

GREEN RESILIENCE: CLIMATE ADAPTATION + MITIGATION SYNERGIES

January 2015 | Weathering Climate Risks Program

CCAP encourages communities, companies and policymakers to **Ask the Climate Question** about key policies and infrastructure investments: Does it cut carbon pollution while also preparing for climate change impacts? We help our partners “connect the dots” between adaptation and mitigation to implement **Green Resilience** policies and measures that reduce GHG emissions and enhance resilience to climate change impacts.

Developing countries place high priority on adaptation planning, while also crafting NAMAs and Low Emissions Development Strategies. However, the nexus between adapting to a changing climate and reducing GHGs is rarely approached in an integrated fashion. CCAP sees great opportunities in focusing on where Adaptation & Mitigation converge (A+M), as seen in the Venn diagram below.

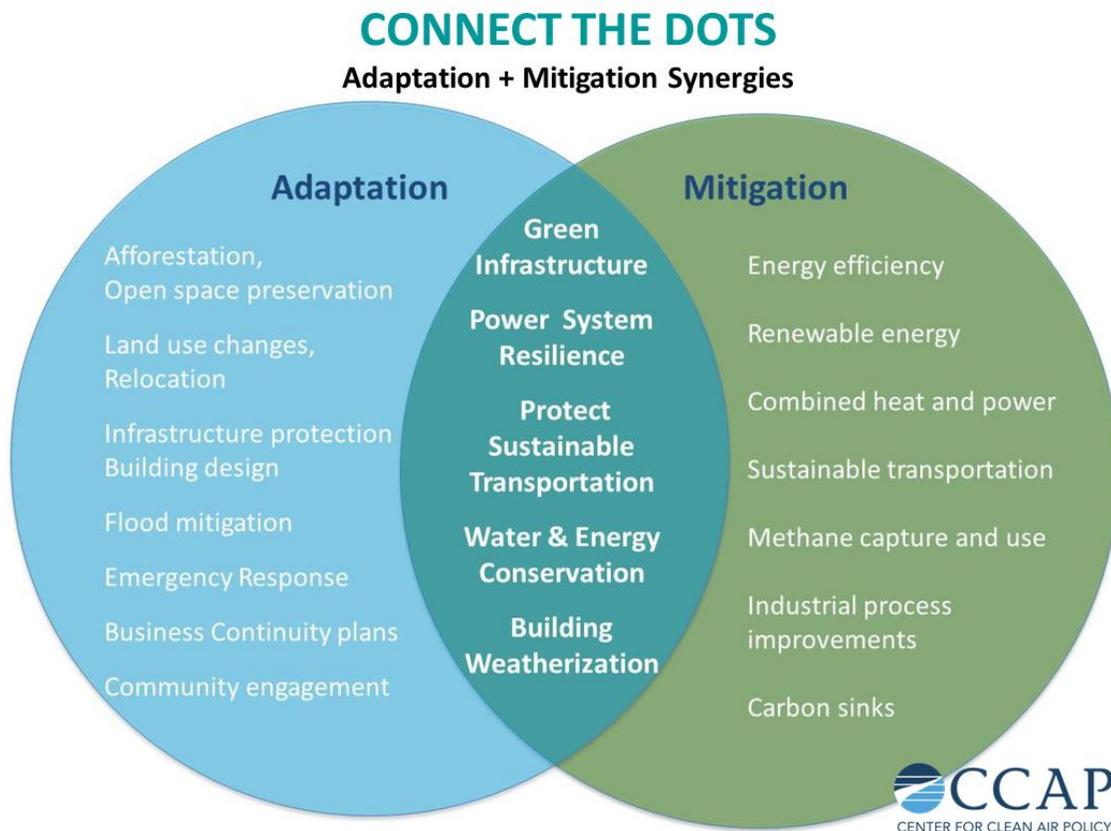


Figure 1 Adaptation + Mitigation Synergies

WHY INTEGRATE ADAPTATION & MITIGATION?

Green Resilience measures can:

- ✓ **Increase return on investments** in mitigation, adaptation and infrastructure.
- ✓ **Increase revenue sources for implementation.** Integrated A+M projects can attract both mitigation and adaptation funds, and leverage investments in infrastructure, disaster relief and economic development.
- ✓ **Enhance climate benefits of infrastructure investments.**

HOW TO IDENTIFY & ADVANCE GREEN RESILIENCE OPPORTUNITIES

Ask the Climate Question

The Green Resilience process can start from either an adaptation or mitigation measure, or can result from “Asking the Climate Question” of current policies and investments. For example, when investing in renewable energy, make sure that the power grid is resilient to extreme weather events. When setting new building codes for storm and flood resilience, consider energy and water efficiency as well. When implementing transit oriented development, include green infrastructure to address urban heat and stormwater runoff.

Follow the Money

How we spend our money reflects our organizational and policy priorities. Aligning climate investments and policies with stakeholders’ economic concerns can increase support for implementation. Examining how decision makers have already decided to allocate budgets and human resources can reveal opportunities to leverage those investments and build upon their momentum. However, too often we don’t see beyond our departmental silos, and thus miss opportunities to coordinate investments and maximize returns.

We therefore invite you to pull out your departmental or organizational budget and identify your top three investments in Adaptation, in Mitigation and in Infrastructure.

CCAP’s 3x3 Green Resilience Matrix is intended to help you quickly identify opportunities to maximize the climate mitigation and adaptation benefits of your top investments. Are there synergies that can be pursued? Are there conflicts that can be avoided? Are infrastructure investments increasing or decreasing GHG emissions and resilience?

		3x3 Green Resilience Matrix			
		Adaptation	Mitigation	Infrastructure	
Investments	Ask the 3x3 Climate Question				
		#1	\$10,000,000 Dune restoration	\$10,000,000 Wind turbines & Photovoltaics	\$2,000,000,000 Roads
		#2	\$5,000,000 Green Infrastructure	\$5,000,000 Green Buildings	\$1,000,000,000 Water treatment facilities
		#3	\$1,000,000 Vulnerability Assessment	\$500,000 Education & Outreach	\$500,000,000 Transit system improvements

Figure 2 Green Resilience Matrix

Connect the Dots: A + M



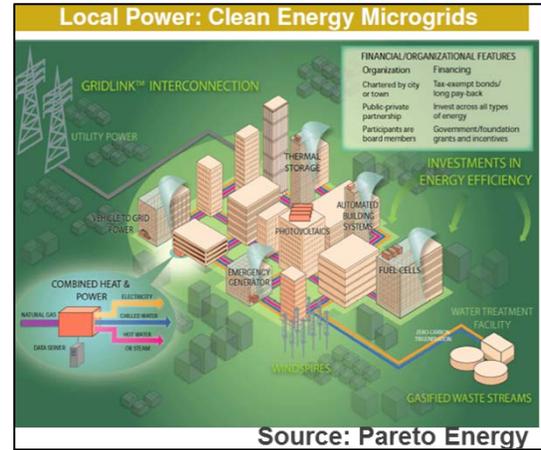
Now take a broader look at your budgets, staffing, investments, policies, programs, development and design decisions. Consider specific opportunities to enhance mitigation benefits of adaptation measures and vice versa. Assess how infrastructure investments can be (re)designed to maximize climate benefits. Looking for cross-sector interactions can be especially fruitful, such as energy/buildings and transportation/flood management.

SECTOR-SPECIFIC EXAMPLES

Energy: CHP and Micro-Grids

Combined heat and power (CHP), which generates both electric power and thermal energy from a single source, can reduce GHGs and help keep the lights on as CHP units did during Hurricane Sandy for college campuses such as Princeton and NYU, hospitals, and commercial and residential buildings such as Battery Park City and Coop City.

Micro-Grids can incorporate energy efficiency, distributed renewables, CHP and smart grid technologies to provide reliable, low-carbon power that can withstand and recover from extreme weather events. Micro-Grids can improve grid stability by increasing reliability, decreasing vulnerability to disruptions, and maintaining business continuity. While there are technical, political and regulatory issues to overcome, Navigant Research projects that global revenues from micro-grids will grow to \$20 billion USD by 2020.



Buildings

Improved design, operations, green roofs and water conservation can reduce building energy use and protect from severe storms, flooding and extreme heat. Incorporating CHP, renewables and micro-grids can minimize business interruption losses. The US Green Building Council has been a leader in this area, as has the Insurance Institute for Business and Home Safety with their Fortified Program. In addition, see the NYC Building Resiliency Task Force reports and Johnson Controls' GREEN framework: Grid-responsive, Resilient, Efficient, Energy-positive, Networked.

Water

DC Water, based in Washington, DC is the first waste water treatment plant in the US to use a thermal hydrolysis process and digesters to both improve water treatment and increase energy efficiency. Their integrated approach includes a 13 MW CHP plant that saves DC Water \$10M annually, cuts demand for grid electricity by one-third and reduces 50,000 tonnes CO₂e per year, among other benefits. DC Water is ensuring that this top of the line facility is also safe from flooding by building a 17-foot sea wall to provide 500-year flood protection for the Blue Plains plant.

Buildings / Energy Green Resilience Nexus

(CCAP draft January 2014)

MEASURE	BENEFITS	
	Mitigation	Adaptation
Energy Efficiency	↓ GHGs	Enhance electricity grid resilience. Maintain business continuity.
Building Code updates	↑ energy efficiency	↑ resilience to wind, flooding earthquakes
On-site Renewables and CHP	↓ GHGs	Enhance electricity grid resilience. Maintain business continuity.
Micro-grids	Supports efficiency & renewables	"
Protect / elevate mechanical and electrical systems	(↓ GHGs from re-building)	Enhance electricity grid resilience. Maintain business continuity.
Elevate / protect structures	"	Protect people, building, infrastructure. Maintain business continuity.
Water efficiency, grey water reuse	↓ GHGs from water distribution & treatment	Prepare for declining water supplies. Maintain ecosystem services.
Green infrastructure (green roofs, green walls, landscaping)	Cooling -- ↓ air conditioning energy use ↓ water treatment needs	↓ urban heat island ↓ stormwater runoff ↑ flood resilience Maintain ecosystem services

Transportation

Shading of pedestrian and cycling facilities and flood prevention for subway systems help keep low-carbon transportation systems comfortable and in service, while increasing network reliability and protecting alternative modes for emergency evacuation. Flood management resources can fund multi-use bicycle paths that can convey flood waters during flash floods (Boulder, Colorado).



Problem

NYC subway flooding after a 2007 storm.
Source: MTA NYC Transit



Partial Solution

MTA NYC Transit has allocated nearly \$90 million toward raising ventilation grates and installing stair pads at subway entrances.
Source: MTA NYC Transit

The **Colombia TOD NAMA** is integrating adaptation into project design criteria, such as maximizing use of green infrastructure and avoiding development in flood-prone areas.

RECENT KEY FINDINGS ON GREEN RESILIENCE

In 2013, CCAP and the US Global Change Research Program (USGCRP) launched the **AMNex – Adaptation + Mitigation Nexus** affinity group of the US National Climate Assessment. CCAP's **Green Resilience paper** documents findings from an AMNex workshop at the NCSE Building Climate Solutions conference in January 2014; some highlights include:

- **Accidental Resilience:** Many solutions are not driven by climate change concerns.
 - Passive building design maintains building temperature during power outages.
- **Intentional Resilience:** Plan ahead to avoid conflicts and maximize synergies.
 - Onsite PV with battery storage at a Boston refueling facility reduces GHGs and enhances preparedness for power outages.
 - Green roofs in DC for stormwater management also reduce building energy use.
- **Research and Capacity Building Needs**
 - Economic analysis that includes business continuity benefits, energy savings and ecosystem services.
 - Resilience metrics at different scales: building, neighborhood scale, infrastructure, city, metro region.
 - How to scale up from pilots to city-wide and regional resilience.
- **Communication and Stakeholder Engagement**
 - Make the business and economic competitiveness case for Green Resilience.



For more information on Green Resilience, please visit: www.ccap.org/programs/weathering-climate-risks, or contact:

Steve Winkelman, Director of Transportation and Adaptation Programs, swinkelman@ccap.org

Center for Clean Air Policy (CCAP)
750 First Street, NE | Suite 940 | Washington, DC 20002
Tel: 202.408.9260 | Fax: 202.408.8896
www.ccap.org

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