**Peer Review of Chapter 13: Chapter and Data Module Manuscript**

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**Summary**

This chapter on Climate Change discusses indicators related to mitigation, adaptation, loss and damage and resilience through finance within Sustainable Development Goal (SDG) 13’s indicator framework, established by the United Nations Climate Change proceedings (UNFCCC). The SDGs and the Paris Agreement are both important, game-changing processes for international action on climate change, but the chapter also critiques both processes for not having reliable data or measurable outcomes and for catering to the desires of the worlds’ historic emitters and biggest economies over those of developing countries facing the burden of climate change.

The chapter describes in great detail the metadata surrounding three of the most important components of SDG 13: greenhouse gas emissions (GHG), climate finance, and climate vulnerabilities. It explores the types of data and how they are collected and to whom they are reported. This section introduces the complexities of climate data, including the incorporation of relative impact weights of particular greenhouse gases to create the Global Warming Potential composite score, the lack of consensus on indicators for climate finance, and the difficulty of holistically assessing climate vulnerability. The challenging nature of climate data is critically examined through a “politics of numbers” framework that illuminates the various opportunities for political manipulation and intentional deprivation of climate data. The tense dynamic between the global effects of climate change and national priorities is alluded to in discussing the power that governments have to set their own baseline counterfactuals against which to measure their own emissions progress. The concept of “greenwashing” is thoroughly developed as one of the primary political manipulations of climate finance data. Lastly, the chapter details the emphasis of SDG 13 on climate vulnerability as it relates to natural disasters and sea level rise, as well as the deprivation of data on the slow, incremental impacts of climate change.

The accompanying data module seeks to illustrate the primary ways that GHG and human mortality data can be used to support normative agendas. It teaches and provides opportunities to practice data skills including: Data access and management, data cleaning and merging, programmatic knowledge including Github, Excel and R, basic analysis in R and Excel and using maps to visualize data. The module asks students to write a memo based on previous tasks to practice communicating findings and conclusions from data exploration in a formal environment. The module has three primary bundles of tasks (not necessarily in order): 1) creating maps, 2) downloading, cleaning data and analyzing data in R and Excel and 3) writing one or two memos (more on that later) that summarize findings/explain the data.

**Strengths**

It’s clear that the authors have done an enormous amount of research in order to include a wealth of information in this chapter. It’s impressive. The authors clearly have a deep understanding of these issues and data. The diversity of indicators selected give us a good range of perspective to understand these issues. In addition, reviewers identified the following strengths in this chapter and data module:

*Chapter:*

* The chapter includes plans for charts, graphs, figures and boxes which, if all are included, will greatly enhance the readability of this text. Specifically, Table 13.1 with SDG indicators provides good context for your exploration of indicators.
* Incorporating the personal quotes from young climate activists into this chapter is a great decision. They really help the reader contextualize such a global, long-term problem as a problem that has affected, is affecting, and will continue to affect people directly.
  + Based on the options listed in the chapter’s opening “hook,” we like the idea of linking Anjali’s COP17 call to action to missing data on climate change: “You’ve been negotiating all my life. In that time, you’ve failed to meet pledges, you’ve missed targets, and you’ve broken promises. But you’ve heard this all before.”
* The “How Climate Change Processes Relate to Development” section is very strong and effectively introduces the Clean Development Mechanism (CDM) and how climate action has been incorporated into the MDGs and SDGs.
* The history section includes good background information on the role of IPCC, UNEP, UNFCCC, the Rio Earth Summit, Kyoto Protocol and Paris Agreement, and we like that you highlighted the important role IPCC played in the collection of scientific data.
* Narrowing the focus of climate vulnerabilities to the impacts of climate-related natural disasters was a great decision, and the way the chapter executes this change is clear and deliberate.

*Data Module:*

* The problem set and goals in this module are in line with the chapter and the book’s overall aims of improving students’ skills in analyzing and visualizing specific datasets. It’s particularly effective to ask students to create a final product (i.e. a memo) that synthesizes what someone has learned through completing these exercises. We particularly appreciated the variable comparisons you’re using for climate data. Your instructions for cleaning steps and creating pivot tables are very clear. It's obvious the authors have done a lot of work in github to get these datasets ready for students and to make this analysis clean and clear. Now, it seems the primary challenge is in bringing all of this work together, creating a cohesive, coherent module that has clear learning objectives and in communicating this to students in a clear way with the correct level-of-detail explanations for each goal and step of this module.

**Weaknesses and Suggestions for Improvement**

The chapter’s primary weaknesses are its shallow coverage of a broad and varied range of topics and issues and its assumption that the reader will be familiar with and already deeply interested in climate change.

*Chapter Scope:*

This chapter’s ambitious scope leads to a broad, but not necessarily equally deep, exploration of climate change-related topics. Though already very selective in what events and indicators to cover, Chapter 13 would benefit from a further narrowing of scope and a deeper exploration of the remaining content. For example, rather than listing every agency and conference related to climate change, a more complete and narrative-like explanation of the breakdown at Copenhagen in 2009 or the Paris Agreement would give your reader a deeper understanding of the global dynamics of climate change (and less of a point-by-point alphabetical list of actors). We identified related points to address for improvement in this chapter by section as follows:

* This chapter sets out to cover more concepts and ideas in the introduction than are able to be fully explored in the rest of the chapter. For instance, Chapter 13 introduces industrialism and colonialism in the introductory section but then does not address its impacts later on in the chapter. These types of disconnects make the chapter as a whole feel a bit out of focus and unfinished.
* In the “Politics of Numbers” section, the political manipulations and deprivations discussed are unbalanced. For some of them, authors provide clear, concrete examples that make the concept easier to understand while, for others, there are no such examples.

*Chapter framework:*

In discussing the impacts of climate change and addressing them, the chapter as a whole feels more normative than descriptive (what one reviewer described as “evangelical”). The chapter jumps right into combating climate change, but does not concretely describe what it is that must be combatted. There is the underlying assumption throughout the chapter that the reader understands the causes and effects of climate change when future readers are likely to have a broad range of experiences in this field and many will likely lack the background knowledge to access some of the content.

* This is exacerbated in the chapter by the lack or minor focus on the real life impacts on people of these indicators, data and issues. We’d like to see the technical and broad overview of history, actors, etc.-type sections peppered with anecdotal evidence of the impacts these high-level ideas and events have on people’s lived experiences.

The data module has three primary weaknesses: it lacks an overarching narrative; task instructions are confusing; and the range of tasks in the module may be challenging for students to accomplish in a single session.

*Data Module focus:* The module is missing a key driving narrative for the tasks, despite the role-playing component. Data exploration and visualization are driven by questions. What questions are driving this data adventure? If my goal is to “help defend your country's (“pick country of your choosing”) mitigation responsibility,” then as a user I’m unclear on what I’m trying to learn or discover from tasks in the first two parts of the module.

*Data module instructions:* The module is confusing on several points, especially related to the memo. It’s unclear, for example, whether this exercise requires creating one memo or two. Details on the memo including its target audience, specific purpose (i.e. agenda), detailed content or structure, format and audience, etc. are missing though we suspect these are contained in the files you’ve created that are stored on GitHub. There’s also key instructional information missing including: How to create maps or what tips to explore/strategies to use in visualizing this data and how to incorporate my products (maps and pivot tables) in the memo.

*Scope and learning level:* The module’s three tasks (data management, data visualization and analysis and results compilation/presentation through memo-writing) will likely require a level of familiarity with software and skills that all students may not already possess. That said, this chapter will be after students have completed between one and 12 modules already. This data module, then, may end up being a reasonable task for students.

**Constructive Suggestions**

*Chapter Scope:* To address the chapter scope, we recommend authors further narrow the focus and develop a coherent narrative that links the concepts and actors introduced in early sections to the data arguments made further on.Specifically, narrow the focus in the opening sections and “trim the fat” within the sections that follow. Areas that this chapter mentions but does not fully explore could be cut:

* The key actors section (in its current form) distracts from the chapter’s main arguments. While it is interesting to learn about key NGO and civil society actors in climate change, it is not clear how these actors relate to the following politics of numbers arguments. We suggest either cutting this section or changing it to include only the actors analyzed in sections three and four.
* Consider taking out the legacy of the industrial revolution and colonialism from “what is climate change?” Alternatively, consider better connecting this section to the main arguments and including it in the history section. If authors choose to keep it, mention specific historical events or statistics that demonstrate the “violent extraction of resources” and its impact such as a general factual overview like the quantity of resources extracted during colonialism and the quantity climate change increased during the industrial revolution.

*Clarifying and improving the discussion within each section:*

* In the abstract and introductory section, define climate change and explain why it is “the most existential threat of our time” to give the reader necessary background info and also help them understand why the issue matters.
* Be explicit about how each organization or framework mentioned in the history section has had a role in data collection/production or creating measurable targets.
* Add a textbox with definitions of mitigation, adaptation, loss and damage to help focus the reader on your key ideas.
* Move from evangelical narrative to more of a descriptive, human impact focus: Show don’t tell about the impact of climate change. We suggest providing facts or statistics which illustrate, for example: “The earth's warming climate threatens to displace XX people, destroy XX in global GDP, etc. by 2050.” These types of impactful details sprinkled throughout the chapter would bring some of the drier explanations to life. For example, this UNHCR report does something similar. Here’s an example: “And even 1.5°C of warming – an unrealistic, best-case scenario – will lead to extreme temperatures in many regions and leave disadvantaged populations with food insecurity, lost incomes and livelihoods, and worse health. Five-hundred million people will be exposed and vulnerable to water stress, 36 million people could see lower crop yields, and up to 4.5 billion people could be exposed to heat waves. In all of these scenarios, the worst affected are the least well-off members of society.” (From UNHCR. “Climate change and poverty, Report of the Special Rapporteur on extreme poverty and human rights.” 25 June 2019.)
* For each concept, political manipulation or deprivation introduced, we suggest incorporating a quick concrete example that solidifies the more abstract concept at the *beginning* of each section or paragraph. For instance, when the chapter discusses how different greenhouse gases are weighted to compile the GWP, it would be helpful to provide an example of two countries with very different GWP or two countries with very similar GWP but different types of greenhouse gasses. Another place where examples would help is the discussion of Annex I, Annex II, and non-Annex countries.

*Data module focus, clarity and structure:* In addition to addressing the points above, we suggest linking the tasks together (i.e. yo*u have to* do part one in order to get to part two) in a substantive way that ties into your goals for the module. Regarding structure, in addition to clarifying the order of steps in the module, it would help for the authors to think in terms of data skills acquisition and content/context learning. Contributing to the overall messy structure is a mixture of skills acquisition and content-focused learning in each step. Here’s an example from the abstract, though this is happening throughout your module. The abstract lists the following skills that students will learn: accessing and retrieving raw data, data wrangling and best practices, exploring missing data, how to report on missing data, creating visualizations, aggregating and disaggregating climate data. It also lists key content learning including about the timeliness and reliability of data; differences between reporting on CO2 and complete GHG emissions inventories; how international trade manipulations can affect country estimates; explore the differential impacts of climate-related mortalities; assess the deadliness and regional impacts of climate hazards; learn how event frequency have changed over time; and other regional concerns. How do these two relate? What are the skills this module is trying to teach? What’s the content students need to learn? What are the ways the module is going to teach these skills, and where does the content fit into that? Finally, the organization and structure of this module makes it hard to follow.[[1]](#footnote-0) Streamlining, compressing and leaning up the presentation of the module and including detailed instructions at each step would greatly improve the module’s do-ability.

**Other points on style, language and organization:**

*Chapter:*

* The first few sections of the chapter (Intro, What is Climate Change?, Abbreviated History, Key Actors, and How Climate Change Processes Relate to Development) should be integrated and abbreviated (depth not breadth). Subtitles instead of section titles would still be an appropriate way to help students transition from one idea to another.
* The structure of each section is inconsistent, which makes some sections feel disconnected from the chapter as a whole. For example, there is not a clear transition between the “Data Landscape” section and the “Politics of Numbers” section. Another example can be found in the “Politics of Numbers” section, where the “Climate Finance” subsection has a deliberate conclusion, but the other two subsections do not.
  + Make the structure of each section more consistent and include transitions. It would help the reader move through the chapter if each section had a quick intro, followed by the main content of the section, and wrapped up with a quick summary/conclusion.
* The writing style in the chapter varies between sections, especially among GHG, Climate finance and Vulnerabilities.
* Many sentences are “laborious” to read. In other words, authors take up more space than necessary to express ideas. It’s easier to show this than to explain it. For example, from the chapter: “Some challenges associated with self reported emissions data arise due to the high burden placed on the individual city due to the high cost of the endeavor and the technical challenges associated with the calculation and modeling necessary to estimate the data. This could result in incomplete estimates or biased outcomes.” (51 words) This rewrite is 33 words: “Collecting and reporting emissions data is expensive, technically complicated and relies primarily on cities, which bear the brunt of the responsibility for self-reporting. These challenges often result in incomplete or biased national estimates.”

1. For reference, this module is organized as:

   1. Abstract
   2. Problem Set
      1. #s 1-4
      2. #s 5-7
      3. #s 1-6
   3. Steps to complete questions 1-4
      1. #s 1-6
   4. Steps to complete questions 5-7
      1. #s 1-8

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