

Climate Change Mitigation and Adaptation Expenditures in the Economy: Towards an Operational Definition

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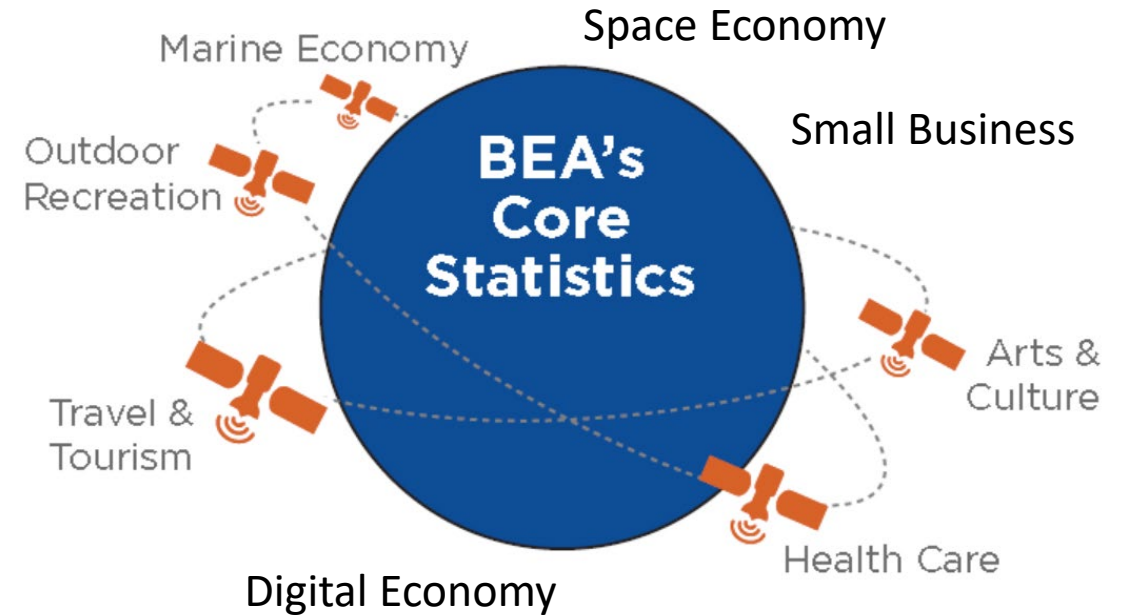


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Disclaimer: The opinions are those of the authors and do not necessarily reflect the official position of the Bureau of Economic Analysis, Department of Commerce, or United States Government.

Thematic accounts / “Special Topics”

- Thematic Accounts
- “These supplementary statistics allow in-depth analysis of special topics that aren’t easily seen within BEA’s core statistics... provide a deeper understanding of the U.S. economy.”

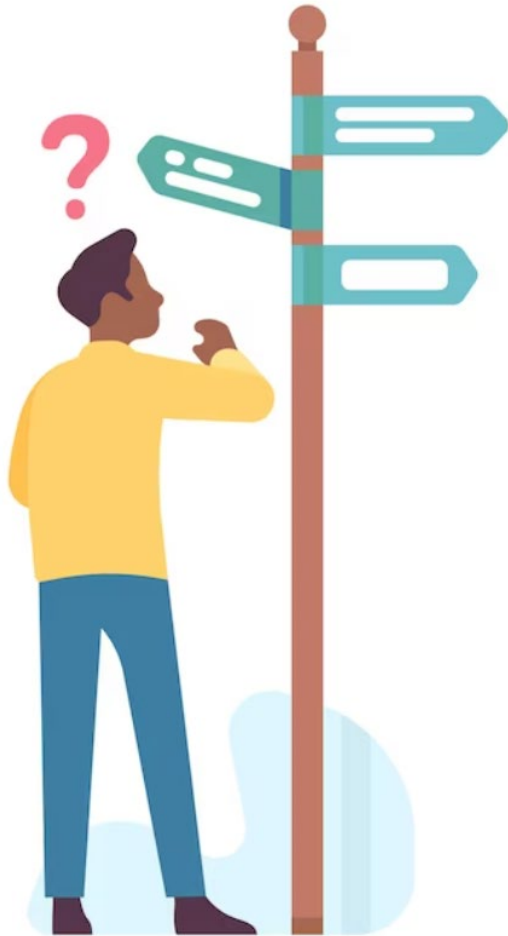


Thematic accounts

- Primarily developed based on expert inputs, data availability, often established based on policy demand for these special topics.
- Difficult to put them into relation with one another since they are built in isolation.
- No definitive guidelines for how to decide what to include or exclude.
- For example: There are overlaps between BEA's
 - “Outdoor Recreation” and the “Marine Economy” accounts;
 - “Outdoor Recreation” and “Travel and Tourism” accounts



How do we develop CC Expenditure Accounts?



Two ways forward:

- A. Based on the established criteria for the SEEA-CF's Environmental Protection Expenditure (EPE) and Resource Management (RM) Accounts and broaden to CCEA
- B. Thematic/Special Topic – Based on experts and without consideration to the established criteria for the SEEA-CF EPE and RM accounts

Is there a starting point in the SEEA-CF?

Yes! → Have EPE on mitigation Greenhouse gases



- **Example from Statistics Norway**

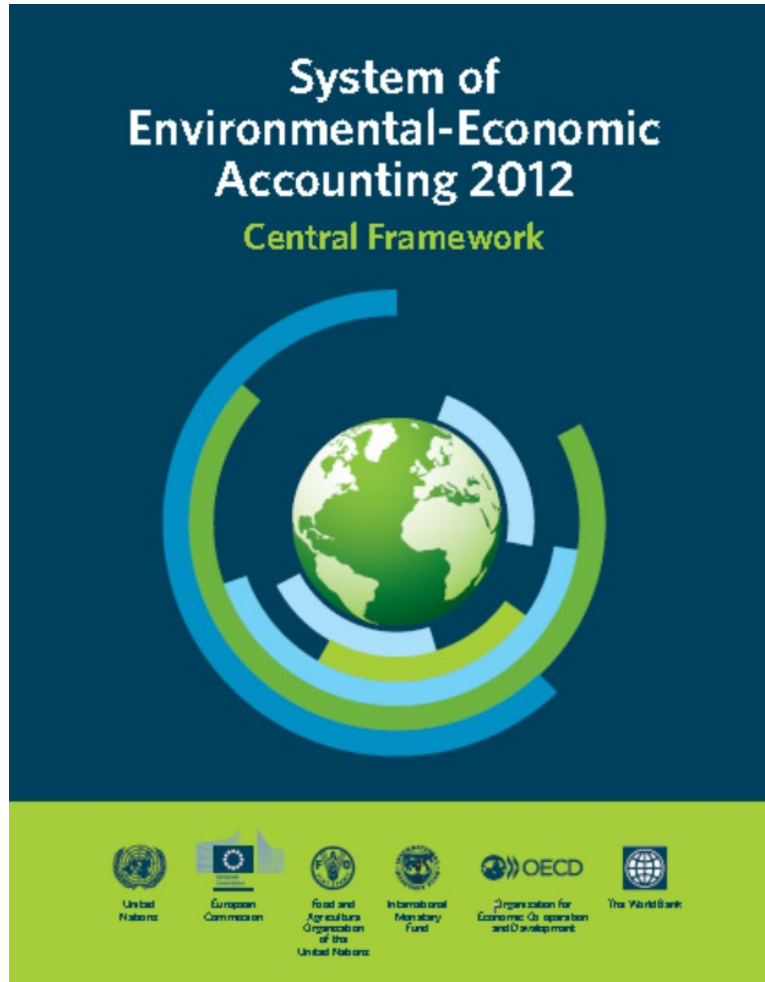
Environmental Protection Expenditure, Reduce Greenhouse gas emissions, NACE B-E36: Mining, Manufacturing, Electricity and Water supply (NOK 1 000), 2019-2022.

	2019	2020	2021	2022
Environmental current expenditure	495 377	422 339	468 038	539 021
EP ancilliary ouput	384 478	283 022	253 200	234 052
Intermediate consumption of EP services	110 899	139 317	214 838	304 969
Investments	1 231 404	2 674 927	4 626 501	1 452 526

Source: <https://www.ssb.no/en/statbank/table/13062/>

Is there a starting point in the SEEA-CF?

Yes! → Research Agenda of SEEA-CF (Annex II)



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**)

Is there a starting point thematic/Special Topic Accounts? 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
- IMF Data Gaps Initiative 3: Recommendation 7
 - Working definitions focus on impacts, adaptation and resilience

See London Group Paper for more detailed information and descriptions of these studies:
https://seea.un.org/sites/seea.un.org/files/measuring_climate_mitigation_and_adaptation_exp_enditures_in_the_economy_-_hass_and_wentland_u.s._bureau_of_economic_analysis_bea.pdf



- Are there internationally agreed upon definitions of Climate Change Mitigation and Adaptation Expenditures?
- Do we know what is included/excluded?



- Climate Change Expenditure Accounts – CCEA
- Claim: ‘Consistent with SNA, SEEA-CF and GFSM’ (i.e. boundaries)
 - “Working” definition for climate change mitigation expenditure:
 - *Climate change mitigation expenditures are expenditures **aimed at making the impacts of climate change less severe** by preventing or reducing the emission of greenhouse gases (GHG) into the atmosphere and enhancing sinks of greenhouse gases.*
 - “Working” definition for climate change adaptation expenditure:
 - *Climate change adaptation expenditures are expenditures aimed at adapting and building resilience of human and ecological systems to the changing climate conditions, **reducing vulnerability, and minimizing the negative climate change impacts.***

- SEEA-CF

4.15 While some economic activities may be undertaken only for a single purpose, many activities are undertaken for a variety of purposes. **Following general principles of classification, activities are deemed to be environmental activities only if the primary purpose of the activity is consistent with the definitions of the two types of environmental activity listed as environmental, i.e., environmental protection and resource management.** In practice, the primary purpose must be attributed to particular transactions or groups of transactions as recorded in the accounts.

- Definition of Environmental Protection Expenditure (EPE)

4.12 ... Environmental protection activities are those activities whose primary purpose is the prevention, reduction and elimination of pollution and other forms of degradation of the environment.

- Definition of Resource Management Expenditures (RM)

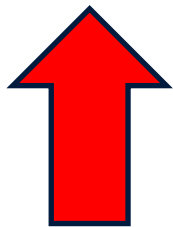
4.13 Resource management activities are those activities whose primary purpose is preserving and maintaining the stock of natural resources and hence safeguarding against depletion.

Decision criteria – Are NOT the same!

SEEA (CEA), SNA (ex. COFOG):

Primary Purpose

- Primary purpose – used in different statistical classification systems such as COFOG, SEEA-CF
- Easier to determine
- Can make decision criteria for what is ‘in’ or ‘out’



IMF:

Reducing impacts of climate change

- Impacts
 - implies causality
 - not known for a long time
 - how to determine this?
- Further analyses are needed. Estimating net impacts on climate require expertise outside of what national statistical offices typically do.
- Comparability → will this create greater scope for some NSOs to disagree? (one NSO determines a net impact as positive and another determines the same activity as negative?) Will this reduce international comparability?



IPCC Definition of Climate Change

- **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/>)

Mitigation expenditures – included in EPE

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 (human interventions) for Carbon Capture & Storage
 - Technically these should also be included:
 - Expenditures on GHG emissions tradeable permits/credits
 - Expenditures imposed by Carbon taxes
 - Technically, expenditures on offsets should be included but these are not always reliable projects – so need to take care when including
- => but often are not currently included due to data collection challenges

Currently NOT included in EPE 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 – soil carbon
- These types of RM expenditures would also be CC mitigation expenditures

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



<p>Environmental Protection Expenditure (EPE) Classification of Environmental Activities (CEA)</p> <p>HUMAN SYSTEMS</p> <p>CEA 1: Protection of Ambient Air & Climate</p> <p>CEA 1 Climate Change Mitigation Activities include expenditures on:</p> <ol style="list-style-type: none">1) Reducing GHG emissions2) Carbon Capture & Sequestration3) Tradeable permits4) Carbon Taxes5) Carbon offsets	<p>Resource Management Expenditures (RM) Classification of Environmental Activities (CEA)</p> <p>NATURAL SYSTEMS</p> <p>CEA 10-16</p> <p>CC Mitigation Activities include expenditures on:</p> <p>Enhancing natural sinks for carbon</p>
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- What is new to EPE/RM when GHG reduction focus is broadened to include CC mitigation?
- Human systems
 - Reducing GHG emissions
 - Tradeable permits & carbon taxes
 - GHG offsets (carbon/biofuel credits)
- Natural Systems
 - Enhance natural carbon sinks

CC mitigation in human and natural systems + CC Adaptation in natural systems in relation to EPE&RM Expenditures

Environmental Protection Expenditure (EPE)
Classification of Environmental Activities (CEA)

HUMAN SYSTEMS

CEA 1: Protection of Ambient Air & Climate

CEA 1 Climate Change Mitigation Activities include expenditures on:

- 1) Reducing GHG emissions
- 2) Carbon Capture & Sequestration
- 3) Tradeable permits
- 4) Carbon Taxes
- 5) Carbon offsets

Resource Management Expenditures (RM)
Classification of Environmental Activities (CEA)

NATURAL SYSTEMS

CEA 10-16

CC Mitigation Activities include expenditures on:
Enhancing natural sinks for carbon

Mixed CC Mitigation & Adaptation Activities include expenditures on:
- Increase natural systems' resilience for dealing with changes in environmental conditions

CC Adaptation Activities include expenditures on:
- Increase natural systems' resilience for dealing with changes in environmental conditions

SEEA EPE&RM Expenditures as starting point for CC Expenditure Accounts

CC mitigation in human and natural systems +
 CC Adaptation in natural systems +
 CC Adaptation in Human systems

<p>Environmental Protection Expenditure (EPE) Classification of Environmental Activities (CEA)</p> <p style="text-align: center;">HUMAN SYSTEMS</p> <p>CEA1: Protection of Ambient Air & Climate</p> <p>CEA1 Climate Change Mitigation Activities include expenditures on:</p> <ol style="list-style-type: none"> 1) Reducing GHG emissions 2) Carbon Capture & Sequestration 3) Tradeable permits 4) Carbon Taxes 5) Carbon offsets 	<p>Resource Management Expenditures (RM) Classification of Environmental Activities (CEA)</p> <p style="text-align: center;">NATURAL SYSTEMS</p> <p>CEA 10-16</p> <p style="background-color: yellow;">CC Mitigation Activities include expenditures on: Enhancing natural sinks for carbon</p> <p style="background-color: orange;">Mixed CC Mitigation & Adaptation Activities include expenditures on: - Increase natural systems' resilience for dealing with changes in environmental conditions</p>
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HUMAN SYSTEMS

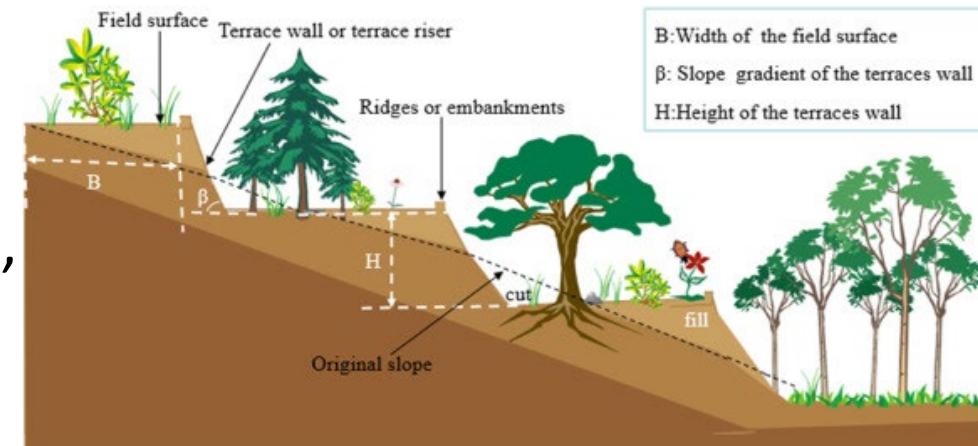
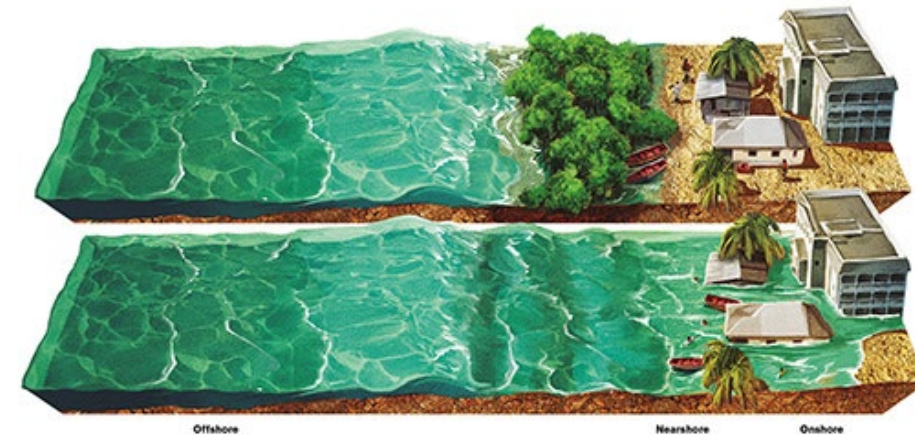
CC Adaptation Expenditures
 Related to human systems

(NOT part of EPE/RM expenditures)

CC Adaptation Activities include expenditures on:
 - Increase natural systems' resilience
 for dealing with changes in environmental conditions

- **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 applicable 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>)

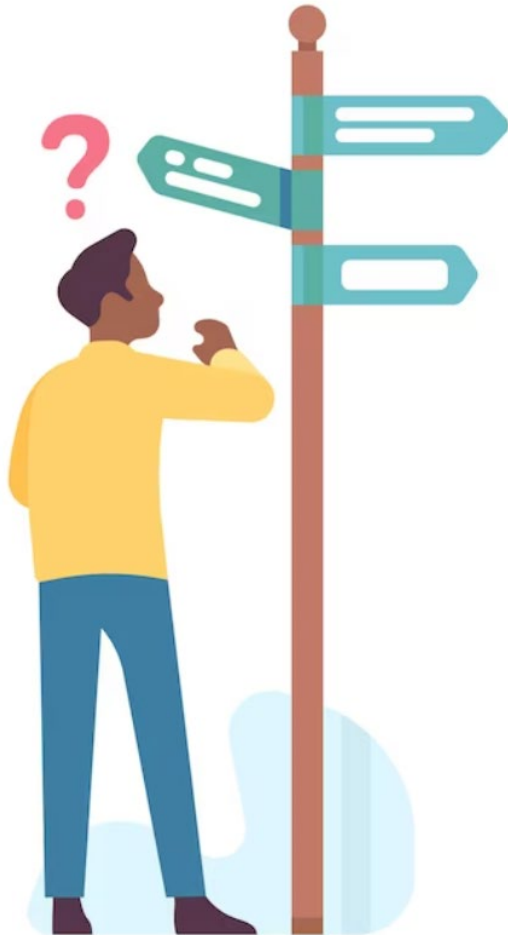
- **“Two Florida communities prove the power of climate adaptation”**
Punta Gorda: after 2007 storm...updated, climate-resilient building codes.
Babcock Ranch: “is a new community designed with climate resilience as an underlying principle. ...Strong building codes, floodable streets, native plantings 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/)

Primary Purpose and Baselines?

- Consider a bridge built to higher specifications due to climate change.
 - The “primary purpose” of the bridge is for transportation, but should we consider the **additional** expenditure above and beyond the old (baseline) standards as climate change adaptation?
 - The primary purpose of this additional (but not entire) expenditure is climate change related.
 - Is it the baseline that matters for primary purpose?
 - Similarly, we consider electric cars as mitigation-related because the baseline car (or the standard alternative) is an internal combustion engine running on fossil fuel (emitting GHGs)... But what if the electricity production is from coal fired power plants?





Two pathways to development...

- SEEA-CF EPE/RM Expenditure accounts can form the foundation for Climate Change Expenditure Accounts (CCEA)
- Better to have CCEA related to the SEEA Environmental Expenditure Accounts than as separate, unrelated thematic accounts – especially since we already find parts of the CC Expenditures in the established SEEA-CF EPE/RM Expenditure accounts
Must use same criteria: primary purpose and *not* impacts.

- Need to further develop criteria for determining what to include / exclude from the different topics.
- Is “primary / main purpose” a good enough criterion? How should we consider secondary purpose and/or technical aspects?
- “Impacts” of expenditures are not useable for developing expenditure statistics.

- Develop preliminary criteria for what is in and out of CC expenditures – The Eurostat study may be helpful in this work.
- See how far we can get examining the different statistics and data sources to see what could be useable.
 - Examine products and services in the SUT internal system
 - Examine the 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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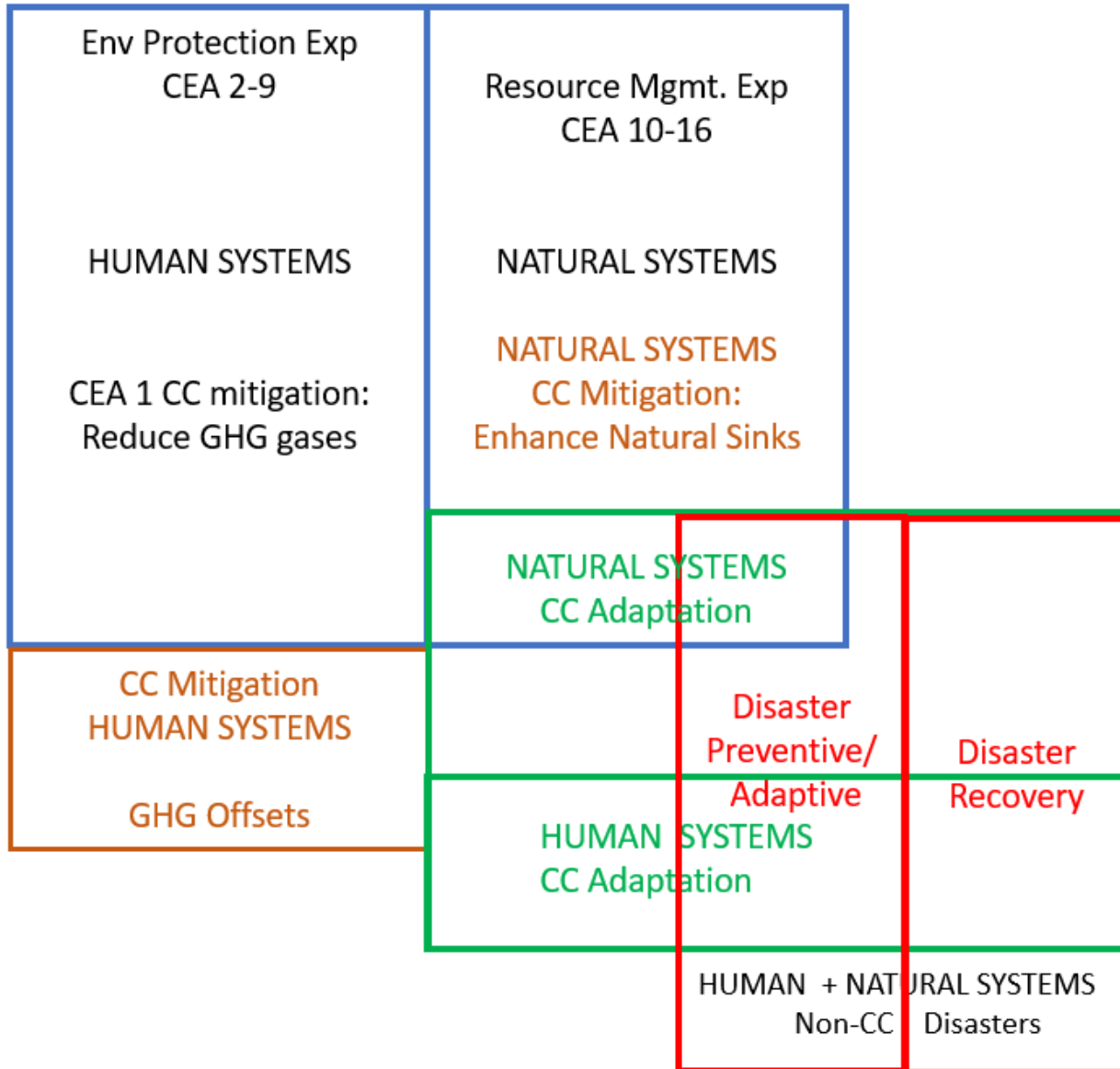
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Some Definitions of CC Mitigation and Adaptation

- Intergovernmental Panel on Climate Change (IPCC) IPCC. 2022. Annex I: Glossary. In: P Shukla, J Skea, R Slade, et al. (eds.). [Climate Change 2022: Mitigation of Climate Change](#).
- OECD-Development Assistance Committee (DAC) [OECD DAC Rio Markers for Climate: Handbook](#)
- Multilateral Development Banks (MDBs) [MDB-IDFC 2021, Common principles for climate mitigation finance tracking, version 3](#); MDB-IDFC 2015, [Common principles for climate change adaptation finance tracking](#)
- International Development Finance Club (IDFC) IDFC. 2021. [IDFC Green Finance Mapping Report 2021](#)
- Climate Policy Initiative (CPI) Buchner et al., 2021. [Global Landscape of Climate Finance 2021](#).
- Climate Bonds Initiative (CBI) CBI 2019. [Climate Resilience Principles: A framework for assessing climate resilience investments](#)
- EU Sustainable finance taxonomy EU Commission. 2020. [Regulation \(EU\) 2020/852 of the European Parliament and of the Council of 18 June 2020 on the establishment of a framework to facilitate sustainable investment, and amending Regulation \(EU\) 2019/2088](#)

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