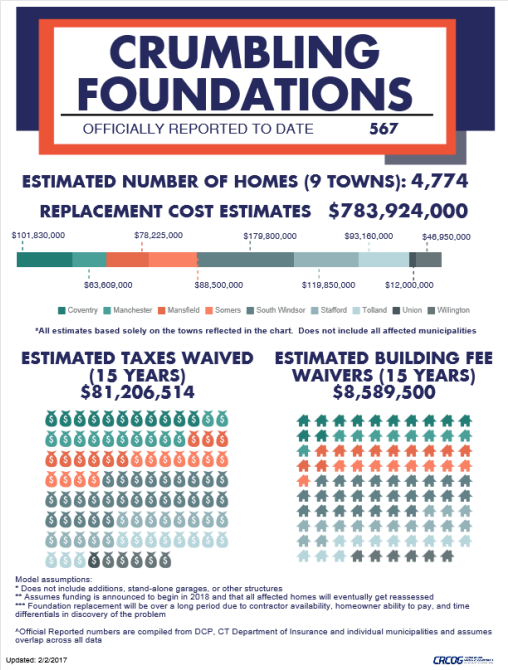
REGIONAL CHALLENGES

CRUMBLING FOUNDATIONS



crcog.org/ crumbling-foundations

CT-gov

Pauline Yoder
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WHAT IS THE CHALLENGE?

Crumbling building foundations are a problem in central and north-eastern Connecticut. The foundations in question are concrete made with stone aggregate originating from a specific quarry, and poured from the early 1980s to 2015. While the issue has primarily impacted homes, commercial buildings have also been affected.

In 2016, CRCOG formed an ad-hoc committee to provide towns and homeowners with assistance to address the impacts associated with the concrete, including helping to determine avenues for financial relief for homeowners affected by the situation.

The committee worked to establish guidelines for municipalities for tax assessments for affected properties, as well as suggestions for permit fee waivers for properties being remediated. CRCOG also compiled information and resources for affected property owners on qualified contractors for testing and remediation services, and is administering a reimbursement program, through the CT Department of Housing, for inspections and testing for failing concrete foundations (https://foundationtesting.org/).

CRCOG has compiled a list of documents and resources for affected homeowners and the 41 municipalities where the issues are occurring, including many communities outside the Capitol Region. The documentation can be found at http://crcog.org/crumbling-foundations.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

41 municipalities within and around the Capitol Region have been impacted by crumbling foundations. Not only are property owners affected, but potential decreases in property values affect grand lists, impacting the fiscal health of municipalities. Proactively addressing the problem will help to significantly reduce long-term fiscal impacts, which could impact the long-term economic health of the region.

The issue illustrates a proactive response to addressing the impacts of unforeseen hazards, which could happen anywhere and have regional consequences. The collective approach to solving the regional issue is warranted given the significant impacts that hazards can have on the housing market, which can have a negative ripple effect across the state's economic recovery. The coordinated actions can significantly reduce the long term implications.

Although the crumbling foundation problem does not fit FEMA's definition of a natural hazard, the losses incurred have been significant. CRCOG will continue to provide referrals and information to people seeking assistance in this matter.

REGIONAL CHALLENGES

REPETITIVE LOSS PROPERTIES

Vacant land where an RL property was once located
Photo by MMI

Source of flooding for a group of RL properties in West Hartford
Photo by MMI

Diane Ifkovic
State NFIP Coordinator
Connecticut Department of Energy and Environmental Protection
79 Elm Street
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WHAT IS THE CHALLENGE?

According to FEMA, a Repetitive Loss (RL) property is any insurable building for which two or more claims of more than $1,000 were paid by the National Flood Insurance Program (NFIP) within any rolling ten-year period, since 1978. A total of 144 RL properties are listed in the 38 municipalities that comprise the Capitol Region.

If a property is not insured against flood losses, or is insured but the owner does not submit claims, then the property cannot appear on the RL list. Therefore, the RL list is not an absolute reflection of flood risk in a community. Nevertheless, the RL list can provide a starting point for evaluating flood risk in a community, and it may indicate that flooding may be a problem in a specific area even when not obvious upon a cursory review of the setting.

Of the 144 RL properties listed in the Capitol Region, two are erroneously listed in the region (properties in Milford and Windham) and one is a duplicate (a property in Simsbury is listed in Simsbury *and* Plainville), for a current total of 141 RL properties. One property attributed to Hartford is located in West Hartford. The Town of West Hartford has the most listed properties, at 34. Other communities with at least ten each are New Britain, Simsbury, and Southington. A total of 12 communities in the Capitol Region do not host any RL properties.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

As noted above, examination of the RL list may indicate that flooding is a problem in a specific area. For a risk evaluation to be effective, each RL first must be accurate. Communities must carefully check and offer corrections to their individual RL lists. Misplaced properties (such as Milford and Windham) must be formally transferred to the correct municipality, duplicates must be cleared, and mitigation status should updated to ensure that resources are directed to the properties with most risk and highest flood losses. For example, the RL list indicates that of six RL properties in Plainville, only one is mitigated. However, a reconnaissance of the properties shows that an additional four properties were mitigated through acquisitions followed by removal of insured buildings.

It is important for Capitol Region communities to further reduce flood losses, including the RL property losses that have represented a strain on the NFIP. Before targeting specific properties for technical assistance, each municipality must know with certainty which RL properties are accurately represented by the information on the list. **This plan therefore recommends that each municipality with RL properties should work with DEEP to conduct a list validation.**

REGIONAL CHALLENGES

CRITICAL FACILITIES OF REGIONAL SIGNIFICANCE

Patch.com

MDC

Contact individual owners of regional critical facilities such as MDC, CT DOT, and Eversource.

WHAT IS THE CHALLENGE?

During the hazard mitigation planning process, local communities provide lists or descriptions of their "critical facilities." According to FEMA's Local Mitigation Planning Handbook (2013), "Critical facilities are structures and institutions necessary for a community's response to and recovery from emergencies. Critical facilities must continue to operate during and following a disaster to reduce the severity of impacts and accelerate recovery," and "Outreach programs that increase risk awareness, **projects to protect critical facilities**, and the removal of structures from flood hazard areas are all examples of mitigation actions" (bold text added for emphasis).

Oftentimes, communities are not inclined to list critical facilities that are owned by State or regional entities, despite the fact they the local community is often required to provide emergency response, access, and egress to these facilities; or shares in the benefits provided by these facilities. Furthermore, when these facilities are considered critical and listed in hazard mitigation plans, local communities sometimes are hesitant to offer potential mitigation actions to protect them. This barrier should be addressed when possible, as effective hazard mitigation is often a partnership between communities and critical facility owners.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

In the Capitol Region, the Metropolitan District Commission (MDC, or "the District") provides water and sewer service to eight member communities (Hartford, West Hartford, East Hartford, Bloomfield, Wethersfield, Windsor, Newington, and Rocky Hill) and parts of Farmington, Glastonbury, and South Windsor. MDC owns and operates water treatment plants in West Hartford and Bloomfield; water pollution control facilities (WPCFs) in Hartford, East Hartford, Windsor, and Rocky Hill; and about 70 sanitary sewer pumping stations that direct sewage to the WPCFs. MDC also maintains some drainage infrastructure in Hartford. These facilities are considered critical facilities in this natural hazard mitigation plan update.

Other critical facilities of regional significant are located in the Capitol Region. Examples include Bradley International Airport in Windsor Locks, Amtrak and CT Rail facilities such as passenger stations, the CTfastrak busway stations, power generator facilities, CT DOT operations and maintenance facilities, Eversource facilities, and numerous State agency facilities. These facilities are considered critical facilities in this natural hazard mitigation plan update, though they may not be individual listed or mapped.

NEW INITIATIVES

CITY OF HARTFORD CLIMATE ACTION PLAN

Plan Cover image: The "My Vision for Hartford" public comment wall during Envisionfest Hartford
Image: Hartford Climate Action Plan

Hartford Climate Action Plan

Shubhada Kambli
Hartford Climate Stewardship Council
c/o Planning & Zoning Commission
250 Constitution Plaza, 4th Floor
Hartford, CT 06103
860-757-9500
Shubhada.kambli@Hartford.org

WHAT IS IT?

The Climate Action Plan sets forth initiatives to promote environmental stewardship with an emphasis on priority community values to improve public health outcomes, advance the economy, and promote social equity. The goals are focused in six action areas, which evaluate the root causes of climate change and set forth strategies to improve resiliency and respond to challenges. The six action areas are:

- Energy
- Landscape
- Waste
- Food
- Transportation
- Water

The Climate Action Plan strategically targets initiatives intended to achieve multiple wins in education, green jobs, and neighborhood revitalization by anticipating actions that have benefits to the broader community beyond the city limits.

In addition to the goals and strategies, the Plan includes measures that residents and businesses can take to reduce negative impacts of climate change, promote sustainability, and reduce resource consumption. The Plan includes an extensive bibliography of resources for further information and initiatives.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

The Climate Action Plan addresses aspects of climate change that affect all communities, noting that concerns about climate change and the consequences of human activity have far reaching impacts for natural resources that sustain everyone.

The Plan's strategies focus on education and outreach, working collectively to initiate change, and looking at past actions to inform future decisions that influence regulations, policies, and enforcement actions that influence behavioral changes to produce tangible results. **To the extent that these actions reduce losses associated with natural hazards that are exacerbated by climate change, the Climate Action Plan can advance hazard mitigation.**

The goals and policies, while specific to Hartford in some instances, are attributes that are applicable to all communities, households and industries. The Climate Action Plan promotes efforts that can work at state and regional levels where collaboration on initiatives related to transportation, energy, water, and food are critical to reducing costs and environmental degradation of shared resources.

NEW INITIATIVES

Hartford Green Infrastructure and Zoning Regulations

Courtesy of City of Hartford Office of Sustainability

Courtesy of City of Hartford Office of Sustainability

City of Hartford
Planning & Zoning
250 Constitution Plaza, 4th Floor
Hartford, CT 06103
860-757-9077

WHAT IS IT?

In 2016, the Hartford Planning and Zoning Commission, in consultation with the City's Office of Sustainability, adopted new zoning regulations that incorporate green infrastructure (GI) practices into new developments affecting more than 5,000 square feet of land. The goal is to promote environmental sustainability in new development, including reducing threats to water quality from stormwater runoff.

The regulation changes are to manage the impact of events of 1-inch of precipitation without discharging stormwater runoff into the public drainage systems. The purpose is to address the capture and treatment of stormwater runoff by reducing impervious surfaces and add green spaces that have additional benefits such as cooling and cleaning the air and beautifying streets and neighborhoods.

In addition to the new zoning regulations, the City implemented several prototype projects to demonstrate the benefits, including construction of a green roof at the Connecticut Science Center, a bioswale at UConn Law campus, a new rain garden at Keney Park, and construction of permeable pavement at the State Capital building.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Green infrastructure (GI), sometimes used synonymously with "low impact development" (LID), is an important tool in addressing climate change. Consider the following:

- Reducing stormwater runoff reduces billions of gallons of sewage-stormwater mixing into local waters from sewer overflows
- GI reduces heat-island effects through reduction of heat emission from pavements, which can cool temperatures by 20-45 degrees
- GI captures pollutants such as particulate matter and contaminants in wastewater, providing improved water quality and significant public health benefits for communities.

The new zoning regulations promote GI and LID by creating "development-free" buffers near waterways, advancing GI to limit impervious coverage, and requiring management of a 1-inch storm either on-site or at an off-site location that diverts stormwater from any public drainage system. The regulations also include specific innovations such as the removal of minimum parking area requirements, which may lead to smaller paved areas.

NEW INITIATIVES

LOW IMPACT DEVELOPMENT (LID) FOR RURAL RESILIENCY

WHAT IS IT?

Low-impact development (LID) prioritizes minimally invasive design, construction, and site operation techniques to reduce stormwater runoff quantity, undesirable water quality, and the corresponding negative impacts to receiving waters. Strategies such as reducing impervious services, installing infiltration systems, and zone-specific standards are used to address environmental impacts that come from typical development approaches such as extensive parking areas, box-building construction, and rapid stormwater removal from a site. LID helps to increase local resilience to climate change by mitigating the impacts of drought, protecting drinking water reserves, reducing flooding, and reducing stress on infrastructure.

A joint initiative between Northwest Hills Council of Governments, Northwest CT Conservation District, and CIRCA resulted in development of a municipal-scale manual for a sustainable approach to protect water sources and historic development patterns in rural communities. The manual presents techniques designed to help properly capture, infiltrate, and manage stormwater, which in turn recharges groundwater, reduces erosion, and protects sensitive habitats. The manual provides a framework to improve water quality through engineering specifications, enforcement tools and development standards to reduce erosion and impacts from pollution on aquatic and natural environments.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Joanna to send graphics.

LID can increase the resilience to the impacts of climate change on the natural, built, and human environments. The installation of LID infrastructure increases small and rural community resiliency in many ways, including:

- protecting drinking water supplies, streams, rivers and other water resources throughout the watershed
- protecting natural vegetation, hydrology and other resources on development sites
- reducing damage to local roads, bridges, the built environment, as well as to agricultural resources and human environments.

The development of a LID Manual focuses on strategies achievable by municipalities with maximum effect, which offers significant returns on investments by producing a product easily transferrable to many towns in the rural parts of the Capitol Region. **Municipalities in the Capitol Region can benefit from mitigation actions related to increasing resiliency through LID.**

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NEW INITIATIVES

Helping Small Businesses Mitigate Impacts of Natural Hazards

Ct.deep.gov

WHAT IS IT?

In an effort to assist small business with reduction of property damage or loss due to natural hazards, CT DEEP has proposed strategies for towns to implement educational programs with recommendations for best management practices (BMPs) to prevent pollution from chemicals from getting out into the environment.

According to FEMA, 40% of businesses affected by disaster never reopen, and 25% that do reopen fail; other studies show that 90% of businesses fail within two years of being struck by a disaster. Damage during storm events result in property damage, loss of inventory, and environmental contamination and liabilities resulting from chemical releases into the environment.

The sample mitigation objectives for municipalities is to increase awareness by small businesses of any chemicals and toxic products they use, store and/or sell, and to use BMPs to improve safety. On a regional scale, the objectives are to improve chemical safety practices to prevent disruption of economic activity and protect the environment and public health.

Strategies for educational programs include providing information on municipal websites, social media, brochures and posters, or through workshops.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

The benefits of reducing damage to small businesses during a disaster are a reduction in property damage and losses, avoiding expensive cleanups, reducing liability and risk to public health, and a more rapid recovery and continued operations that result in less impacts to the municipality's economic base.

The municipalities of the Capitol Region can benefit from mitigation actions related to mitigating flood impacts to small businesses. DEEP has recommended that hazard mitigation plan strategic actions list the municipality as the lead agency, with assistance from CT DEEP, where DEEP would develop information for dissemination. Suggested action priority is on a medium scale, with a completion time frame of one year.

Connie Mendolia
Department of Energy & Environmental Protection
79 Elm Street
Hartford, CT 06106-5127
860-424-3297
www.ct.gov/deep

NEW INITIATIVES

Revised Municipal Separate Stormwater System (MS4) General Permit

http://nemo.uconn.edu/ms4/index.htm

Department of Energy & Environmental Protection
79 Elm Street
Hartford, CT 06106-5127
860-424-3297

Amanda Ryan
Municipal Stormwater Educator
UConn CLEAR
Middlesex County Extension
PO Box 70, 1066 Saybrook Road
Haddam, CT 06438
860-345-5231

WHAT IS IT?

The General Permit for the Discharge of Stormwater from Small Municipal Separate Storm Sewer Systems (MS4 General Permit) is the product of a mandate by the U.S. EPA as part of its Stormwater Phase II rules in 1999. This general permit requires municipalities to manage stormwater entering its storm sewer systems to protect watercourses.

DEEP issued a new General Permit in July 2017 that applies to 121 towns and all state and federal institutions that operate a stormwater system. All municipalities within an "urbanized area" are required to comply with the General Permit. In the Capitol Region, only four towns (Stafford, Columbia, Coventry, and Andover) are not required to comply.

Given the complexities of the new permit, the UConn Center For Land Use Education and Research (CLEAR) was charged with providing technical assistance to municipalities. The CLEAR web site (http://nemo.uconn.edu/ms4/index.htm) contains valuable information to help municipal staff navigate permit compliance.

CRCOG has also provided assistance related to the MS4 permit, including information distribution to its member municipalities and referrals when requests for assistance are received.

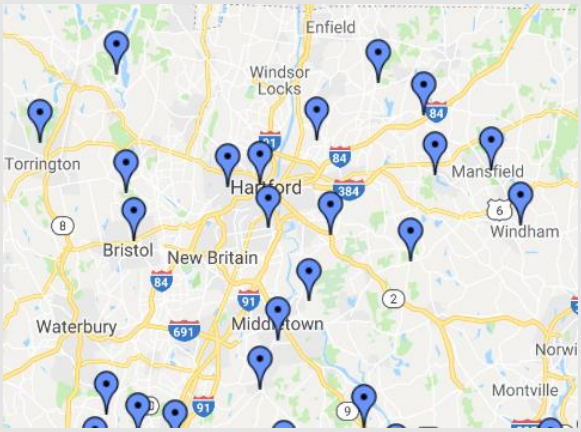
REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Because watershed boundaries do not coincide with political boundaries, the actions of municipalities upstream can have a significant impact on the downstream municipality's land and water resources. Stormwater management throughout an entire watershed, with commitment from all municipalities, is critical to protecting the health of the State's resources. MS4 compliance is there both community-specific and regional at the same time.

The basic requirements of the permit are to (1) submit a Stormwater Management Plan (SMP) identifying six minimum control measures to prevent and/or treat polluted runoff; (2) submit annual reports indicating implementation progress; and (3) monitor the quality of water. Many municipal planners and engineers have noted that the objectives of the MS4 permit are aligned with the objectives of flood hazard mitigation. Therefore, MS4 compliance is expected to help communities achieve progress with hazard mitigation.

NEW INITIATIVES

"SUSTAINABE CT"



Images courtesy of Sustainable CT

WHAT IS IT?

Sustainable CT is a voluntary certification program to recognize thriving and resilient Connecticut municipalities. An independently funded, grassroots, municipal effort, Sustainable CT provides a wide-ranging menu of best practices. Municipalities choose Sustainable CT actions, implement them, and earn points toward certification.

Sustainable CT also provides opportunities for grant funding to help communities promote economic well-being and enhance equity, all while respecting the finite capacity of the natural environment. The program is designed to support all Connecticut municipalities, regardless of size, geography or resources. Sustainable CT empowers municipalities to create high collective impact for current and future residents.

The mission statement is:

To provide municipalities with a menu of coordinated, voluntary actions, to continually become more sustainable; to provide resources and tools to assist municipalities in implementing sustainability actions and advancing their programs for the benefit of all residents; and to certify and recognize municipalities for their ongoing sustainability achievements.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Sustainable CT provides a "Master Action List" to serve as a resource as communities track progress towards certification. Many actions are consistent with the goals of hazard mitigation and, if accomplished, may demonstrate progress with hazard mitigation. Examples include:

- Identify, or create and disseminate, a toolkit for pre-disaster business preparedness and for post-disaster conditions.
- Develop a drought communications plan to inform residents about voluntary and mandatory drought restrictions.
- Review and revise regulations to encourage and promote LID.
- Review the POCD and adopt a revised POCD that includes the Hazard Mitigation Plan goals and at least three other sustainability concepts.
- Conduct a Climate Vulnerability Assessment, identify how the impacts of climate change will likely affect the community, and demonstrate consideration has been given to low-income residents and their vulnerability to extreme weather events.

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372 High St
Willimantic, CT 06226
860-465-2813

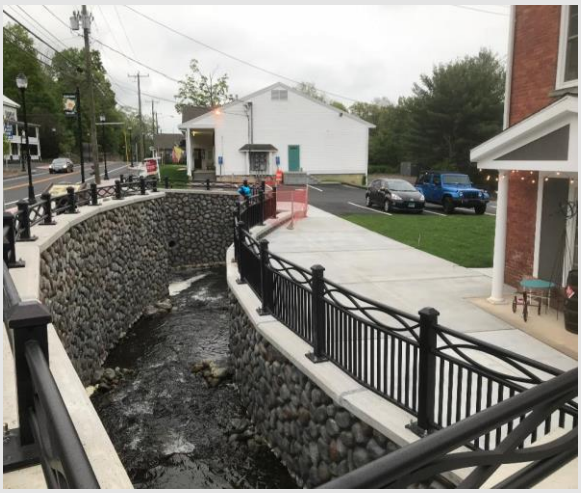
Sustainable CT Mailing Address:
83 Windham St
Willimantic, CT 06226

https://sustainablect.org/about/contact-us/

NEW INITIATIVES

MITIGATION OF RISKS TO HISTORIC RESOURCES

Old Wethersfield



South Coventry Historic District
Photo by MMI

State Historic Preservation Office (SHPO)
450 Columbus Blvd
Suite 5
Hartford, CT 06103
860-500-2300

WHAT IS IT?

Recognizing that historic and cultural resources are increasingly at risk to natural hazards and climate change, the State Historic Preservation Office (SHPO) conducted a resiliency planning study for historic and cultural resources from 2016 through 2018. Working with the State's Councils of Government and municipalities, numerous examples were identified where historic and cultural resources were at risk now and could be at risk in the future due to climate change and the identification of more historic resources. Historic resources are difficult to floodproof, elevate, or relocate without potential loss of their historicity. Therefore, a thorough understanding of the options for each set of historic resources is necessary prior to disasters that could damage these resources, in order to avoid irreversible damage during recovery. SHPO's planning process identified eight strategies that can be employed to make historic and cultural resources more resilient:

- Identify Historic Resources
- Revisit Historic District Zoning Regulations
- Strengthen Recovery Planning
- Incorporate Historic Preservation into Planning Documents
- Revisit Floodplain Regulations and Ordinances
- Coordinate Regionally and with the State
- Structural Adaptation Measures
- Educate

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

SHPO has produced three sets of resources that can be used to inform hazard mitigation planning:

- Individual reports produced for coastal communities include detailed recommendations that are application in the Capitol Region.
- A best practices guide for planning techniques to make historic resources more resilient was completed in 2017 and will be made available in 2018.
- The State Historic Preservation Plan is being updated and will provide policy direction to communities.

Because community planners often do not know which resources may be historic or cultural, or which are most likely to be considered historic in the next decade as structures built in the 1950s and 1960s become eligible, it can be difficult to evaluate risks to flooding and other hazards. Therefore, this plan suggests as a mitigation action that each Capitol Region municipality should conduct a survey of potential historic resources in cooperation with SHPO.

OUTREACH EFFORTS

PUBLIC INFORMATION MEETINGS

Public Meeting: Natural Hazards Mitigation Plan

Wednesday, May 16

Local planners are seeking public input on preparing for natural disasters at a series of meetings to be held throughout the greater Hartford area. Floods, high winds, winter storms, drought, and wildfires, impact area residents and businesses every year. These events damage property, cause power outages, block roads, and can cause injury and death. Meetings will be held throughout May to discuss what can be done to minimize risks from natural hazards. The Council of Governments is offering five opportunities for the public to attend an informational meeting where local residents and workers can learn about the plan, ask questions, and provide input. Members of the public may attend any of the meetings, regardless of which community they are from. The same information will be presented at each meeting. More more details, see the full press release at https://ct-coventry.civicplus.com/DocumentCenter/View/2477. To share your thoughts, take the survey at the link below.

Examples of Announcements on Municipal Web Sites

WHAT WAS ACCOMPLISHED?

CRCOG held five meetings for local residents and employees of local businesses to learn about the Natural Hazard Mitigation Plan, ask questions, and provide input for the update. Meetings were held in Ellington, Coventry, Simsbury, Hartford, and Plainville throughout the month of May 2018. Attendees came from Avon, Bolton, Coventry, East Windsor, Ellington, Glastonbury, New Britain, Plainville, Simsbury, and Windsor. Some key input is summarized below:

Concerns:

- High Wind Events
- Power Outages & Road Blockages
- Increasing Flood Frequency
- Development and its Impacts on Runoff

Mitigation Needs:

- Increased tree maintenance & debris removal
- Public Education
- Improved Communication with the Public
- Improved Power Grid Resilience
- Hazard Mitigation Incentives for Landlords

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Questions and comments brought by the public during these meetings informed plan development by highlighting hazards of concern, existing community capabilities and gaps in those capabilities, and specific actions recommended for future pursuit. Tornadoes struck Connecticut in mid-May 2018, bringing the hazard back to the forefront in people's minds, which in turn affected meeting discussions. Several outcomes of the meetings include the following:

- A specific area of concern for risk of flooding was identified in Plainville.
- Wind hazards were noted as being a significant concern for residents in all towns.
- New capabilities and needed actions were identified in Bolton, Ellington, Coventry, Simsbury, and New Britain.

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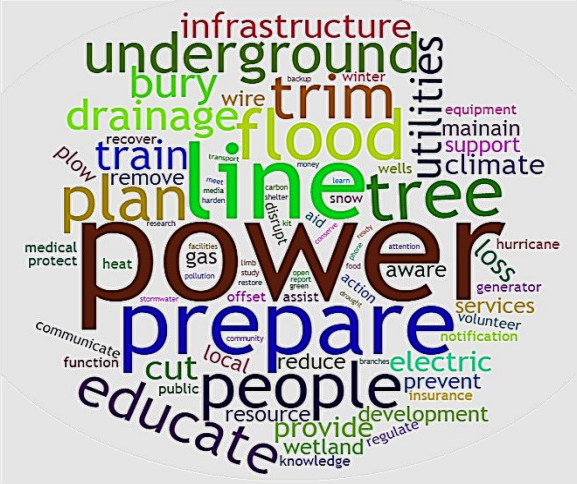
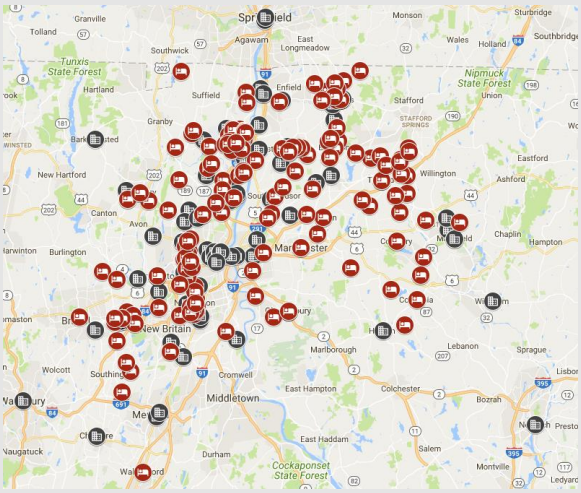
OUTREACH EFFORTS

PUBLIC ENGAGEMENT SURVEY



Keywords in Open-Ended Question Responses



Residences and Workplaces of Survey Respondents

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WHAT WAS ACCOMPLISHED?

A survey was posted online in the spring of 2018 to solicit input from the public on local mitigation activities and strategies. The survey was opened on April 19, 2018 and closed on June 4, 2018. Press releases were carried in numerous news media outlets and municipal web sites. A total of 172 people responded. The following table provides a snapshot of the top three choices from each category. A full description of the survey is in the plan document.

Top Hazard of Concern	Winter Storm	Thunder-storm	Tropical Cyclone
Community Resources	CERT & Emergency Responders	Local Government	Local Schools
Actions Taken by Individuals	Clear Roof of Snow	Disaster Supply Kit	Manage Vegetation
Priority Hazard Mitigation Actions	Emergency Power	Response Training	Underground Power Lines
Priority Recovery Activities	Injuries / Casualties	Medical Facility Operation	Utilities & Infrastructure

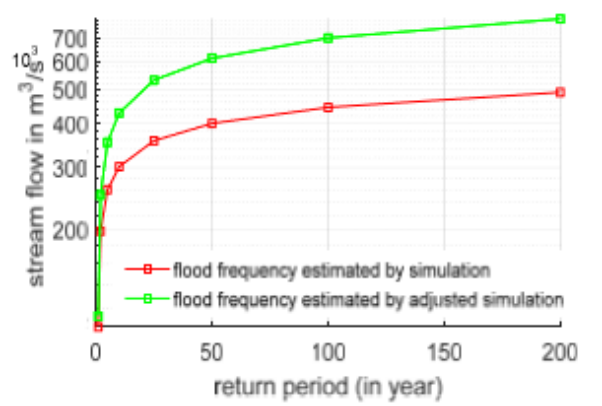
REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Results were tabulated by town and considered in updating municipal challenges and strategies sections. General points drawn from the survey include:

- High Priorities:
  - Utilities (especially power), infrastructure, and critical facilities
  - Vulnerable population assistance
  - Education, public warning, emergency response training
- Low Priorities:
  - Flood insurance & floodproofing
  - Drought ordinances
  - Building-earthquake analysis
  - Natural & recreational resources, tourism & business

IMPACTS OF CLIMATE CHANGE

INTENSE PRECIPITATION AND RIVERINE FLOODS



Streamflow increases predicted with climate adjusted simulation

The Eagleville Dam located on Eagleville Lake in Coventry & Mansfield

Source: Willimanticriver.org

WHAT IS THE CHALLENGE?

As the climate changes, trends in Connecticut are noticeably shifting toward increased annual temperatures and increased yearly rainfall. Rising air temperatures allow the atmosphere to hold more moisture. With the decrease of the Arctic ice sheet, storms appear to move at a slower rate, allowing for the storm to produce high amounts of rainfall.

Since the late 1960's Connecticut has experienced an increased frequency of greater magnitude rainstorms. These intense storms have increased the average 24 hour 100-year rainfall amounts by 1 to 2 inches in southern New England. Increased rainfall has also lead to an increase in peak flows and riverine flooding throughout Connecticut and New England. These increased streamflows may prove to be a challenge for aging infrastructure, such as culverts and dams.

Under agreement with the Connecticut Institute for Resilience and Climate Adaptation (CIRCA), the University of Connecticut (UConn) has developed a hydrological framework to estimate riverine flood frequency and risks. This framework has also been applied to assess flood-inundation and flood overtopping risks. The modeling demonstrates increased flooding throughout areas of the stream network.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

With northern Connecticut already seeing a significant increase in flooding, and climate change continuing to progress, it is likely rain storms of a greater magnitude will continue throughout the Capitol Region.

Climate change projections and riverine flood modeling provide results and information that municipalities can utilize to make informed decisions on flood mitigation. With streams and rivers throughout the region, and over 650 dams, flood mitigation efforts must be implemented to reduce risks.

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1080 Shennecossett Rd
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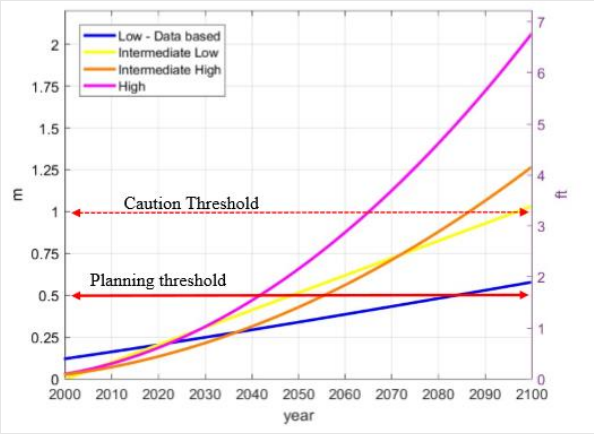
860-405-9214
circa@uconn.edu

IMPACTS OF CLIMATE CHANGE

SEA LEVEL RISE AND THE CONNECTICUT RIVER



Connecticut sea level rise projections showing observation and model based predictions, with the planning and caution thresholds.

Flooding on the CT River in Hartford. As sea levels rise flooding upstream may become more frequent

Source: CT.gov/CID

Connecticut Institute for Resilience and Climate Adaptation (CRICA)
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WHAT IS THE CHALLENGE?

Global sea level rise (SLR) is occurring at an increasing rate due to the melting of land ice and the expansion of ocean water due to heat absorption associated with climate change. Global sea level represents a global mean; regional variations need to be considered for local planning. Observations and extrapolations show that the sea level in Long Island Sound is rising at a more rapid rate than the global SLR projections.

The Connecticut Institute for Resilience and Climate Adaptation (CIRCA) has conducted regional projections for Connecticut, and has recommended that planning anticipates a 0.5 m (1ft 8 inch) rise in sea level by 2050. There is significant diversion between projections after 2050; for 2050, the difference between the lowest and highest projection is approximately 0.3 m, and for 2100 the difference is almost 1.5 m.

Sea level rise (SLR) impacts both human development and the environment. With rising seas comes increased flooding events along the coast, and along water bodies connected to the coast. This flooding affects homes, business, utilities and infrastructure, and can seriously affect a municipality during a large enough event.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

While the Capitol Region is not coastal, sea level rise will affect the Connecticut River, and potentially populations near the river's floodplain.

Habitats and geography of the river may change as the sea levels rise, which could potentially cause changes upstream in some towns. Also, as tides begin to further inundate the river from the coast, riverine water levels may begin to rise, making flooding worse when it occurs.

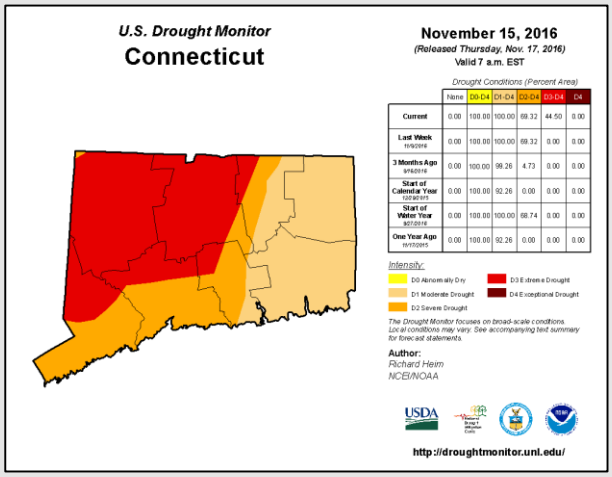
Connecticut's lawmakers have recently adopted Public Act No. 18-82 "An Act Concerning Climate Change Planning and Resiliency." This bill mandates that sea level rise be taken into account when planning, and also requires municipalities to consider sea level rise scenarios when preparing hazard mitigation plans.

IMPACTS OF CLIMATE CHANGE

DROUGHTS

Shuttle Meadow Reservoir, New Britain in 2016

Source: Courant.com



	None	D0-D4	D1-D4	D2-D4	D3-D4	D4
Current	0.00	100.00	100.00	69.32	44.50	0.00
Last Week 11/8/2016	0.00	100.00	100.00	69.32	0.00	0.00
3 Months Ago 8/16/2016	0.00	100.00	99.26	4.73	0.00	0.00
Start of Calendar Year 12/27/2016	0.00	100.00	92.26	0.00	0.00	0.00
Start of Water Year 9/27/2016	0.00	100.00	100.00	68.74	0.00	0.00
One Year Ago 11/17/2015	0.00	100.00	92.26	0.00	0.00	0.00

The US Drought Monitor

Source: droughtmonitor.unl.edu

Connecticut Institute for Resilience and Climate Adaptation (CRICA)
University of Connecticut
Avery Point Campus
1080 Shennecossett Rd
Groton, CT 06340
860-405-9214
circa@uconn.edu

WHAT IS THE CHALLENGE?

The U.S. Geological Survey states that drought can be defined differently by different people. A farmer may consider a drought the period of time his/her crops go without water, while a water supplier may consider it a period of decreased supply that affects both water quality and quantity. Hydrologists typically consider a drought to be a period of decrease in both precipitation and streamflow.

In recent years Connecticut has experienced shorter but more intense “flash droughts” with some of these short term droughts resulting in record breaking-low stream flows. The drought of 2015-2016 was significant. Within the Salmon River in East Hampton, flows were recorded at levels lower than those observed during the 1960s drought.

Under agreement with the Connecticut Institute for Resilience and Climate Adaptation (CIRCA), the University of Connecticut (UConn) has prepared climate change projections in connection with a drinking water resiliency study. The projections show an increase in temperature that could increase evapotranspiration losses. While the projections also predict an increase in rainfall and storm intensity, this may be coupled with more extreme dry periods between storms, especially during the summer months. Summer droughts are projected to become more frequent. Specifically, the severity of the 1-in-20 year drought rises drastically in these projections.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

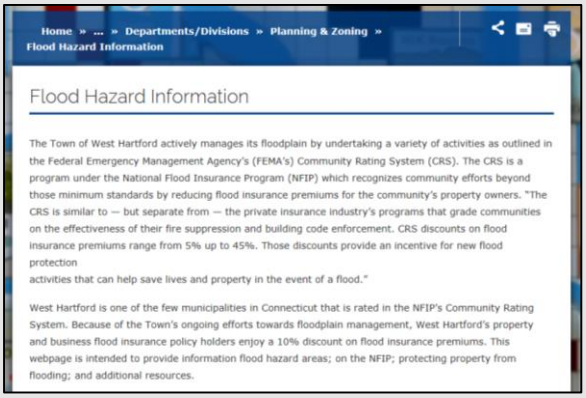
While droughts do not pose an immediate threat, a drought can have long term affects on agriculture, the economy, utilities, and the environment.

The Capitol Region is urban and suburban with rural and agricultural areas spread throughout. A drought event could cause impacts across all municipalities and therefore mitigation strategies could be developed that are relevant to the area.

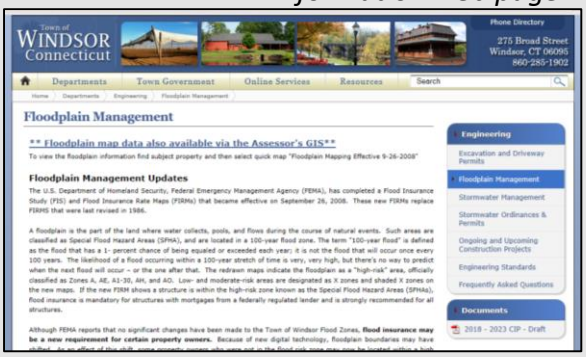
The public water system profile in the Capitol Region is diverse, with water utilities ranging from very small apartment and condominium complexes to the large MDC system. It is important to educate residents on the benefits of ongoing water conservation as well as drought condition conservation. As an active member of the Central Water Utility Coordinating Committee (WUCC), CRCOG can work with municipalities and water utilities that may need communications and coordination assistance during a drought event.

MITIGATION SUCCESS STORY

PUBLIC INFORMATION: MUNICIPAL WEB PAGES



West Hartford Flood Hazard Information web page



Windsor Flood Management web page

FOR MORE INFORMATION

Please contact individual municipalities regarding information on their official web sites.

For information about what types of information should be posted on web sites, contact the State National Flood Insurance Program (NFIP) coordinator:

Diane Ifkovic
State NFIP Coordinator
Connecticut Department of Energy and Environmental Protection
79 Elm Street
Hartford, CT 06106
Diane.ifkovic@ct.gov

WHAT IS IT?

Several Capitol Region municipalities provide detailed information about flood risks on their official web sites. In most cases, the information is for residents to understand how to assess their risks and access the FEMA maps. In some cases, regulations are mentioned. For Community Rating System (CRS) communities such as West Hartford, the web page provides public information that achieves credit and helps the town remain in the CRS program.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Providing information to the public is an important category of hazard mitigation. In the Capitol Region, provision of public information on municipal web sites align primarily with the Multi-Jurisdictional Hazard Mitigation Plan Municipal Goal #6:

- Improve public outreach, education, and warning systems

It also helps achieve progress with the following mitigation goals:

- Goal 1: Minimize the impact of natural hazards on physical buildings and infrastructure
- Goal 3: Improve institutional awareness and understanding of natural hazard impacts and mitigation within municipal governments and other decision-making bodies
- Goal 9: Minimize the economic impact of hazard damages

MITIGATION SUCCESS STORY

PROPERTY ACQUISITIONS: PEQUABUCK RIVER

Plainville Citizen

View of vacant parcel,; photo by MMI, 2018

FOR MORE INFORMATION

Mark S. Devoe
Director of Planning and Economic Development
860-793-0221 x 210
www.plainvillect.com

WHAT IS IT?

When repeatedly experiencing and recovering from flood events, along with the ever-rising cost of flood insurance, becomes too much of a hassle, homeowners may decide that it's time to relocate.

The town of Plainville has worked with over 20 residents living along the Pequabuck River to purchase their properties. Many of these properties were within the 1% annual-chance floodplain and had been hit by recent storms, including Hurricane Irene in 2011. By acquiring the properties, the town relieved the owners of a financial burden, and enabled them to move to a less hazard-prone area.

Following the acquisitions, Plainville has converted the areas to open space. These areas are now a valuable aesthetic and recreational asset for the town, with the added benefits of improving wildlife habitat and creating areas where floodwaters can safely accumulate, decreasing flood risks elsewhere.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

If a property owner does decide it's time to move, their town and state, as well as the federal government, may be able to help. Some local communities may have their own property acquisition programs, and grants are available for application through the federal government. Property owners unable to sell their property on the market may be eligible for a property acquisition program or grant.

Acquisition and conversion to open space of flood prone properties aligns primarily with the Multi-Jurisdictional Hazard Mitigation Plan's Municipal Goal #4: Increase the use of natural, "green," or "soft" hazard mitigation measures, such as open space preservation and green infrastructure.

MITIGATION SUCCESS STORY

WET FLOODPROOFING: HARTFORD BOATHOUSE

Hartford Boat House

Images from Public Domain

WHAT IS IT?

The Hartford-based nonprofit Riverfront Recapture's mission is "to connect people with the Connecticut River." As part of this effort, the organization constructed a boathouse in 2002 to house boats and a community and function room.

The building was designed to allow flood waters into the lower level, where boats are stored, through flood grates. Concrete siding and walls withstand water damage and are easy to clean after a flood, but are designed to look like wooden clapboard. Mechanical and electrical systems are located on the second level to avoid flood damage.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Properties that must be in flood prone areas because they require proximity to water in order to function are called water-dependent use properties.

Limiting development in flood hazard zones to water-dependent uses and floodable uses such as parks and open space allows a community to balance economic and hazard mitigation interests.

Construction of a wet-floodproofed water-dependent use building like a boat house in a flood hazard area aligns primarily with the Multi-Jurisdictional Hazard Mitigation Plan's Municipal Goal # 1: Minimize the impact of natural hazards on physical buildings and infrastructure.

FOR MORE INFORMATION

Marc Nicol
Director of Planning & Park Development
mnicol@riverfront.org
860-713-3131 X 334
www.riverfront.org/

MITIGATION SUCCESS STORY

DRAINAGE UPGRADES: NEW BRITAIN

Hart Street Drainage System Project

David Murphy, 2018

FOR MORE INFORMATION

Rob Trottier
New Britain City Engineer
New Britain Department of Public Works
860-826-3350
www.newbritainct.gov/

WHAT IS IT?

New Britain replaced and upsized a drainage system on Hart Street. Previously, degraded and undersized storm drains would be overwhelmed by significant rain events, causing water to backup and flood the street. The flooding would make the street impassible, causing at best an inconvenience to residents and travelers, and at worst a dangerous delay for emergency responders.

New Britain intends to continue replacing aged and undersized drainage infrastructure around the city.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Complaints of flash or poor-drainage flooding on roads are very common. The locations of prone areas typically are not represented on FEMA Flood Insurance Rate Maps, but can cause property damage and travel delays during important emergency response situations.

Constructing, upgrading, and maintaining appropriately sized drainage infrastructure is key to mitigating these types of floods. Passing ordinances requiring that drainage systems meet a certain capacity can support these efforts.

Drainage upgrades align primarily with the Multi-Jurisdictional Hazard Mitigation Plan Municipal Goal #5: Improve the resilience of local and regional utilities and infrastructure using strategies including adaptation, hardening, and creating redundancies.

MITIGATION SUCCESS STORY

STREAM CULVERT UPSIZING: FARMINGTON

Two views of the undersized culvert and nearby, potentially-affected properties. Photo by MMI

WHAT IS IT?

Bridges and culverts (pipes that convey water under a roadway) must be sized appropriately to ensure water can pass through during high flow events. An undersized culvert or bridge can back-up water and flood upstream areas, while acting as a pressure-hose causing erosion downstream. If water overtops the road or seeps through the fill below it, it can wash-out the road, cause additional damage downstream, and hamper transportation and hazard response along that route.

An appropriately-sized structure allows water and debris to flow through it during storms without significant changes to velocity or power.

This new, upsized culvert in Farmington has decreased the risk of flooding upstream, the risk of erosion downstream, and the risk of road failure.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

It is important to address the many undersized bridges and culverts in this region proactively:

1. Identify, prioritize and replace undersized structures
2. Require larger structures during new construction or replacements.
3. Consider the impacts that climate change will have on the appropriate sizes of structures.

Many culverts in the region were likely designed based on "Technical Paper No. 40," published by the U.S. Weather Bureau in 1961. In 2015, CT DOT put out bulletin EB-2015-2, directing that precipitation estimates from *NOAA Atlas 14* (9/30/2015) be used in culvert planning and design. Extreme precipitation data from the Northeast Regional Climate Center (NRCC; http://precip.eas.cornell.edu/) is also a good tool to use to model appropriate culvert sizes.

FOR MORE INFORMATION

MITIGATION SUCCESS STORY

MICROGRID: PARKVILLE NEIGHBORHOOD, HARTFORD

Parkville Fuel Cell; photo by MMI

Parkville microgrid area; photo by MMI

WHAT IS IT?

A microgrid is a localized electric system that includes both electricity sources (such as power plants, generators, fuel cells, or solar panels) and electricity users. Under normal conditions, a microgrid is connected to regional electric grids, but during regional power outages a microgrid is able to act in "island mode," maintaining power to connected users.

In 2017, the City of Hartford installed an 800-kilowatt microgrid in the Parkville section of the city that, in the event of a power outage, will be able to power the school, senior center, Dwight Branch library, Charter Oak Health Center, a gas station, and a grocery store. The natural gas powered fuel cell that powers the local system feeds excess energy back into the larger regional grid under normal conditions.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

Power outages caused by the effects of winter storms, hurricanes, lightning, and other natural hazards is one of the most commonly cited impacts of natural disasters in the region. Such outages can have direct impacts on health, safety, and the economy, as well as indirect impacts on hazard response and recovery efforts.

Developing microgrids that encompass critical facilities such as emergency response, shelter, fuel, and food facilities, can help make a community more resilient to natural disasters. Urgent needs of the community can be met and response and recovery efforts can move forward without delay while the regional grid is repaired.

Microgrid development aligns primarily with the Multi-Jurisdictional Hazard Mitigation Plan Municipal Goal #5: Improve the resilience of local and regional utilities and infrastructure using strategies including adaptation, hardening, and creating redundancies.

FOR MORE INFORMATION

MITIGATION SUCCESS STORY

CODE PLUS DESIGN: SOUTH WINDSOR EMERGENCY OPERATIONS CENTER

South Windsor EOC
photo courtesy of South Windsor

South Windsor EOC
photo courtesy of South Windsor

WHAT IS IT?

In 2016, South Windsor completed a $2.3 million project ($1.28 million of which came from state grant funds) to install an EOC (Emergency Operations Center) in a renovated municipal building.

During emergency events such as a natural hazard, the EOC will function as a hub for information collection, response coordination, priority-setting, resource management, and communications facilitation. Under non-emergency conditions, the space will be used to conduct emergency responder trainings, community education and awareness workshops, and Neighborhood Emergency Team preparedness programs.

The building renovations made the structure more resilient to hazard events; for example, the new roof was designed to withstand a Category 3 hurricane (130 mph winds).

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

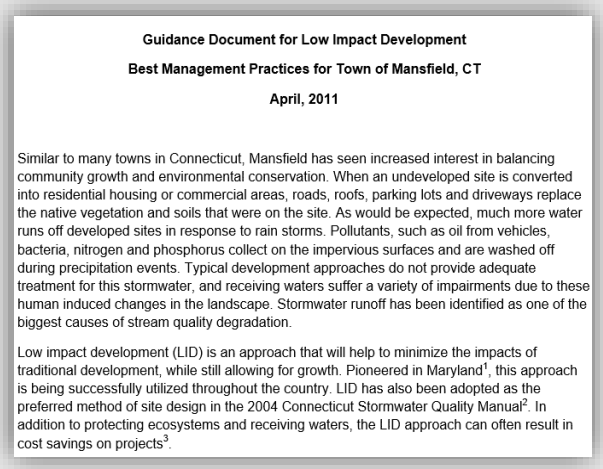
Hazards cannot be avoided completely, so a community's ability to respond to emergency situations during and following a hazard event is an essential part of resiliency and hazard mitigation. Critical facilities that are central to emergency response may be vulnerable to natural hazards just like the rest of the community, so protecting these assets from the impacts of those hazards is key:

- Mitigate Structural Damage
  - protect against floods, wind, earthquakes, etc.
- Mitigate Operational Interruptions
  - backup power, resilient communications, ensure roads to and from facilities are passable
- Ensure Operational Preparedness
  - Familiarize staff with Emergency Plan, assign roles before event, conduct trainings/exercises.

FOR MORE INFORMATION

MITIGATION SUCCESS STORY

STORMWATER MANAGEMENT: LOW IMPACT DEVELOPMENT



Guidance Document for Low Impact Development

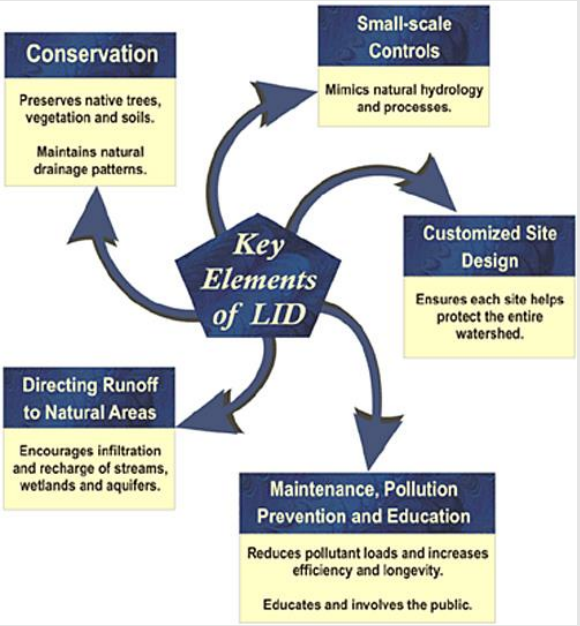
Best Management Practices for Town of Mansfield, CT

April, 2011

Similar to many towns in Connecticut, Mansfield has seen increased interest in balancing community growth and environmental conservation. When an undeveloped site is converted into residential housing or commercial areas, roads, roofs, parking lots and driveways replace the native vegetation and soils that were on the site. As would be expected, much more water runs off developed sites in response to rain storms. Pollutants, such as oil from vehicles, bacteria, nitrogen and phosphorus collect on the impervious surfaces and are washed off during precipitation events. Typical development approaches do not provide adequate treatment for this stormwater, and receiving waters suffer a variety of impairments due to these human induced changes in the landscape. Stormwater runoff has been identified as one of the biggest causes of stream quality degradation.

Low impact development (LID) is an approach that will help to minimize the impacts of traditional development, while still allowing for growth. Pioneered in Maryland[1], this approach is being successfully utilized throughout the country. LID has also been adopted as the preferred method of site design in the 2004 Connecticut Stormwater Quality Manual[2]. In addition to protecting ecosystems and receiving waters, the LID approach can often result in cost savings on projects[3].

Mansfield LID-Regulation Guidance



Key Elements of LID, From The CT Stormwater Quality Manual, 2011

FOR MORE INFORMATION

Department of Energy & Environmental Protection
79 Elm Street
Hartford, CT 06106-5127
860-424-3297

Amanda Ryan
Municipal Stormwater Educator
UConn CLEAR
Middlesex County Extension
PO Box 70, 1066 Saybrook Road
Haddam, CT 06438
860-345-5231

WHAT IS IT?

Low Impact Development (LID) is an approach to development that uses runoff-reducing site design principles and small-scale non-structural treatment practices distributed throughout a site to manage stormwater runoff. The technique provides on-site retention, detention, and infiltration of runoff in a way that mimics nature, reducing load to streams and municipal treatment plants.

The Town of Mansfield has adopted stormwater management requirements into its Zoning Regulations that promote the use of LID practices. The purpose of the stormwater management requirements are to improve water quality and decrease peak runoff. The Town has also published guidance that includes LID best management practices, in order to assist developers to be in compliance with the new regulations.

REGIONAL SIGNIFICANCE AND LINK TO HAZARD MITIGATION

In addition to improving water quality, lowering maintenance costs, improving aesthetics and providing local ecological benefits, Low Impact Development helps mitigate hazards, primarily those posed by inland flooding. Reducing the rate of runoff directly into waterways can lower the elevation of flood crests.

Examples of LID practices include:

- Bioretention Areas or Rain Gardens
- Vegetated Swales
- Water Harvesting
- Pervious Pavements
- Green Roofs