Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

Resilience Action Matrix Summary

ID:	Resilience Strategy:	Climate Change Effects Addressed:								Climate Change Impacts Addressed:							Source Document:
		Decreased Air Quality	Decreased Water	Drought	Extreme Weather	Increasing Precipitation	Ocean Acidification	Rising Temperatures	Sea-Level Rise	Health and Well-Being	Coastal Communities	Ocean and Marine Life	Ecosystems and Wildlife	Socially Vulnerable Populations	Infrastructure	Agriculture and Food Supply	
GI_01	Collaborate With Community-Based Organizations To Develop Or Expand Urban Greening And Urban Agriculture Programs	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×	×	California Adaptation Planning Guide
GI_02	Coastal Impoundments	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	✓	×	×	×	NJ Future, Local Options/Local Actions
GI_03	Protect Habitats And Migration Routes	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	✓	×	×	×	NJ Future, Local Options/Local Actions
GI_04	Track Biological Indicators Of Change	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	✓	×	×	×	NJ Future, Local Options/Local Actions
GI_05	Use Interconnected Green Corridors And Parks To Protect Surrounding Communities From Hazards, As Well As Protecting Watershed	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	✓	×	×	×	NJ Future, Local Options/Local Actions
GI_06	Use Vacant Land For Green Spaces	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	✓	×	×	×	NJ Future, Local Options/Local Actions

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

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GI_07	Use Natural Predators For Mosquitos	✓	✓	✓	✓	✓	✓	✓	✓	✓	×	×	×	×	×	×	NJ Future, Local Options/Local Actions
GI_08	Biofiltration Planter	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_09	Bioretention Planter	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_10	Bioretention Swale	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_11	Blue And Green Roofs	×	×	×	×	✓	×	✓	×	×	×	×	×	×	✓	×	FEMA Building Community Resilience with Nature-Based
GI_12	Establish Groundwater Conservation Programs	×	×	✓	×	×	×	×	✓	×	×	×	×	×	✓	×	National Wildlife Federation Building Ecological

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

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GI_13	Floating Island Planter	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_14	Green Alley	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_15	Green Parking Lots	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	Naturally Resilient Communities
GI_16	Green Transitway	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_17	Hybrid Bioretention Planter	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_18	Integrate Green Infrastructure Into A Boulevard	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

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GI_19	Integrate Green Infrastructure Into A Commercial Shared Street	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_20	Integrate Green Infrastructure Into A Reclaimed Intersection	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_21	Integrate Green Infrastructure Into A Residential Shared Street	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_22	Integrate Green Infrastructure Into A Residential Street	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_23	Integrate Green Infrastructure Into Neighborhood Main Street	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_24	Maintain, Create, And/Or Restore Urban Tree Canopy	×	×	×	×	✓	×	✓	×	✓	×	×	×	×	×	×	NJ Future, Local Options/Local Actions; FEMA Building

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

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		Decreased Air Quality	Decreased Water	Drought	Extreme Weather	Increasing Precipitation	Ocean Acidification	Rising Temperatures	Sea-Level Rise	Health and Well-Being	Coastal Communities	Ocean and Marine Life	Ecosystems and Wildlife	Socially Vulnerable Populations	Infrastructure	Agriculture and Food Supply	
GI_25	Manufactured Treatment Device (Mtd)	×	×	✓	×	✓	×	×	×	×	×	×	×	×	✓	×	NJ Future NJ Developers Green Infrastructure
GI_26	Permeable Pavement	×	×	✓	×	✓	×	×	×	×	×	×	×	×	✓	×	FEMA Building Community Resilience with Nature-Based
GI_27	Rain Gardens	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	FEMA Building Community Resilience with Nature-Based
GI_28	Rainwater Harvesting/Cisterns	×	×	✓	×	✓	×	×	×	×	×	×	×	×	✓	×	FEMA Building Community Resilience with Nature-Based
GI_29	Stormwater Curb Extension	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_30	Stormwater Greenway	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

Resilience Action Matrix Summary

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		Decreased Air Quality	Decreased Water	Drought	Extreme Weather	Increasing Precipitation	Ocean Acidification	Rising Temperatures	Sea-Level Rise	Health and Well-Being	Coastal Communities	Ocean and Marine Life	Ecosystems and Wildlife	Socially Vulnerable Populations	Infrastructure	Agriculture and Food Supply	
GI_31	Stormwater Median	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_32	Stormwater Parks	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	FEMA Building Community Resilience with Nature-Based
GI_33	Stormwater Transit Stop	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_34	Tree Trenches	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	FEMA Building Community Resilience with Nature-Based
GI_35	Ultra Urban Green Street	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NACTO Urban Street Stormwater Guide
GI_36	Vegetated Swales	×	✓	×	×	✓	×	×	×	×	×	×	×	×	✓	×	FEMA Building Community Resilience with Nature-Based

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

Resilience Action Matrix Summary

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		Decreased Air Quality	Decreased Water	Drought	Extreme Weather	Increasing Precipitation	Ocean Acidification	Rising Temperatures	Sea-Level Rise	Health and Well-Being	Coastal Communities	Ocean and Marine Life	Ecosystems and Wildlife	Socially Vulnerable Populations	Infrastructure	Agriculture and Food Supply	
GI_37	Waterfront Parks	×	×	×	×	✓	×	×	✓	×	×	×	×	×	✓	×	FEMA Building Community Resilience with Nature-Based
GI_38	Constructed Wetlands	×	✓	×	×	×	×	×	✓	×	×	×	✓	×	×	×	NJ Future NJ Developers Green Infrastructure
GI_39	Floodplain Restoration	×	×	×	×	✓	×	✓	×	×	×	×	✓	×	×	×	FEMA Building Community Resilience with Nature-Based
GI_40	Greenways	×	×	×	×	✓	×	✓	×	×	×	×	✓	×	×	×	FEMA Building Community Resilience with Nature-Based
GI_41	Block Flood Entry Points With Elevated Waterfront Parks And Plazas	×	×	×	×	×	×	×	✓	×	×	×	×	×	✓	×	NJ Future, Local Options/Local Actions
GI_42	Detention Basin	×	×	×	×	✓	×	×	×	×	×	×	×	×	✓	×	APA Planning Magazine "Got Contaminants?" article

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

Resilience Action Matrix Summary

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		Decreased Air Quality	Decreased Water	Drought	Extreme Weather	Increasing Precipitation	Ocean Acidification	Rising Temperatures	Sea-Level Rise	Health and Well-Being	Coastal Communities	Ocean and Marine Life	Ecosystems and Wildlife	Socially Vulnerable Populations	Infrastructure	Agriculture and Food Supply	
GI_43	Increase Natural Water Storage Capabilities	×	✓	×	×	×	×	×	×	×	×	×	×	×	✓	×	NJ Future, Local Options/Local Actions
GI_44	Retention Basin	×	×	×	×	✓	×	×	×	×	×	×	×	×	✓	×	APA Planning Magazine "Got Contaminants?" article
GI_45	Use Watershed Plans To Identify Impervious Surface That Can Be Removed	×	×	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NJ Future, Local Options/Local Actions
GI_46	Wet Pond	×	×	×	×	✓	×	×	×	×	×	×	×	×	✓	×	NJ Future NJ Developers Green Infrastructure
GI_47	Build Berms To Mitigate Storm Surge.	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural
GI_48	Beach Stabilization Using Biopolymers	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	NJ Future, Local Options/Local Actions

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

Resilience Action Matrix Summary

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		Decreased Air Quality	Decreased Water	Drought	Extreme Weather	Increasing Precipitation	Ocean Acidification	Rising Temperatures	Sea-Level Rise	Health and Well-Being	Coastal Communities	Ocean and Marine Life	Ecosystems and Wildlife	Socially Vulnerable Populations	Infrastructure	Agriculture and Food Supply	
GI_49	Create A Living Shoreline	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	NJ Future, Local Options/Local Actions
GI_50	Daylight Rivers And Streams	×	×	×	×	✓	×	×	×	×	×	×	✓	×	×	×	Naturally Resilient Communities
GI_51	Dune Management Program	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	NJ Future, Local Options/Local Actions
GI_52	Dune Planting And Restoration	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	National Wildlife Federation Building Ecological
GI_53	Ecosystem Service Valuation Framework	×	×	×	×	×	×	×	✓	×	×	×	✓	×	×	×	NJ Future, Local Options/Local Actions
GI_54	Enhance Landscaping And Design Measures	×	×	✓	×	×	×	×	×	×	×	×	✓	×	×	×	FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

Resilience Action Matrix Summary

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		Decreased Air Quality	Decreased Water	Drought	Extreme Weather	Increasing Precipitation	Ocean Acidification	Rising Temperatures	Sea-Level Rise	Health and Well-Being	Coastal Communities	Ocean and Marine Life	Ecosystems and Wildlife	Socially Vulnerable Populations	Infrastructure	Agriculture and Food Supply	
GI_55	Establish Migration Areas For Tidal Marsh And Wetlands	×	×	×	×	×	×	×	✓	×	×	×	✓	×	×	×	NJ Future, Local Options/Local Actions
GI_56	Establish Shoreland Protection Districts	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	NJ Future, Local Options/Local Actions
GI_57	Flood Bypasses	×	×	×	×	✓	×	×	×	×	×	×	✓	×	×	×	Naturally Resilient Communities
GI_58	Horizontal Levees	×	×	×	×	×	×	×	✓	×	×	×	✓	×	×	×	Naturally Resilient Communities
GI_59	Implement A Fuels Management Program	×	×	×	×	×	×	✓	×	×	×	×	✓	×	×	×	FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural
GI_60	Living Breakwaters	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	Naturally Resilient Communities

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

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GI_61	Living Shoreline	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	FEMA Building Community Resilience with Nature-Based
GI_62	Oyster Reefs	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	Naturally Resilient Communities
GI_63	Preserve Floodplains As Open Space	×	×	×	×	✓	×	×	×	×	×	×	✓	×	×	×	FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural
GI_64	Preserve High-Hazard Areas As Open Space	×	×	×	×	×	×	×	✓	×	×	×	✓	×	×	×	FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural
GI_65	Protect And Restore Natural Coastal Buffers	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural
GI_66	Protect And Restore Natural Flood Mitigation Features	×	×	×	×	✓	×	×	×	×	×	×	✓	×	×	×	FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural

Risk Reduction Actions: Green Infrastructure & Nature-Based Solutions

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GI_67	Seagrasses	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	Naturally Resilient Communities
GI_68	Stabilize Erosion Hazard Areas	×	×	×	×	×	×	×	✓	×	×	×	✓	×	×	×	FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural
GI_69	Support A Stream Maintenance Program	×	×	×	×	✓	×	×	×	×	×	×	✓	×	×	×	NJ Future, Local Options/Local Actions
GI_70	Wave Attenuation Devices	×	×	×	×	×	×	×	✓	×	✓	×	×	×	×	×	Resilient NJ Program Guidance
GI_71	Wetland Restoration And Protection	×	×	×	×	×	×	×	✓	×	×	×	✓	×	×	×	FEMA HMA Mitigation Action Portfolio; FEMA Building

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Collaborate With Community-Based Organizations To Develop Or Expand Urban Greening And Urban Agriculture Programs

ID: GI_01

Description:

Urban greening can include adding trees, parks, green infrastructure, and other green elements to a neighborhood. Urban agriculture includes community gardens or small farms within urban areas of a community.

Climate Change Effects Addressed:

Decreased Air Quality	✓
Decreased Water Quality	✓
Drought	✓
Extreme Weather	✓
Increasing Precipitation	✓
Ocean Acidification	✓
Rising Temperatures	✓
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	✓
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:
California Adaptation Planning Guide

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Coastal Impoundments

ID: GI_02

Description:

Provides a "climate smart" habitat for migratory birds.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	✓	Health And Well-Being	×
Decreased Water Quality	✓	Coastal Communities	×
Drought	✓	Ocean And Marine Life	×
Extreme Weather	✓	Ecosystems And Wildlife	✓
Increasing Precipitation	✓	Socially Vulnerable Populations	×
Ocean Acidification	✓	Infrastructure	×
Rising Temperatures	✓	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Protect Habitats And Migration Routes

ID: GI_03

Description:

Identifies routes, installs infrastructure for crossing.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	✓	Health And Well-Being	×
Decreased Water Quality	✓	Coastal Communities	×
Drought	✓	Ocean And Marine Life	×
Extreme Weather	✓	Ecosystems And Wildlife	✓
Increasing Precipitation	✓	Socially Vulnerable Populations	×
Ocean Acidification	✓	Infrastructure	×
Rising Temperatures	✓	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:

NJ Future, Local Options/Local Actions

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Track Biological Indicators Of Change

ID: GI_04

Description:

Develops biological indicators to track changes in ecosystems and wildlife.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	✓	Health And Well-Being	×
Decreased Water Quality	✓	Coastal Communities	×
Drought	✓	Ocean And Marine Life	×
Extreme Weather	✓	Ecosystems And Wildlife	✓
Increasing Precipitation	✓	Socially Vulnerable Populations	×
Ocean Acidification	✓	Infrastructure	×
Rising Temperatures	✓	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:

NJ Future, Local Options/Local Actions

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Use Interconnected Green Corridors And Parks To Protect Surrounding Communities From Hazards, As Well As Protecting Watershed

ID: GI_05

Description:

Protect streams, trees, etc. for their mitigation effects.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	✓	Health And Well-Being	×
Decreased Water Quality	✓	Coastal Communities	×
Drought	✓	Ocean And Marine Life	×
Extreme Weather	✓	Ecosystems And Wildlife	✓
Increasing Precipitation	✓	Socially Vulnerable Populations	×
Ocean Acidification	✓	Infrastructure	×
Rising Temperatures	✓	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Use Vacant Land For Green Spaces

ID: GI_06

Description:

Transform vacant land into green spaces for economic, social, environmental benefits.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	✓	Health And Well-Being	×
Decreased Water Quality	✓	Coastal Communities	×
Drought	✓	Ocean And Marine Life	×
Extreme Weather	✓	Ecosystems And Wildlife	✓
Increasing Precipitation	✓	Socially Vulnerable Populations	×
Ocean Acidification	✓	Infrastructure	×
Rising Temperatures	✓	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Use Natural Predators For Mosquitos

ID: GI_07

Description:

Uses fish to eliminate mosquito larvae, reducing the need for harmful spraying of pollutants.

Climate Change Effects Addressed:	
Decreased Air Quality	✓
Decreased Water Quality	✓
Drought	✓
Extreme Weather	✓
Increasing Precipitation	✓
Ocean Acidification	✓
Rising Temperatures	✓
Sea-Level Rise	✓

Climate Change Impacts Addressed:	
Health And Well-Being	✓
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Biofiltration Planter

ID: GI_08

Description:

Where infiltration cannot be accomplished due to contextual characteristics, native soils, or other constraints, walled planters can be designed with an impermeable base and supporting drainage infrastructure that collects water, filters runoff downward through soil media, and channels treated runoff through an underdrain (perforated) pipe. Biofiltration planters provide water quality treatment and reduce runoff volumes, and may be applied in more limited rights-of-way.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Bioretention Planter

ID: GI_09

Description:

Bioretention planters are stormwater infiltration cells constructed with walled vertical sides, a flat bottom area, and a large surface capacity to capture, treat, and manage stormwater runoff from the street.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:
NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Bioretention Swale

ID: GI_10

Description:

Bioretention swales are shallow, vegetated, landscaped depressions with sloped sides. They are designed to capture, treat and infiltrate stormwater runoff as it moves downstream. Swales are less expensive to build but use more space for infiltration and conveyance than planters, and can handle low to moderate flows of runoff.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	✓
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	✓
Agriculture and Food Supply	×

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Blue And Green Roofs

ID: GI_11

Description:

Blue Roofs are non-vegetated roofs that can hold stormwater. Blue roofs are only suitable for flat roofs, but the benefits are that they are generally less costly than green roofs due to fewer materials needed. A green roof can be combined with blue roof systems to maximize stormwater storage and aesthetic benefits.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✓
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions; NJ Future NJ Developers Green Infrastructure Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Establish Groundwater Conservation Programs

ID: GI_12

Description:

Maintain aquifer levels, and minimize salt water intrusion.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	✗	Health And Well-Being	✗
Decreased Water Quality	✗	Coastal Communities	✗
Drought	✓	Ocean And Marine Life	✗
Extreme Weather	✗	Ecosystems And Wildlife	✗
Increasing Precipitation	✗	Socially Vulnerable Populations	✗
Ocean Acidification	✗	Infrastructure	✓
Rising Temperatures	✗	Agriculture and Food Supply	✗
Sea-Level Rise	✓		

Source Document:

National Wildlife Federation Building Ecological Solutions to Coastal Community Hazards

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Floating Island Planter

ID: GI_13

Description:

Vegetated space on pedestrian refuge islands, bikeway buffers, transit boarding islands, or other constructed elements that are offset from the curb can improve the streetscape and provide space for street trees. Bioretention planters may sometimes be incorporated into islands, provided suitable topography and thoughtful design.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	✓
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	✓
Agriculture and Food Supply	×

Source Document:

NACTO Urban Street Stormwater Guide

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Green Alley

ID: GI_14

Description:

Integrating green stormwater infrastructure into alleys transforms negative spaces into community assets that also serve mobility functions, improving the ease of access for service vehicles and freight and dramatically upgrading pedestrian and bicycle accessibility.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	✓
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	✓
Agriculture and Food Supply	×

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Green Parking Lots

ID: GI_15

Description:

Green parking lots incorporate permeable or semi-permeable paving and porous design techniques to reduce stormwater runoff volume. In addition to permeable pavement, they often reduce or eliminate curbing and include extensive landscaping which treats runoff and improves the appearance of the parking lot while also improving water quality by filtering and removing pollutants from stormwater.In addition to engineered design solutions, green parking lots may also incorporate local codes designed to minimize the land area devoted to parking. This may include reduced parking stall dimensions, shared parking arrangements, and/or reductions in the minimum number of parking spaces required.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:
Naturally Resilient Communities

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Green Transitway

ID: GI_16

Description:

Upgrading to a high-capacity rail or bus transit line within the street often involves significant capital investment or full reconstruction, creating an opportunity to reframe the entire form and use of the street. Green stormwater infrastructure is integrated comprehensively in this street, recasting a large impervious expanse of pavement into a high-performing stormwater street that provides an attractive and safer street for people, both on transit and off.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:
NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Hybrid Bioretention Planter

ID: GI_17

Description:

A hybrid bioretention cell combines elements of both swales and planters, featuring a walled side opposite a graded side slope to increase vegetated space and infiltrating area, while providing a softer streetscape treatment for people walking. Walls or graded sides can be configured adjacent to either a street or sidewalk, and can utilize a range of materials including concrete, rocks, or steel-faced curbs.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	✓
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	✓
Agriculture and Food Supply	×

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Integrate Green Infrastructure Into A Boulevard

ID: GI_18

Description:

Many cities are restoring these boulevards into vibrant, iconic urban streets, with increasing opportunities to increase safety and comfort for people using the street, capture stormwater runoff, improve shade coverage, and reduce reflective surfaces. These ecosystem services are key to making broad streets into good human habitats.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Integrate Green Infrastructure Into A Commercial Shared Street

ID: GI_19

Description:

Local residential streets are often underutilized as public spaces, with overly wide or undifferentiated lanes that enable speeding and cut-through traffic. Stormwater projects are often the only opportunity to reconstruct or fully retrofit such streets. Integrating green stormwater infrastructure can help create calmer streets for people walking, biking, and enjoying their neighborhood.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:
NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Integrate Green Infrastructure Into A Reclaimed Intersection

ID: GI_20

Description:

Complex or multi-legged intersections are common in non-grid street networks, or where two grids at different orientations come together. Multi-legged intersections can be reconfigured to improved access for people walking and bicycling, while capturing large amounts of surface area to gather and infiltrate runoff.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Integrate Green Infrastructure Into A Residential Shared Street

ID: GI_21

Description:

These streets can often be redesigned as shared spaces, with a dramatically improved environment for walking, bicycling, and playing while accommodating service, delivery, and very local motor vehicle access.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	✗	Health And Well-Being	✗
Decreased Water Quality	✓	Coastal Communities	✗
Drought	✗	Ocean And Marine Life	✗
Extreme Weather	✗	Ecosystems And Wildlife	✗
Increasing Precipitation	✓	Socially Vulnerable Populations	✗
Ocean Acidification	✗	Infrastructure	✓
Rising Temperatures	✗	Agriculture and Food Supply	✗
Sea-Level Rise	✗		

Source Document:
NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Integrate Green Infrastructure Into A Residential Street

ID: GI_22

Description:

Local residential streets are often underutilized as public spaces, with overly wide or undifferentiated lanes that enable speeding and cut-through traffic. Stormwater projects are often the only opportunity to reconstruct or fully retrofit such streets. Integrating green stormwater infrastructure can help create calmer streets for people walking, biking, and enjoying their neighborhood.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:
NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Integrate Green Infrastructure Into Neighborhood Main Street

ID: GI_23

Description:

Neighborhood main streets are at the center of community life—they are conduits for social and economic activity, providing vital spaces to travel to and through. Green expressions make streets more inviting by providing a tree canopy, absorbing heat, and improving the image of the street. Effective stormwater management is critical to mitigate flooding risks for adjacent properties on neighborhood main streets.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:
NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Maintain, Create, And/Or Restore Urban Tree Canopy

ID: GI_24

Description:

Identify and invest in salt-tolerant tree species that can withstand hurricanes and provide multiple ecosystem services, such as habitat for other native species (NJ Future) Tree canopy can reduce stormwater runoff by catching rainfall on branches and leaves and increasing evapotranspiration. By keeping neighborhoods cooler in the summer, tree canopy can also reduce the "urban heat island effect" (FEMA).

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✓
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✓
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✗
Agriculture and Food Supply	✗

Source Document:

NJ Future, Local Options/Local Actions; FEMA Building Community Resilience with Nature-Based Solutions; Rutgers Resilient Plan Element for Perth Amboy

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Manufactured Treatment Device (Mtd)

ID: GI_25

Description:

Structural alternative to treating water quality, and ideally used when space is limited (highly developed areas). MTD's can reduce chemical contaminants through filtration, vortex separation and other technologies.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✓
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

NJ Future NJ Developers Green Infrastructure Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Permeable Pavement

ID: GI_26

Description:

Permeable pavements allow more rainfall to soak into the ground. Common types include pervious concrete, porous asphalt, and interlocking pavers. Permeable pavements are most commonly used for parking lots and roadway shoulders.

Climate Change Effects Addressed:	
Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✓
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:	
Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions; California Adaptation Planning Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Rain Gardens

ID: GI_27

Description:

A rain garden is a shallow, vegetated basin that collects and absorbs runoff from rooftops, sidewalks, and streets. Rain gardens can be added around homes and businesses to reduce and treat stormwater runoff.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions; Rutgers Resilient Plan Element for Perth Amboy

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Rainwater Harvesting/Cisterns

ID: GI_28

Description:

Rainwater harvesting systems collect and store rainfall for later use. They slow runoff and can reduce the demand for potable water.

Climate Change Effects Addressed:	
Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✓
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:	
Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions; Rutgers Resilient Plan Element for Perth Amboy

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Stormwater Curb Extension

ID: GI_29

Description:

The available space generated by curb extensions can be used for bioretention, plantings, street furniture, benches, and street trees.

Climate Change Effects Addressed:	
Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:	
Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:
NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Stormwater Greenway

ID: GI_30

Description:

Cities around the world are restoring urban streams that had previously been decked or canalized, often with a roadway on top. Streets-to-streams projects are transformative, presenting an opportunity to implement high-performance water quality management practices, while creating inviting and active public spaces. These spaces can become destinations in themselves, giving people in cities access to a new kind of waterfront.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	✓
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	✓
Agriculture and Food Supply	×

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Stormwater Median

ID: GI_31

Description:

Wide medians used to separate traffic directions may be utilized for large amounts of water conveyance and infiltration. On very wide streets and parkways, green stormwater infrastructure can be coupled with greenways for bicycling and walking, providing attractive public space adjacent to stormwater management.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Stormwater Parks

ID: GI_32

Description:

Stormwater parks are recreational spaces that are designed to flood during extreme events and to withstand flooding. By storing and treating floodwaters, stormwater parks can reduce flooding elsewhere and improve water quality.

Climate Change Effects Addressed:	
Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:	
Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Stormwater Transit Stop

ID: GI_33

Description:

Incorporating stormwater facilities at transit stops introduces new opportunities for mutual benefits and inter-agency collaboration, unlocking new project funding sources and leveraging complementary resources.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	✓
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	✓
Agriculture and Food Supply	×

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Tree Trenches

ID: GI_34

Description:

A stormwater tree trench is a row of trees planted in an underground infiltration structure made to store and filter stormwater. Tree trenches can be added to streets and parking lots with limited space to manage stormwater.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	✗	Health And Well-Being	✗
Decreased Water Quality	✓	Coastal Communities	✗
Drought	✗	Ocean And Marine Life	✗
Extreme Weather	✗	Ecosystems And Wildlife	✗
Increasing Precipitation	✓	Socially Vulnerable Populations	✗
Ocean Acidification	✗	Infrastructure	✓
Rising Temperatures	✗	Agriculture and Food Supply	✗
Sea-Level Rise	✗		

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions; Rutgers Resilient Plan Element for Perth Amboy

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Ultra Urban Green Street

ID: GI_35

Description:

Often found downtown or serving as major multi-modal corridors, ultra urban streets have dense activity and strong demand for street and curb space throughout the day. While ultra urban streets are challenging to retrofit for stormwater management, the benefits of green infrastructure are greatest here: shade for public space and sidewalks, good drainage for bikeways and crosswalks, beautification at transit stops, and the capture or filtration of otherwise polluted runoff.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✓
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

NACTO Urban Street Stormwater Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Vegetated Swales

ID: GI_36

Description:

A vegetated swale is a channel holding plants or mulch that treats and absorbs stormwater as it flows down a slope. Vegetated swales can be placed along streets and in parking lots to soak up and treat their runoff, improving water quality.

Climate Change Effects Addressed:	
Decreased Air Quality	×
Decreased Water Quality	✓
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:	
Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	✓
Agriculture and Food Supply	×

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions; Rutgers Resilient Plan Element for Perth Amboy

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Waterfront Parks

ID: GI_37

Description:

Waterfront parks in coastal areas can be intentionally designed to flood during extreme events, reducing flooding elsewhere. Waterfront parks can also absorb the impact from tidal or storm flooding and improve water quality.

Climate Change Effects Addressed:	
Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✓

Climate Change Impacts Addressed:	
Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Constructed Wetlands

ID: GI_38

Description:

Provide natural filtering of chemicals and pollutants, provide wildlife habitat, adds aesthetic benefits. However, wetlands are vulnerable to chemicals so use of pesticides and herbicides upstream should be considered.

Climate Change Effects Addressed:	
Decreased Air Quality	×
Decreased Water Quality	✓
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:	
Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

NJ Future NJ Developers Green Infrastructure Guide; APA Planning Magazine "Got Contaminants?" article

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Floodplain Restoration

ID: GI_39

Description:

Undisturbed floodplains help keep waterways healthy by storing floodwaters, reducing erosion, filtering water pollution, and providing habitat. Floodplain restoration rebuilds some of these natural functions by reconnecting the floodplain to its waterway.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	×	Health And Well-Being	×
Decreased Water Quality	×	Coastal Communities	×
Drought	×	Ocean And Marine Life	×
Extreme Weather	×	Ecosystems And Wildlife	✓
Increasing Precipitation	✓	Socially Vulnerable Populations	×
Ocean Acidification	×	Infrastructure	×
Rising Temperatures	✓	Agriculture and Food Supply	×
Sea-Level Rise	×		

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Greenways

ID: GI_40

Description:

Greenways are corridors of protected open space managed for both conservation and recreation. Greenways often follow rivers or othernatural features. They link habitats and provide networks of open space for people to explore and enjoy.

Climate Change Effects Addressed:	
Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	✓
Sea-Level Rise	×

Climate Change Impacts Addressed:	
Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Block Flood Entry Points With Elevated Waterfront Parks And Plazas

ID: GI_41

Description:

Block critical flood entry points and provide public open space with Harbor views.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	×	Health And Well-Being	×
Decreased Water Quality	×	Coastal Communities	×
Drought	×	Ocean And Marine Life	×
Extreme Weather	×	Ecosystems And Wildlife	×
Increasing Precipitation	×	Socially Vulnerable Populations	×
Ocean Acidification	×	Infrastructure	✓
Rising Temperatures	×	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Detention Basin

ID: GI_42

Description:

Holds runoff during rain events and slowly releases the water until empty .

Climate Change Effects Addressed:	
Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:	
Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

APA Planning Magazine "Got Contaminants?" article

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Increase Natural Water Storage Capabilities

ID: GI_43

Description:

Create a watershed management plan; protect aquifer recharge; store greywater.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	×	Health And Well-Being	×
Decreased Water Quality	✓	Coastal Communities	×
Drought	×	Ocean And Marine Life	×
Extreme Weather	×	Ecosystems And Wildlife	×
Increasing Precipitation	×	Socially Vulnerable Populations	×
Ocean Acidification	×	Infrastructure	✓
Rising Temperatures	×	Agriculture and Food Supply	×
Sea-Level Rise	×		

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Retention Basin

ID: GI_44

Description:

Retains runoff, this reducing peak flows. While the water level varies, retention basins always contain some water.

Climate Change Effects Addressed:	
Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:	
Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	✓
Agriculture and Food Supply	×

Source Document:

APA Planning Magazine "Got Contaminants?" article

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Use Watershed Plans To Identify Impervious Surface That Can Be Removed

ID: GI_45

Description:

Improve stormwater management.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	×	Health And Well-Being	×
Decreased Water Quality	×	Coastal Communities	×
Drought	×	Ocean And Marine Life	×
Extreme Weather	×	Ecosystems And Wildlife	×
Increasing Precipitation	✓	Socially Vulnerable Populations	×
Ocean Acidification	×	Infrastructure	✓
Rising Temperatures	×	Agriculture and Food Supply	×
Sea-Level Rise	×		

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Wet Pond

ID: GI_46

Description:

Accommodate runoff and provide stability for larger storms. Use native vegetation along at least 50% of the shoreline.

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✗
Socially Vulnerable Populations	✗
Infrastructure	✓
Agriculture and Food Supply	✗

Source Document:

NJ Future NJ Developers Green Infrastructure Guide

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Build Berms To Mitigate Storm Surge.

ID: GI_47

Description:

Building a coastal berm to absorb waves and protect the shoreline from erosion. Building a storm berm to keep rock protection in place and provide a slow supply of sediment to the coastal system.

Climate Change Effects Addressed:	
Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:	
Health And Well-Being	×
Coastal Communities	✓
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Beach Stabilization Using Biopolymers

ID: GI_48

Description:

Apply protein polysaccharide biopolymer (PPB) on beaches to reduce sand displacement.

Climate Change Effects Addressed:	
Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:	
Health And Well-Being	×
Coastal Communities	✓
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

NJ Future, Local Options/Local Actions

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Create A Living Shoreline

ID: GI_49

Description:

Install cost-effective plantings to create a natural way of maintaining shoreline.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	×	Health And Well-Being	×
Decreased Water Quality	×	Coastal Communities	✓
Drought	×	Ocean And Marine Life	×
Extreme Weather	×	Ecosystems And Wildlife	×
Increasing Precipitation	×	Socially Vulnerable Populations	×
Ocean Acidification	×	Infrastructure	×
Rising Temperatures	×	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Daylight Rivers And Streams

ID: GI_50

Description:

Daylighting rivers or streams is the process of removing obstructions (such as concrete or pavement) which are covering a river, creek, or drainage way and restoring them to their previous condition. Daylighting removes artificial impediments and reestablishes rivers and streams within their original channels where possible or, where development is in the way, creates a new channel for the waterway. The resulting restored river or stream provides stormwater benefits as well as numerous aesthetic, economic, and environmental co-benefits.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:
Naturally Resilient Communities

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Dune Management Program

ID: GI_51

Description:

To foster and maintain a healthy, stable, and natural dune system; outlines specifications for restoring, enhancing, and maintaining the dunes, while addressing the needs of the community' s various stakeholders; the specifications, which were developed through interdepartmental collaboration and used the best available research, have since been used to conduct restoration and maintenance work led by in-house staff.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	✓
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Dune Planting And Restoration

ID: GI_52

Description:

Dunes can serve as a barrier between the water' s edge and inland areas, buffering waves as a first line of defense.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	×	Health And Well-Being	×
Decreased Water Quality	×	Coastal Communities	✓
Drought	×	Ocean And Marine Life	×
Extreme Weather	×	Ecosystems And Wildlife	×
Increasing Precipitation	×	Socially Vulnerable Populations	×
Ocean Acidification	×	Infrastructure	×
Rising Temperatures	×	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:

National Wildlife Federation Building Ecological Solutions to Coastal Community Hazards; FEMA Building Community Resilience with Nature-Based Solutions

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Ecosystem Service Valuation Framework

ID: GI_53

Description:

Case study of ecosystem restoration in Cape May.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	×	Health And Well-Being	×
Decreased Water Quality	×	Coastal Communities	×
Drought	×	Ocean And Marine Life	×
Extreme Weather	×	Ecosystems And Wildlife	✓
Increasing Precipitation	×	Socially Vulnerable Populations	×
Ocean Acidification	×	Infrastructure	×
Rising Temperatures	×	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Enhance Landscaping And Design Measures

ID: GI_54

Description:

Encourage drought-tolerant landscape design through measures such as:
- Incorporating drought tolerant or xeriscape practices into landscape ordinances to reduce dependence on irrigation.
- Providing incentives for xeriscaping.
- Using permeable driveways and surfaces to reduce runoff and promote groundwater recharge

Climate Change Effects Addressed:

Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✓
Extreme Weather	✗
Increasing Precipitation	✗
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:

Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	✗
Infrastructure	✗
Agriculture and Food Supply	✗

Source Document:

FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Establish Migration Areas For Tidal Marsh And Wetlands

ID: GI_55

Description:

Inventory lands and work with landowners to establish migration areas.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	×	Health And Well-Being	×
Decreased Water Quality	×	Coastal Communities	×
Drought	×	Ocean And Marine Life	×
Extreme Weather	×	Ecosystems And Wildlife	✓
Increasing Precipitation	×	Socially Vulnerable Populations	×
Ocean Acidification	×	Infrastructure	×
Rising Temperatures	×	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:
NJ Future, Local Options/Local Actions

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Establish Shoreland Protection Districts

ID: GI_56

Description:

Prohibit hardening of river and estuary shorelines. Maintain natural shoreland habitat; retain storm and sea level rise buffers; sustain ecosystem function; stabilize shoreline.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	✓
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Flood Bypasses

ID: GI_57

Description:

A flood bypass is an area along a river or within a floodplain that is intentionally kept undeveloped so that it is able to receive diverted excess flood waters from a river in order to reduce the risk of flooding in a nearby specific area, such as a city or business district.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:
Naturally Resilient Communities

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Horizontal Levees

ID: GI_58

Description:

A horizontal levee consists of a hardened structure (levee) setback from the coastline with a wide expanse of natural habitat – often a coastal marsh – between the water and the levee. By protecting the coastal habitats and moving the hardened structure back away from the coast, the marshes provide a natural buffering capacity to reduce the impacts of coastal flooding, storm surge and wave action.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

Naturally Resilient Communities

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Implement A Fuels Management Program

ID: GI_59

Description:

A fuels management program may be implemented to reduce hazardous vegetative fuels on public lands, near essential infrastructure, or on private lands by working with landowners. The program can include the following:
- Performing maintenance including fuel management techniques such as pruning and clearing dead vegetation, selective logging, cutting high grass, planting fire-resistant vegetation, and creating fuel/fire breaks (i.e., areas where the spread of wildfires will be slowed or stopped by the removal of fuels).
- Using prescribed burning to reduce fuel loads that threaten public safety and property.
- Identifying and clearing fuel loads created by downed trees.
- Cutting firebreaks into public wooded areas in the wildland-urban interface.
- Sponsoring local "slash and clean-up days" to reduce fuel loads along the wildland-urban interface.
- Linking wildfire safety with environmental protection strategies (i.e., improving forest ecology, wildlife habitat, etc.).
- Developing a vegetation management plan.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	✓
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Living Breakwaters

ID: GI_60

Description:

Breakwaters are offshore structures designed to limit wave energy by creating a barrier, most often underwater, between open water and the shoreline. While traditional breakwaters may be made from stone, concrete, or other building materials, a living breakwater is a breakwater that is intentionally designed to incorporate natural habitat components while still providing protection to the coastline.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	✓
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:
Naturally Resilient Communities

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Living Shoreline

ID: GI_61

Description:

Living shorelines stabilize a shore by combining living components, such as plants, with structural elements, such as seawalls. Living shorelines can slow waves, reduce erosion, and protect coastal property.

Climate Change Effects Addressed:	
Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:	
Health And Well-Being	×
Coastal Communities	✓
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

FEMA Building Community Resilience with Nature-Based Solutions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Oyster Reefs

ID: GI_62

Description:

Oyster reefs serve as natural breakwaters – their physical structure absorbs the force of waves, creating calmer waters on the shoreline side of the reef and reducing the impacts of erosion. In addition to directly reducing wave energy, oyster reefs play an important role in protecting and building coastal marshes and seagrass beds, which can in turn provide their own flood and erosion reduction benefits.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	✓
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:
Naturally Resilient Communities

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Preserve Floodplains As Open Space

ID: GI_63

Description:

Preserving natural areas and vegetation benefits natural resources while also mitigating potential flood losses. Techniques include:
- Developing an open space acquisition, reuse, and preservation plan targeting hazard areas.
- Developing a land banking program for the preservation of the natural and beneficial functions of flood hazard areas.
- Using transfer of development rights to allow a developer to increase densities on another parcel that is not at risk in return for keeping floodplain areas vacant.
- Compensating an owner for partial rights, such as easement or development rights, to prevent a property from being developed.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Preserve High-Hazard Areas As Open Space

ID: GI_64

Description:

Preserve open space to benefit natural resources and to reduce risk to structures from potential sea level rise. Techniques include:
- Developing an open space acquisition, reuse, and preservation plan targeting hazard areas.
- Developing a land banking program for the preservation and management of the natural and beneficial functions of flood hazard areas.
- Adopting rolling easements along the shoreline to promote natural migration of shorelines.
- Using transfer of development rights to allow a developer to increase densities on another parcel that is not at risk in return for keeping floodplain areas vacant.
- Compensating an owner for partial rights, such as easement or development rights, to prevent a property from being developed.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Protect And Restore Natural Coastal Buffers

ID: GI_65

Description:

Natural resources provide floodplain protection, riparian buffers, and other ecosystem services that mitigate sea level rise. It is important to preserve such functionality with the following:
- Examining the appropriate use of beach nourishment, sand scraping, dune-gap plugs, etc., for coastal hazards.
- Implementing dune restoration, plantings (e.g., sea oats), and use of natural materials.
- Examining the appropriate use of sediment-trapping vegetation, sediment mounds, etc., for coastal hazards.
- Planting sediment-trapping vegetation to buffer the coast against coastal storms by collecting sediment in protective features such as dunes or barrier islands.
- Performing sand scraping—using bulldozers to deposit the top foot of sand above the high-tide line—to reinforce the beach without adding new sand.
- Using sediment mounds to act as artificial dunes or plugs for natural dune gaps in order to slow the inland progress of storm-related wind and water.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	✓
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Protect And Restore Natural Flood Mitigation Features

ID: GI_66

Description:

Natural resources provide floodplain protection, riparian buffers, and other ecosystem services that mitigate flooding. It is important to preserve such functionality with the following:
- Protecting and enhancing landforms that serve as natural mitigation features (i.e., riverbanks, wetlands, dunes, etc.).
- Using vegetative management, such as vegetative buffers, around streams and water sources.
- Protecting and preserving wetlands to help prevent flooding in other areas.
- Establishing and managing riparian buffers along rivers and streams.
- Retaining natural vegetative beds in stormwater channels.
- Retaining thick vegetative cover on public lands flanking.

Climate Change Effects Addressed:	
Decreased Air Quality	✗
Decreased Water Quality	✗
Drought	✗
Extreme Weather	✗
Increasing Precipitation	✓
Ocean Acidification	✗
Rising Temperatures	✗
Sea-Level Rise	✗

Climate Change Impacts Addressed:	
Health And Well-Being	✗
Coastal Communities	✗
Ocean And Marine Life	✗
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	✗
Infrastructure	✗
Agriculture and Food Supply	✗

Source Document:
FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Seagrasses

ID: GI_67

Description:

Under normal conditions, seagrass meadows are able to slow down water currents and reduce wave energy, reducing the impact of wave action on adjacent shorelines. Additionally, seagrass beds are capable of stabilizing the sea floor with their extensive root systems, keeping sediments from moving and trapping suspended sediment to maintain the integrity of the local shoreline.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	✓
Ocean And Marine Life	×
Ecosystems And Wildlife	×
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

Naturally Resilient Communities

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Stabilize Erosion Hazard Areas

ID: GI_68

Description:

To stabilize slopes susceptible to erosion, consider options such as:
- Preventing erosion with proper bank stabilization, sloping or grading techniques, planting vegetation on slopes, terracing hillsides, or installing riprap boulders or geotextile fabric.
- Stabilizing cliffs with terracing or plantings of grasses or other plants to hold soil together.
- Prohibiting removal of natural vegetation from dunes and slopes.
- Planting mature trees in the coastal riparian zone to assist in dissipation of the wind force in the breaking wave zone.
- Using a hybrid of hard/soft engineering techniques (i.e., combine low-profile rock, rubble, oyster reefs, or wood structures with vegetative planting or other soft stabilization techniques).
- Implementing marine riparian habitat reinstatement or revegetation.
- Using a rock splash pad to direct runoff and minimize the potential for erosion.
- Using bioengineered bank stabilization techniques.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

FEMA Mitigation Ideas: A Resource for Reducing Risk to Natural Hazards

RESILIENT NJ

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Support A Stream Maintenance Program

ID: GI_69

Description:

Maintain streams to protect stormwater systems and provide other benefits.

Climate Change Effects Addressed:	
Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	✓
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	×

Climate Change Impacts Addressed:	
Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

NJ Future, Local Options/Local Actions

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Wave Attenuation Devices

ID: GI_70

Description:

Offshore structures parallel to the coast the provide protection from wave energy and reduce damage and erosion.

Climate Change Effects Addressed:		Climate Change Impacts Addressed:	
Decreased Air Quality	×	Health And Well-Being	×
Decreased Water Quality	×	Coastal Communities	✓
Drought	×	Ocean And Marine Life	×
Extreme Weather	×	Ecosystems And Wildlife	×
Increasing Precipitation	×	Socially Vulnerable Populations	×
Ocean Acidification	×	Infrastructure	×
Rising Temperatures	×	Agriculture and Food Supply	×
Sea-Level Rise	✓		

Source Document:
Resilient NJ Program Guidance

Risk Reduction Actions:
Green Infrastructure & Nature-Based Solutions

Individual Action Sheet

Resilience Strategy: Wetland Restoration And Protection

ID: GI_71

Description:

Restoring and protecting wetlands can improve water quality and reduce flooding. Healthy wetlands filter, absorb, and slow runoff. Wetlands also sustain healthy ecosystems by recharging groundwater and providing habitat for fish and wildlife.

Climate Change Effects Addressed:

Decreased Air Quality	×
Decreased Water Quality	×
Drought	×
Extreme Weather	×
Increasing Precipitation	×
Ocean Acidification	×
Rising Temperatures	×
Sea-Level Rise	✓

Climate Change Impacts Addressed:

Health And Well-Being	×
Coastal Communities	×
Ocean And Marine Life	×
Ecosystems And Wildlife	✓
Socially Vulnerable Populations	×
Infrastructure	×
Agriculture and Food Supply	×

Source Document:

FEMA HMA Mitigation Action Portfolio; FEMA Building Community Resilience with Nature-Based Solutions