of the city's emergency response preparations, with teachers functioning as a communications conduit. Each school has an emergency generator. It is recognized that a key role of schools in a disaster is simply to keep functioning so that parents can get to work as needed.

As noted above, effective arrangements exist to use the school bus fleet for evacuations.

Education needs and aspirations:

- **Structural integrity:** only 3 schools in the state are rated to withstand more than a Cat 1 storm, with the major issues being window and roof strength. This would appear to be a significant weakness. (CT now has stronger codes applying for 2014 onwards, for both public and private schools. The need is for back-fitting legacy establishments).

– There would appear to be value in having the Board of Education participate in emergency planning.

Education unknowns:

- The impact of WCCOG's 100 year and 500 year event scenarios on school buildings has not been assessed (said differently – schools need to be treated as critical assets in WCCOG's work).

- Back-up and access arrangements for school pupil data were unknown to workshop participants.

Healthcare

Stamford appears to defer to the operators of its two hospital campuses to determine the adequacy of its hospital facilities for a major event. These hospitals have their own back-up power supplies and are assumed to have sufficient "surge" capacity to deal with additional workloads from such an event.

The federal Department of Homeland Security is in charge of mass-care arrangements, with American Red Cross providing much of the logistics and materials required.

Nursing homes and senior housing are monitored and regulated through the city's Health department.

Healthcare needs and aspirations:

- **Integration:** Stamford should try to piece together the various parts of its healthcare system and conduct an exercise with the providers to determine how it would fare under WCCOG's 100 year and 500 year event – which buildings would be standing, which staff could get to work, what number of casualties (of which type) should be expected, and so on. As with schools, WCCOG needs to include healthcare facilities in its definition of critical assets, if it does not already do so.

- **Vulnerable assets:** Stamford has a nursing home and a senior housing complex in a flood plain. Over the long run it may be wise to plan for relocation, and in the short term to confirm that evacuation capabilities exist.

Healthcare unknowns:

- It is not known whether back-up arrangements exist for the healthcare data of Stamford's citizens.

Score: Education 2.5/5; Healthcare 3.5/5

ESSENTIAL 6: Apply Risk-Aware Planning, Land Use and Building Codes

Apply and enforce realistic, risk compliant building regulations and land use planning principles. Identify safe land for low-income citizens and develop upgrading of informal settlements, wherever feasible.

Stamford has consistently sought to minimize development density on flood plains, which has limited the numbers of properties at risk of inundation; it has clear code requirements for property raising, and the height of berms and barriers; and it has the lowest FEMA flood insurance rates in the state.

Planning and land use needs and aspirations include:

- **Hurricane barrier:** Stamford should evaluate the risk and impact of its hurricane barrier being overtopped.

- **Master Plan:** the regional Master Plan was perceived to be relatively weak on resilience issues. This needs to be addressed and its requirements trickled down to city plans, as they are in New York. The master plan also needs to provide the focus for coordinating resilience-relevant activities of many bodies in the state which currently are separate.

- **Population growth downtown:** many downtown and suburban office parks are now being re-used for housing, which may bring in 15,000 people over the next 20 years. These people will tend to be younger and the assumption is that they will tend to rely on transit rather than owning a car. The trend needs to be related to WCCOG's hazard maps; and Stamford's emergency management and evacuation capabilities need to be "stress-tested" with the new population assumptions (including the impact when some proportion of these new residents start to have families).

- **Low income housing vulnerability:** the city is building 4000 units of low-income housing that could be at risk of inundation if the hurricane barrier fails or is overtopped. This suggests that at the very least, evacuation and critical route planning for these houses should be a priority.

- **Expediting property upgrades:** the city needs to resolve the conflict between the desire to raise buildings in flood plans, and the desire to restrict their height.

  – It may also benefit from investigating forms of financing for making properties more resilient, as for example San Francisco has for certain forms of earthquake retrofit; and from expedited permitting as used by Atlanta for flood protection. These may require some form of resilience certification, in the manner of LEED for sustainability. Incentives are key as many of the affected properties are rentals.

- **Keep score:** just as the City has a publicly reported sustainability scorecard, it should complete the UN ISDR's resilience scorecard and perhaps make a summary of this publicly available.

- **Integration with decision-making:** the City should strengthen its procedural framework to ensure that resilience is considered as a factor in all land use decisions (see also Essential 2). Specific code requirements related to each building are covered, but the impact of development on the overall resilience position is less strongly assessed.

Score: 3/5

ESSENTIAL 7: – Build Public Awareness and Capacity

Ensure education programs and training on disaster risk reduction are in place in schools and local communities.

Stamford has CERT and SART teams in many neighborhoods, and already makes use of reverse 911, Facebook, Twitter and e-mail in addition to the traditional mailshots. It was estimated that Stamford's resilience outreach efforts achieve 2-3 "touch-points" per year with the average citizen; and separately, schools have emergency drills.

Public awareness needs and aspirations:

- **Languages:** materials need to be translated into the major languages used in the city besides English – Spanish, Creole, Hindi and others.
- **Additional outreach:** consideration could be given to using existing events such as farmers' markets or fairs for additional outreach.
- **Two-way communication**:
  - Stamford could investigate "mining" Twitter, SMS (and perhaps Facebook, although this tends to

be less immediate) for additional data on issues requiring a response (or not) as major events are taking place. Twitter in fact publishes an API for this purpose.

- While not discussed in the workshop, but we note that Stamford is a user of SeeClickFix, where citizens report problems with street surfaces, lighting, graffiti etc. Consideration could be given to using this existing channel as a way to "crowd-source" data on problems from disasters and major events.

Score: **3.5/5**

ESSENTIAL 8: Enhance and Protect Ecosystem Services

Protect ecosystems and natural buffers to mitigate floods, storm surges and other hazards to which your city may be vulnerable. Adapt to climate change by building on good risk reduction practices.

Stamford is aware of the role that its coastal ecosystems can play, and has been investing effort in protecting and restoring these as far as possible given the existing urban extent. For example:

- Mill River floodplain was improved by taking out a dam and re-engineering river flows.
- Much public parkland has been created along the coastline to function as a buffer zone.
- A salt marsh advancement zone assessment has just been completed with The Nature Conservancy, building on its work for the CT coastline as a whole.
- A beach risk reduction plan has been budgeted.
- Catch-basins are cleaned regularly.

Ecosystem needs and aspirations:

- **Treescape:** Stamford has so far not really focused on protecting its urban tree canopy to help manage the heat island effect or investigated the scope for green-scape on buildings to help here.
  - Additional greenery also helps delay to run-off, which will in turn potentially help with storm water management, as for example Philadelphia is finding.

Score: **2/5**

ESSENTIAL 9: Create Warning Systems and Rehearse Preparedness

Install early warning systems and emergency management capacities in your city and hold regular public preparedness drills.

Stamford holds regular tactical flood and other emergency drills and is supported in these by the US Army Corps of Engineers, with whom it has a MoU to provide flood warning data. This is in lieu of having its own flood gauges which were removed due to lack of funding. As noted there is extensive use of reverse 911, SMS and so on to alert people of flood dangers.

Warning and rehearsal needs and aspirations:

- **Scope of drills:** some drills should also involve the public (if only through CERT and SART teams) where possible.
- **Sirens:** the city formerly had flood sirens. These could be re-installed and would add to the level of warning.

- **Private sector:** as already noted, Stamford could investigate creating MoUs with private companies in the city to provide resources for disaster response – United Rentals, Terex, GE, hotels, AirBnB and so on. This is done in other countries (Japan and the Netherlands as examples) but not extensively in the USA.

Score: **3/5**

ESSENTIAL 10: Learn and Build Back Better

After any disaster, ensure that the needs of the survivors are placed at the center of reconstruction with support for them and their community organizations to design and help implement responses, including rebuilding homes and livelihoods.

Stamford has well worked and tested processes for the immediate aftermath of an event – rubble clearance, building inspections and so on, supported by mutual aid arrangements with other cities.

However, while the city has a number of neighborhood plans that can be used as the basis for rebuilding its economy after a disaster, and while the new ESF 17 Regional Long Term Recovery group will help build the capacity for recovery, arrangements for the longer term recovery are relatively under-developed. It was noted that some parts of New Orleans have still not recovered 10 years after Katrina, and there is a strong desire to avoid that outcome in Stamford.

Learn and build back better needs and aspirations:

- **Simulation of post-disaster scenarios:** Stamford could consider undertaking simulations of post-disaster life in the city where key infrastructure systems or transportation links (as examples) are unavailable for an extended period.

  – Given the value of land in the area (close to $1 trillion), it would be valuable to assess the potential economic value at risk in WCCOG's 100 year and 500 year scenarios. (This could provide the business case for many resilience investments).

- **Coverage of neighborhood plans:** the neighborhood plans that could act as the blueprint for recovery do not cover the whole city; and for those that do, there needs to be a process that allows them to change so that existing weaknesses in economic and building patterns and in city life are not re-instantiated post event.

- **People:** it is not clear how (if at all) the city could or would help those who may be without their homes for a year or more.

- **Planning and approvals:** the City should investigate how planning and approvals processes can be streamlined to enable post disaster action / investment that builds resilience, rather than replacing like for like.

- **Disbursing funds:** the City should agree a streamlined process for disbursing recovery funds, incorporating State and Federal organizations as required, both to other organizations and to individual citizens

- **Insurers' conduct and competence:** there was wide-spread dissatisfaction after Sandy with the quality of loss assessments from insurers – loss adjusters were brought in from other states who were evidently unfamiliar with rebuilding costs for buildings of the type found in the North East. It would desirable were the city to identify a way to ensure a better performance after future events.

- **Trees:** typically, damage to trees after a storm is considerable. There is no agreed way to assess which trees are damaged to the point of needing to be cut down, and which should be replaced (and with what species).

Score: **2/5**

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