

Measuring Climate Mitigation and Adaptation Expenditures in the Economy: Methodological Challenges

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Disclaimer: The opinions are those of the authors and do not necessarily reflect the official position of the Bureau of Economic Analysis, Department of Commerce, or United States Government.

- Survey of **current efforts** internationally (Scott)
 - Much of the paper; less of this in this presentation
- Overview of the **key conceptual challenges** for economic measurement of climate change (CC) mitigation and adaption (Julie)
- **Next steps for the U.S.** and possibly other international efforts (Scott)
 - Initial intent with this paper: outline challenges AND solutions
 - For this paper, we seek feedback on the conceptual/methodological challenges before we move on to sketching out solutions and initial estimates from existing data sources
 - **Main takeaway:** surveying prior work highlights a sufficient number of classification challenges that need further attention/vetting from the international statistical community before we begin compiling statistics



Accounts and statistics relating to the minimization of natural hazards and the effects of climate change:

- “A2.19 The SEEA Central Framework limits the scope of economic activities considered to be environmental to environmental protection and resource management activity. However, it is recognized that there are a number of other economic activities that are related to the environment which may be of **particular interest for policy and analytical purposes** (see sect. 4.2). A specific set of activities encompasses efforts to minimize the impact of **natural hazards** (such as floods, cyclones and bush fires) and **efforts to mitigate, or adapt to, the effects of climate change.**”

(SEEA-CF, Annex II, pages 307-308, **emphases added**)

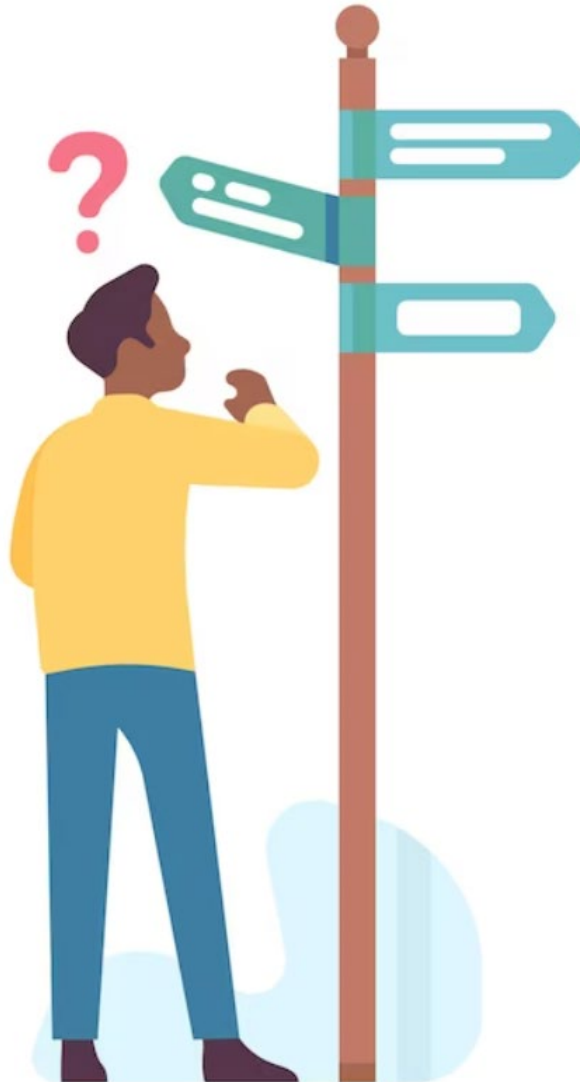
Work related to Climate Change Expenditures

- UNECE: CES CC related statistics
 - Indicators but no definitions
- Eurostat:
EPE/RM statistics + CC statistics
 - Mitigation in EPE & expanded definition of mitigation but no data
 - Ongoing project to delineate CC mitigation & adaptation activities – produce EU estimates
- OECD: CC Budget Tagging
 - Focus on projects and policy. Definitions no more specific than “principal objective” and descriptions of expected results
- EU: Green Budgeting
 - Budgetary policymaking to achieve climate goals
- EU: Taxonomy for Sustainable Activities
 - Unit of analysis is ‘projects’
 - Currently only Mitigation Economic Activities are described
- IADB: Government CC Spending
 - Proposes both main purpose and secondary tags which have no CC intent stated but have a measurable impact or are responses to CC impacts
 - Proposes classification & methodology
- Austrian project: Federal Government current costs for CC Adaptation
 - Budget analysis & expert interviews
 - Provides some figures for 2014

Conclusions from the review of current work

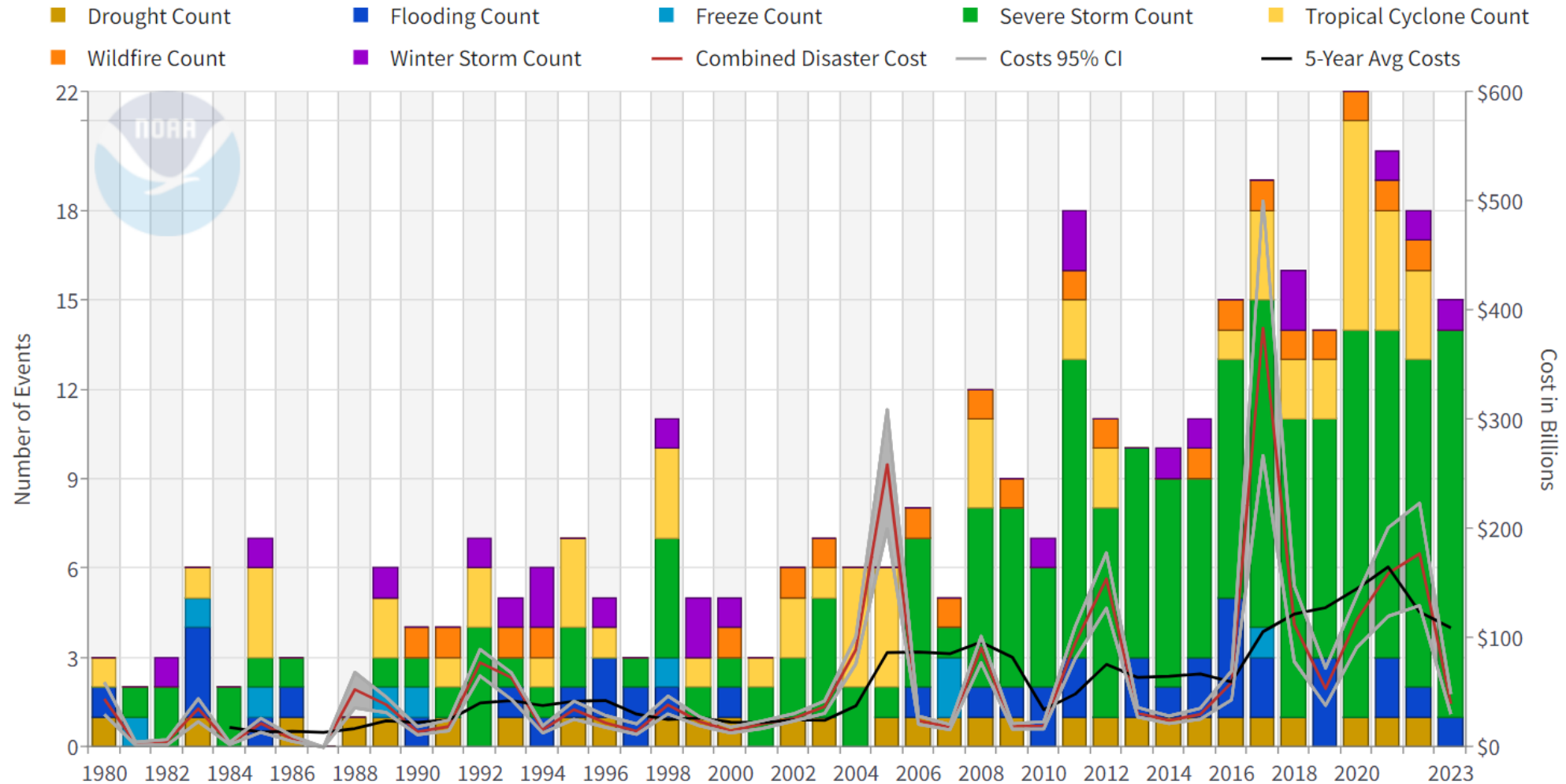
- **No consensus on definitions** or how to decided what is in/out
 - **No clear classification scheme** for CC expenditures (economy-wide)
 - Most work focused on government budgets and not economy-wide statistics
-
- **IADB:** has the most developed framework
 - Developed definitions, evaluation criteria, and classifications for the climate related expenditures of government.
 - **EU Taxonomy:** provides a list of private sector activities that qualify for CC mitigation.
 - CC adaptation list of economic activities to be developed.
 - **Eurostat:** project identifying climate change activities, industries, and products is the most integrated attempt, as their statistics leverage EU supply and use tables to develop satellite accounts for climate change expenditures.
 - Product and services lists have not been released (to our knowledge).

Where do we go from here? → look at definitions & stories to avoid mistakes made with CEPA and energy



U.S. Billion-Dollar Weather & Climate Disasters

United States Billion-Dollar Disaster Events 1980-2023 (CPI-Adjusted)



Powered by ZingChart

Source: NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2023). DOI: [10.25921/stkw-7w73](https://doi.org/10.25921/stkw-7w73)

Coastal areas – “Managed Retreat”

- **“Alaska, Washington native villages threatened by climate change receive \$75 million to relocate”**

Under the new Voluntary Community-Driven Relocation program announced this week during the 2022 White House Tribal Nations Summit, three tribal communities will each receive \$25 million to begin relocating core infrastructure threatened by sea-level rise, flooding and extreme weather.

- **Shifting Sands:
Carolina’s Outer Banks Face a Precarious Future**

“Despite the risks of building on barrier islands, developers kept constructing homes on North Carolina’s Outer Banks. Now, as sea level rises and storms become more frequent and powerful, the famed vacation spot is fighting an increasingly difficult battle to keep from washing away.”

Temperature & humidity increases on land

- **Heat – both indoor and outdoor workers**

Amid extreme heat, there are few federal protections for workers during hot temperatures. The Biden administration wants to change that but the rule making process is long and the heat won't wait.

- **Seven locally transmitted malaria cases found in Texas and Florida**

CC is a major factor: Water, increased temperature, and humidity – ideal breeding grounds for mosquitoes



- **Mitigation**

A human intervention to reduce emissions or enhance the sinks of greenhouse gases.

- **Adaptation**

In *natural systems*, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.

In *human systems*, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities.

(Source: <https://apps.ipcc.ch/glossary/>)

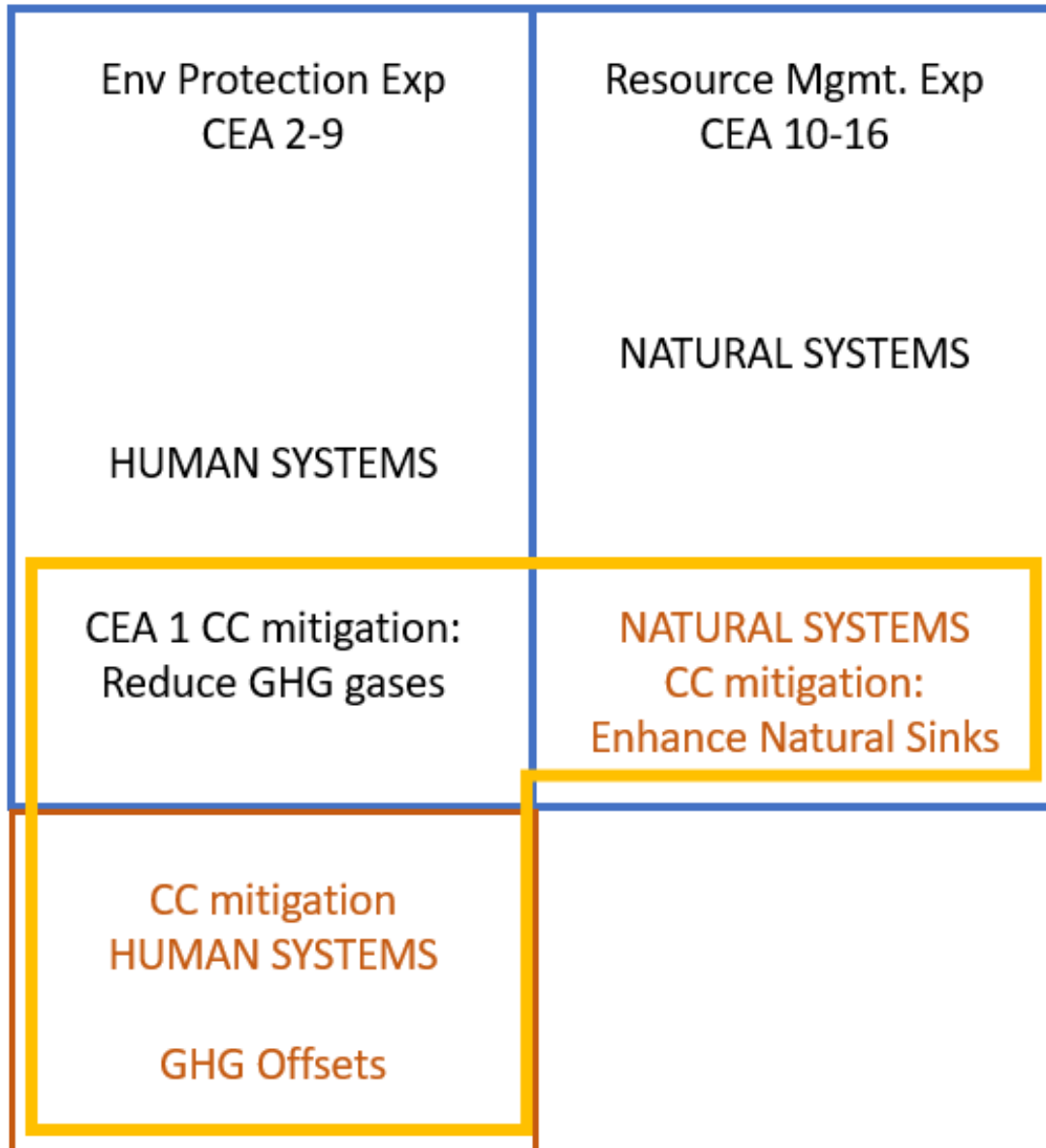
Reduce GHG emissions

- Included in CEA 1: *Protection of ambient air and climate*
 - Expenditures for the reduction of GHG emissions (technology, process improvements, etc.)
 - Includes expenditures on human systems for Carbon Capture & storage
 - Should these include?
 - Expenditures on GHG emissions tradeable permits/credits (offsets)
 - Expenditures due to Carbon taxes
- often these are not included due to data collection challenges

Currently NOT included in mitigation expenditures definitions

- What does “enhance the sinks” of GHGs include?
 - GHG sinks: sequester or store carbon
- ***Resource management expenditures*** that improve or preserve “GHG sinks” would also be CC mitigation expenditures.
- Examples include expenditures that improve or preserve:
 - Forested areas
 - Mangroves
 - Tropical ecosystems
 - Wetlands
 - Topsoil – reduce erosion
- These types of RM expenditures would also be CC mitigation expenditures

Climate Change **mitigation** and EPE/RM expenditures



- What is new to EPE/RM?
See brown text!
- Human systems
 - Reducing GHG emissions
 - GHG offsets (carbon credits)
- Natural Systems
 - Enhance natural sinks
These are BOTH resource management AND CC mitigation expenditures

- **In *natural* systems...**
 - The process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects. (IPCC definition)
 - → should find these “human interventions” as part of RM expenditure since it has to do with ‘natural systems’
- **In *human* systems...**
 - In *human systems*, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. (IPCC definition)
 - → most human systems are outside of EPE and RM expenditures
 - → need to identify and define what these are

- “**Nature-based solutions**” – part of resource management expenditures & ecosystem improvement and resilience
- For example:
 - In Coastal areas, the planting of mangroves or other wetland species—can reduce the threat of inundation while also providing a habitat for marine life and improving water quality.
 - Climate-smart agriculture, preserving and enhancing topsoil
 - Decreasing deforestation
 - Constructing terraces on hillsides, using vegetation at critical points to control soil erosion, increase soil moisture, and reduce runoff.

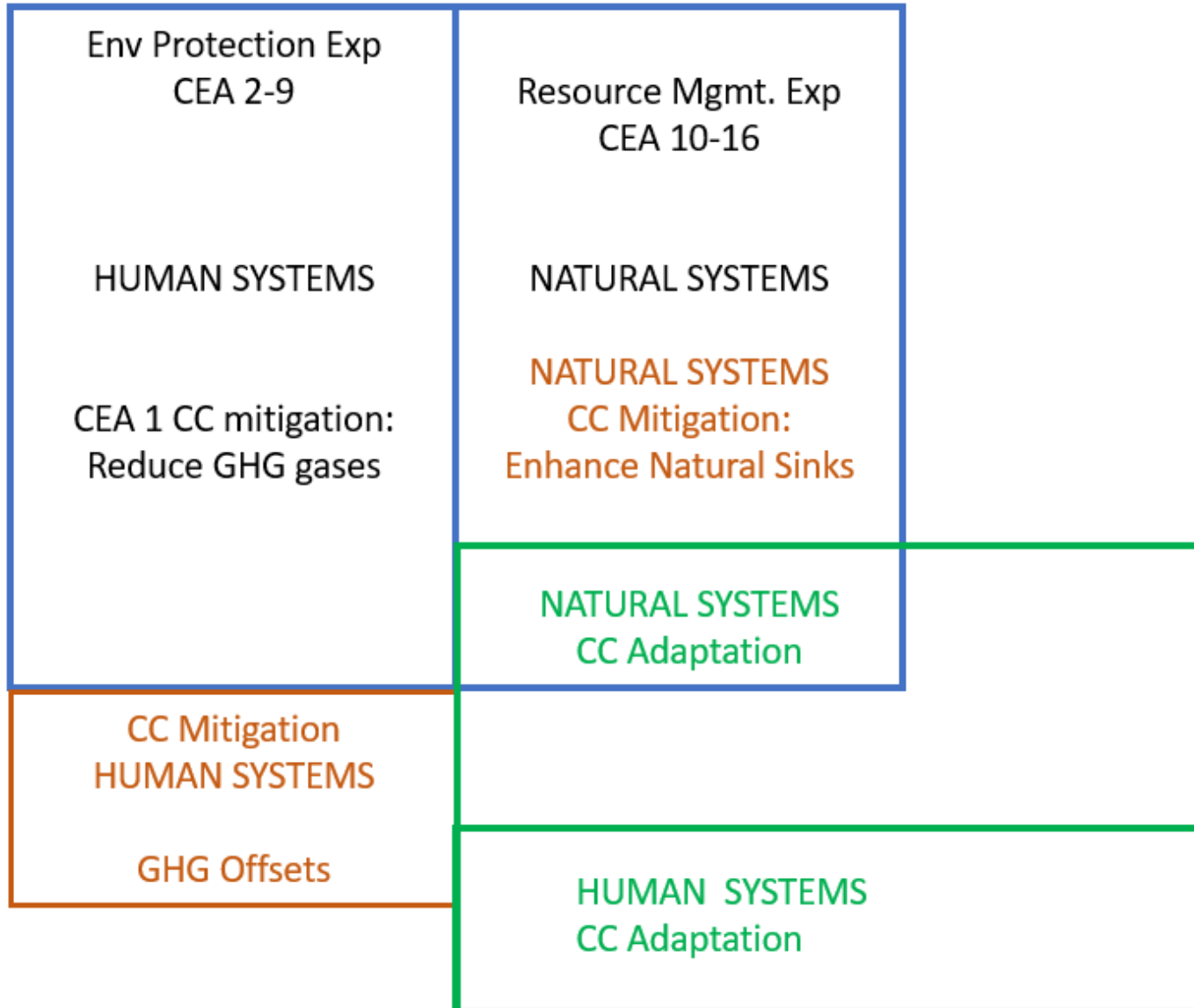
- Example: Miami, Florida “Beyond water management strategies, Miami must also develop considerably new or reinforced zoning and building codes. Homes, commercial buildings, and urban infrastructure will bear the brunt of climate effects, and there’s a host of potential solutions...”

(Source: <https://slate.com/technology/2022/05/miami-climate-change-survival.html>)

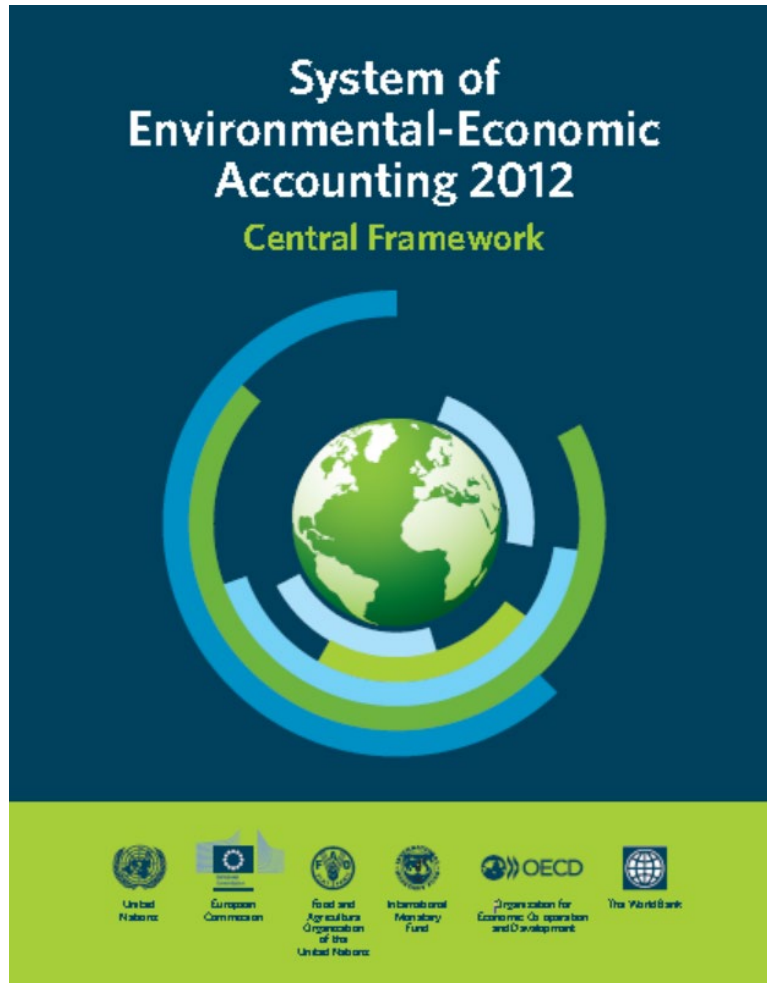
- “**Two Florida communities prove the power of climate adaptation**”
Punta Gorda: after 2007 storm...updated, climate-resilient building codes.
Babcock Ranch: “is a new community designed with climate resilience as an underlying principle. ...Strong building codes, floodable streets, native plantings in prolific greenspaces, building outside of the floodplain, undergrounding vulnerable utilities, and providing microgrids and energy independence”

(Source: https://www.geiconsultants.com/thought_leadership/power-of-climate-adaptation/)

EPE/RM + CC Mitigation + CC Adaptation



- Climate Change mitigation and adaptation occur in both natural systems and human systems.
- EPE&RM are focusing mostly on natural systems
- Need to add in the 'human systems' dimension to include climate change mitigation and especially adaptation

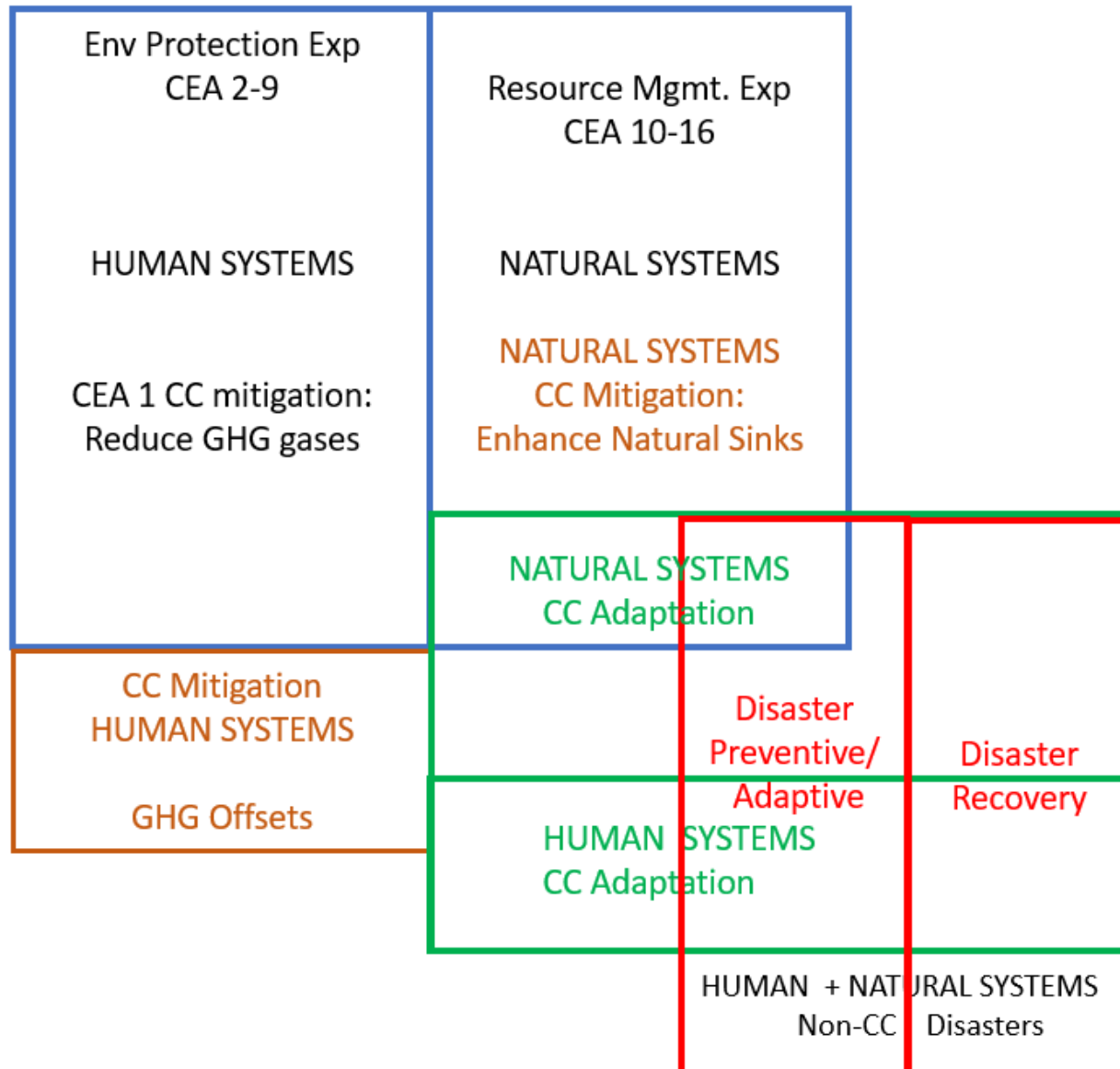


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(SEEA-CF, Annex II, pages 307-308)

EPE/RM + Climate Change + Disaster Expenditures



- Putting all three concepts together show that there are areas overlapping – even though the terminology use can be different.
- Disaster preventive/adaptive activities are relevant for both natural and human systems
- Same for Disaster recovery activities
- There are also Non-Climate Change disasters in both human and natural systems

Policy demand for EPE/RM expenditures, CC expenditures, Disaster expenditures – need to further develop!

- Terminology is not consistent: Disaster preventive can refer to activities that are considered CC adaptation and/or CC mitigation
- Overlapping areas – can lead to double counting
- Difficult to cover and define all of the activities relevant to human systems – many involve various structures, how they should be built and where they should/should not be built.

- Need to further develop criteria for determining what to include / exclude from the different topics.
- “primary / main purpose” may not be a good enough criterion
 - Consider secondary purpose and/or technical aspects?
 - Particularly acute for adaptation (e.g., building to new hurricane standards)
- Many different systems are developed for specific purposes
 - UN’s climate financing, EU’s green finance, OECD DAC Tagging but not useable for expenditure statistics.
 - IADB – government expenditures only – a good start, but we need a more general system for all sectors to use.

- Prior U.S. work on developing environmental activity accounts: EGSS pilot
 - Presented at LG last year
 - Reasonably well-developed classification definitions and standards from SEEA-CF and international work on this topic
 - USA benefited by others' prior experience
 - Reasonably good data to measure most of this activity
 - Key gaps still remain, but these are small details compared to methodological and conceptual gaps in CC mitigation and adaptation definitions/classifications

Accounting for Environmental Activity: Measuring Public Environmental Expenditures and the Environmental Goods and Services Sector in the US

**Dennis Fixler, Julie L. Hass, Tina Highfill, Kelly M.
Wentland & Scott A. Wentland**

- Develop preliminary criteria for what is in and out of CC expenditures
 - SEEA-CF ‘main purpose’ criteria?
 - Can we draw from SNA definitions: Consumption vs. Investment?
 - Parallels between adaptation (and some mitigation) expenditures activity and physical capital investments, durables, and intermediate goods
 - Expenditures with multi-period usage
 - Expenditures intended to lower future costs or expand future output
 - How should we think about depreciation and capitalization in this context?
- Rooting criteria in existing accounting concepts facilitates comparability and consistency across accounts

Next steps for USA – Learning by doing



- See how far we can get by examining different statistics and data sources to see what could be useable.
 - Examine products and services in the SUT internal system
 - 5,300+ distinct product categories; private and public sector
 - Other data sources:
 - For example, construction and/or housing cost data
 - Examine the relevant federal government Agency budgets
For example: FEMA (Federal Emergency Management Agency)

Thank You!



Additional questions/comments?

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