Environmental Issues in East Asia

EA30e Spring 2021

April 26, 2021

Contents

Preface

0.1 Guiding Principles

Environmental issues in East Asia are not unique or particularly more prevasive than other parts of the world. However, the issues are born from particular histories that may contrast with other parts of the world and other parts of the world may be able to learn from.

In this project, the students in EA030e (Spring 2021) have written a textbook that highlights examples of environmental processes. Each student contributed to one theme, composed of two examples that highlight environmental issues of East Asia.

0.1.1 Context and Positionality

As students in a college course located in Southern California, we approach the project with...

Our goal is not to call out environmental issues in East Asia, but to point to linkages of how a range of globalized economy contribute to these environmental problems.

In the end, it would be useful for us to acknowledge we have some capacity to address these how these global linkages could be modified to reduce these environmental issues.

We are not experts, but learning... if there are errors please let us know... We recommend that suggestions be submitted via a github pull request.

0.1.2 Goals

Processes across horizontal boundaries define many environmental patterns that frame human interactions with the environment. How do humans impact processes that cross these boundaries and how do humans influence these ecosystem interface?

0.1.3 Rationale

We hope to learn more about the how environmental issues are expressed in different parts of the world and to what extent can we learn from this work.

0.1.4 Activity

Each group will be composed of two students, that will become experts and teach their classmates on the topic.

0.2 East Asia and the World

0.3 Acknowledgments

Everyone in the world!

Author Guide

Why Learn LaTeX?

In the past, I used LaTeXto make publication quality text. In fact, many prefer writing in LaTeXbecause they can focus on the text and avoid worrying about formatting. However, it is NOT WYSIWYG ("what you see is what you get") word processor. In reality, the processing or compiling is a separate step.

Nevertheless, the quality of the output and ability to integrate with R (or Python) allows us to have an exceptional tool to make reproducible documents.

How to Learn LaTeX?

There are several ways to learn LaTeX. I suggest you find a decent tutorial to get the basics. For example, here are some suggestions:

- Learning LaTeXin 30 minutes

If you are like me and can't remember commands very well, then here's a cheet sheet that might be helpful.

R Chunks

To create effective graphics, each chapter will have a rchunk that creates a graphic for the chapter. To review and learn R, here are some resources:

- Marc's Video Description
- RMarkdown for Scientists (super helpful!)
- R Studio Tutorial
- R Studio's Cheatsheet
- R Markdown Cookbook – Robust Source

Noting Your Contribution

Because this is an ongoing project, you should record your contribution to each chapter – but also let go of these contributions at some point; Others might revise and their authorship might take some precedence, so you should both invest in the product but also be willing to detach from the final outcome as others contribute. This will feel uncomfortable at times, but please note from the beginning this is a social process and as such subject to negotiation. Please be generous to the authors that laid the foundation and be respectful of those that follow.

0.4 Setting Up Book Project–Type Setting w/ LaTeX

Latex Book Class

Currently, the text is written using the standard book class.

Structuring the Text with Nested Hierarchies

Contributors divide their contributions into sections and subsections. This format allows a consistent approach to structuring the text and forcing themes to be organized in blocks that can be used to organize the overall text. We use section, subsection, and subsubsection to break up the topic into bite sizes.

To accomplish this, contributors use the `\section{Section}` command for major sections, and the `\subsection{Subsection}` command for subsections, and a similar approach for subsubsections.

NOTE: for each nested level, it MUST be followed by the lowest level in the section before a paragraph is started – in contrast to what is shown above!

NOTE: We may dispense with subsubsections in the future to provide a less blocky structure, but for now they remain useful.

Font Changes

We can use various methods to alter the typeset: *Emphasize*, **Bold**, *Italics*, and *Slanted*. We can also typeset Roman, Sans Serif, Small Caps, and `Typewriter` texts. Look online to see the commands to accomplish these changes.

You can also apply the special, mathematics only commands $\mathbb{BLACKBOARD}$, $\mathbb{BOLD}$, $\mathcal{CALLIGRAPHIC}$, and $\mathfrak{fraktur}$. Note that blackboard bold and calligraphic are correct only when applied to uppercase letters A through Z.

You can apply the size tags – Format menu, Font size submenu – tiny, scriptsize, footnotesize, small, normalsize, large, Large, LARGE, huge and Huge.

You can use the `\begin{quote} etc. \end{quote}` environment for typesetting short quotations. Select the text then click on Insert, Quotations, Short Quotations:

> The buck stops here. *Harry Truman*
>
> Ask not what your country can do for you; ask what you can do for your country. *John F Kennedy*
>
> I am not a crook. *Richard Nixon*
>
> I did not have sexual relations with that woman, Miss Lewinsky. *Bill Clinton*

The Quotation environment is used for quotations of more than one paragraph. Following is the beginning of description of LaTeXfrom *Wikipedia*:

> LaTeX (/ltx/ LAH-tekh or /letx/ LAY-tekh, often stylized as LaTeX) is a software system for document preparation. When writing, the writer uses plain text as opposed to the formatted text found in "What You See Is What You Get" word processors like Microsoft Word, LibreOffice Writer and Apple Pages. The writer uses markup tagging conventions to define the general structure of a document (such as article, book, and letter), to stylise text throughout a document (such as bold and italics), and to add

citations and cross-references. A TEXdistribution such as TEXLive or MiKTEXis used to produce an output file (such as PDF or DVI) suitable for printing or digital distribution.

LaTeX is widely used in academia for the communication and publication of scientific documents in many fields, including mathematics, statistics, computer science, engineering, physics, economics, linguistics, quantitative psychology, philosophy, and political science. It also has a prominent role in the preparation and publication of books and articles that contain complex multilingual materials, such as Sanskrit and Greek. LATEXuses the TeX typesetting program for formatting its output, and is itself written in the TeX macro language."

Use the Verbatim environment if you want LATEX to preserve spacing, perhaps when including a fragment from a program such as:

```
#include <iostream>          // < > is used for standard libraries.
void main(void)              // ''main'' method always called first.
{
 cout << ''This is a message.'';
                             // Send to output stream.
}
```

(After selecting the text click on Insert, Code Environments, Code.)

Mathematics and Text

Warning: Special Characters

When you use percent and ampersand symbols, hash tags, and other non-standard ASCII characters, LATEXwill be very uncooperative. So, do yourself a favor and make sure you understand that these are used for special typesetting functions. To use them you have to "escape" and use commands to get them to do what you might usually expect! % # & è ñ " and " to show a few that do not reflect the key stroke you might expect.

LATEXdoesn't like a range of characters or they reserved for special behavior...

For example, the # is used for tabs in a table environment. % is used to make comments, thus stuff behind a % is ignored. There are lots of others, but these come up the most.

Creating equations

One of the most powerful parts of LATEXis how it can be used to write complex equations, with all those symbols and Greek letters! This can be done inline $y = mx + b + \epsilon$ for fairly simple equations, or set apart for more complex equations:

$$\int_0^\infty e^{-x^2} dx = \frac{\sqrt{\pi}}{2} \tag{1}$$

Theorems, etc

Theorem 1 *(The Currant minimax principle.) Let T be completely continuous selfadjoint operator in a Hilbert space H. Let n be an arbitrary integer and let $u_1, \ldots, u_{n-1}$ be an arbitrary system of $n-1$ linearly independent elements of H. Denote*

$$\max_{\substack{v \in H, v \neq 0 \\ (v,u_1)=0,\ldots,(v,u_n)=0}} \frac{(Tv, v)}{(v, v)} = m(u_1, \ldots, u_{n-1}) \tag{2}$$

Then the n-th eigenvalue of T is equal to the minimum of these maxima, when minimizing over all linearly independent systems $u_1, \dots u_{n-1}$ in H,

$$\mu_n = \min_{u_1,\dots,u_{n-1} \in H} m(u_1, \dots, u_{n-1}) \tag{3}$$

The above equations are automatically numbered as equation (2) and (3).

0.4.1 Lists Environments: Making bulletted, numbered, description lists

We use special commands to create an itemized list.

You can create numbered, bulleted, and description lists (Use the Itemization or Enumeration buttons, or click on the Insert menu then chose an item from the Enumeration submenu):

1. List item 1
2. List item 2
   (a) A list item under a list item.
   (b) Just another list item under a list item.
      i. Third level list item under a list item.
         A. Fourth and final level of list items allowed.

- Bullet item 1
- Bullet item 2
  – Second level bullet item.
    ∗ Third level bullet item.
      · Fourth (and final) level bullet item.

Description List Each description list item has a term followed by the description of that term.

Bunyip Mythical beast of Australian Aboriginal legends.

0.4.2 Theorem-Like Environments

The following theorem-like environments (in alphabetical order) are available in this style.

Example 2 *This is an example*

Exercise 3 *This is an exercise*

Theorem 4 *This is a theorem*

0.4.3 Peer Review Commenting

You can put your comments in square brackets and in color for things that need help. [This section is confusing, I am not sure what commenting means.]

Figure 1: My plot's caption is here!

0.4.4 Adding Figures, etc

Using Rnw Files

To generate R figures, we use R chunks in and Rnw file, where the text is integreated. When we compile into a PDF, the program converts the files into TeX files and then combineds them into a single pdf.

For each chapter, we create a "child" document and Marc will help you create that text when you begin.

Creating a floating figure

This is my floating figure (Figure 1).

Using R to Create Effective Figures

R Markdown can be a very powerful tool to integrate R code, figures and text. Making high quality figures that are both clear and aestically pleasing will be something that we need to think about it.

- Axis Labels – Labelled with clarity
- Axis Text – Size, Orientation
- Captions (usually better than titles)
- References connecting labels to references
- ADA accessible (e.g. color impairment mitigation)

For example, here's code to generate a pretty good figure:

```
## Error in file(file, "rt"):  cannot open the connection
## Error in createDataPartition(., p = 0.8, list = FALSE): object 'maunaloa' not found
## Error in eval(expr, envir, enclos):  object 'maunaloa' not found
## Error in eval(expr, envir, enclos):  object 'maunaloa' not found
## Error in eval(expr, envir, enclos):  object 'maunaloa' not found
## Error in is.data.frame(data):  object 'maunaloa' not found
## Error in summary(model):  object 'model' not found
## Error in predict(., test.data):  object 'model' not found
## Error in mean((pred - obs)^2, na.rm = na.rm):  object 'predictions' not found
```

In the case of Figure **??**fig:maunaloa), we can a create a figure that has all of the characteristics listed above, except perhaps ADA. Creating a "alt text" for the figure is something we might want to consider.

0.4.5 Using Boxes

0.4.6 minibox X

Some text

```
## Error in ggplot(train.data, aes(decimal.date, average)): object 'train.data'
not found
```

Figure 2: Carbon Dioxide Concentrations (Mauna Loa, HI). Source: Scripps/NOAA.

0.4.7 Cross-References, Citations, and Glossaries

Cross-References

We can cross-reference sections (e.g. Section 3 or figures (Figure **??**) using several methods. I suggest you look at the this Rmd file to see how I did it in these examples.

You can also create links to URLs or hyperlinks, e.g. `http://texblog.org`. However, if these addresses change, then the link will break, so I suggest you only link to internal references.

Bibliography generation

There will be two steps to cite our sources. First, we need to add the reference to a database, or bib file. This is titled 'References.bib' and is located in the main folder in our respository. When you add information to the bib file, be sure to paste in the reference using a bibTeX format.

Second, we'll need to place in-line citations, using `\citep{knitr}`, which produces [Xie, 2021], by using a key, which is knitr in this case.

For example, you might write, "This document was produced in RStudio using the knitr package ([Xie, 2021]). Also try `\citet{LosHuertos2017OverviewR}` to create use the author name as the subject: Los Huertos [2018] wrote an guide to help students learn R.

Note: You will see these citations automatically put in alphabetic order in the Bibliography at the end of the PDF.

Creating glossary words

Definition 5 *This is a definition and the word is use in an glossary, e.g.* **peat**. **Peat** *is when you want to capitalize the defined word without having to re-define a capitalized version, the only downside of case sensitivity in LaTeX.*

Chapter Title

Chapter Author Name

[1]

0.5 Section Heading

0.5.1 Subsection Headings

Some text here... if you cut and paste, be sure to make sure you don't include formatted characters outside the ASCII values. See Author Guide0.3.

Optional Subsubsection Headings

some text here....

0.6 Goals of this template

This template will NOT teach you how to use LaTeX! To accomplish that, we'll rely on some great online resources that you can find on in Chapter 0.3.

Instead this section of the document is designed to demonstrate how our textbook will look, feel, and ultimately how we contribute to the project.

This document also compiles all of our projects into a single PDF, where each chapter is composed of a input tex file.

0.7 Here's figure

0.7.1 R Created Figures

First we create an R chunk and add some code. In this case, I created a floating figure which can be referenced (Figure 3)!

[1] Statement of Contributions– For example, "The chapter was first drafted by Marc Los Huertos (2021). The author recieved valuable feedback from X, and Y and Z to improve the chapter. Slater revised the chapter in 2022 with suggestions from Cater." Note: I am still working on the formatting for this to improve it.

```
plot(pressure)
```

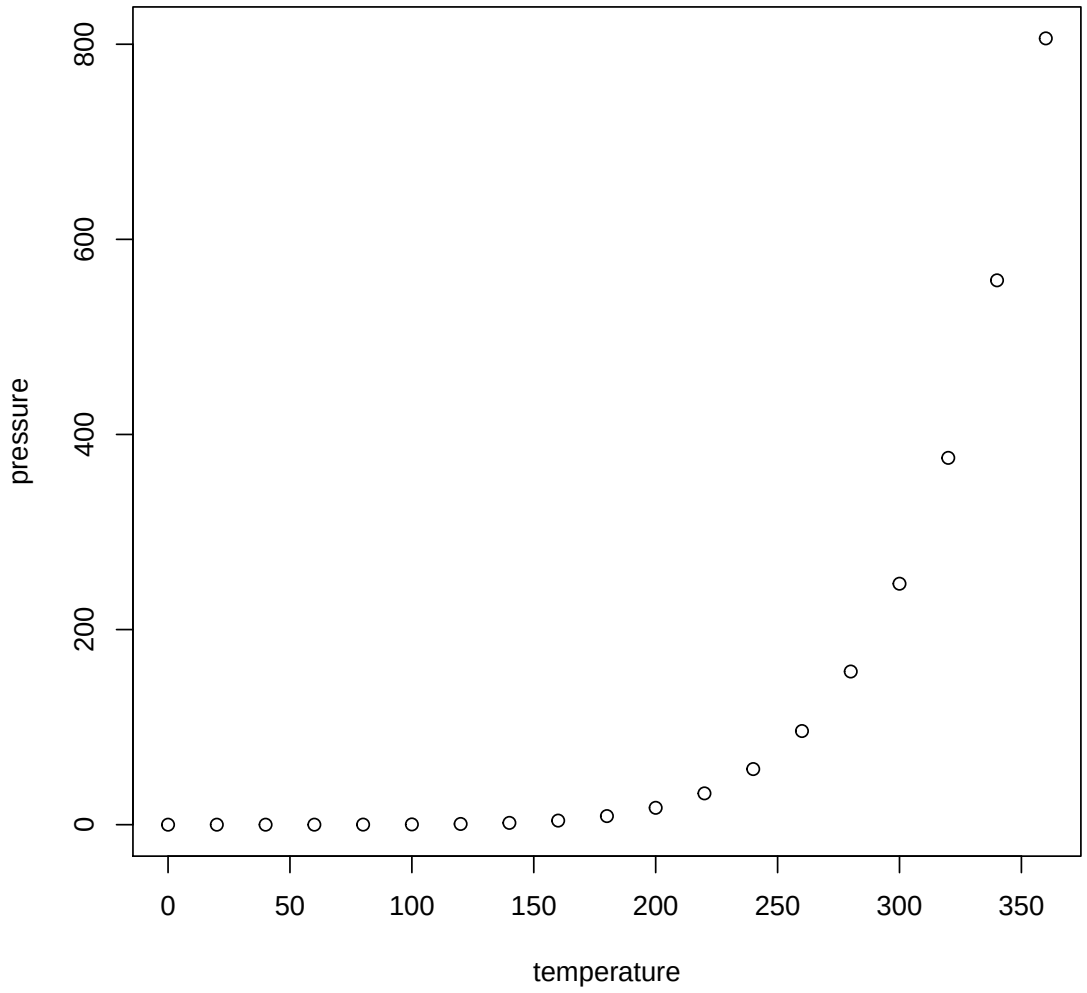


Figure 3: Figure Caption...we should turn "echo=False" in the R chunk options, but I left it true for now. (source: ??)

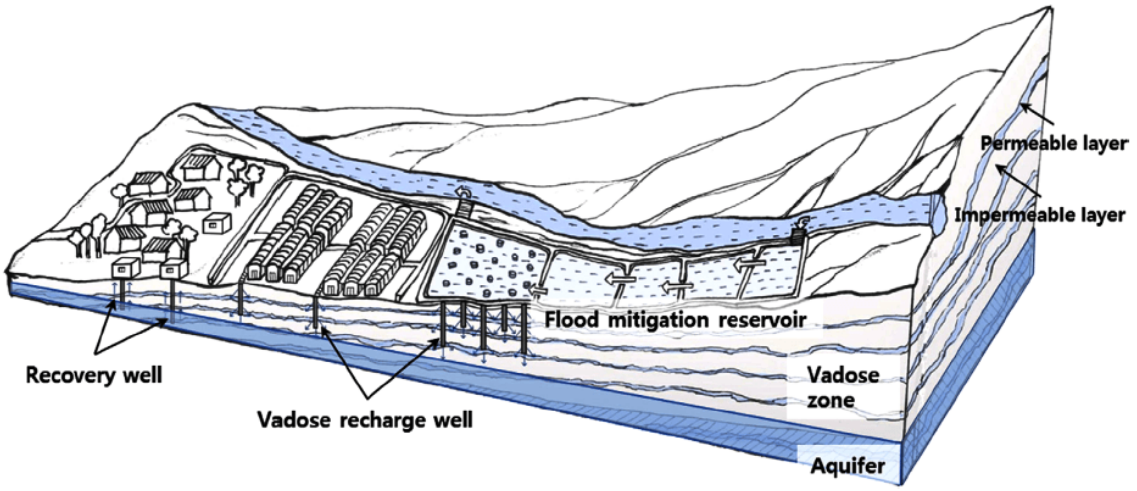


Figure 4: Vadose zone is neato (Source: Lee et al. [2017]).

0.7.2 Floating Figures from External Sources

All figures and images that are imported should be put into the "images" sudirectory to keep stuff organized. Even better to create a subdirectory with your images, but we can naviagate as we go.

Figure 4 is a good example of inserting an image from an external source.

In this case, I had to specify the width so it would fit on the page! See the Rnw file for the code. Notice, I was also abel to "reference" the figure in the text.

0.8 Adding Citations

See the Guide, as well, but my video is probably the most helpful.

Generally, there are many environmental trends in Asia [Imura et al., 2005].

Imura et al. [2005] describes the how urbanization has affected the hydrology of East Asia.

Title...

Nora

→
chekcing on this today, 4-020-2021

0.9 What the Polar Vortex and why do we care?

test commit and pull request

0.9.1 What Factors Drive Land Use Change?

Chapter 1

The Earth System

Marc Los Huertos

1.1 The Sun's Energy and the Earth's Temperature

The temperture of the Earth's surface is the result of a balance – the energy entering the atmosphere and the leaving the atmosphere. Most of this energy is in the form of light or electromagnetic radiation (Figure 1.1).

Light enters the atmosphere, where some is absorbed and some is reflected. Light interacts in different ways with land, oceans, and vegetation, which is beyond the scope of our project. The "quality" of light changes through these processes.

1.1.1 The Spectrum of Light Entering and Exiting the Earth's Surface

As the sun's electromagnetic radiation interacts with the Earth's Atmosphere, certain wavelengths are absorbed and filtered out (Figure 1.2).

1.1.2 The Atmosphere and Greenhouse Effect

1.2 Carbon Biogeochemistry

1.2.1 Long and Short Time Scales

The carbon cycle processes occur at wide range of temporal scales from hundreds of millions of years to seasons of the year. These have been referred to as long and short carbon cycles. However, for our purposes, I will call them "geologic carbon" and "biosphere carbon" processes.

1.2.2 Rock Cycle and Geologic Carbon

The carbon cycle describes changes in the fluxes and reservoirs of carbon in the Earth system. On very long time-scales, millions of years, the primary reservoirs of carbon are the atmosphere, ocean, and rocks (limestone). Carbon moves between these reservoirs through volcanic outgassing, silicate weathering, and limestone sedimentation. The carbon cycle is linked to Earth's energy balance through atmospheric carbon in the form of CO_2 , a greenhouse gas.

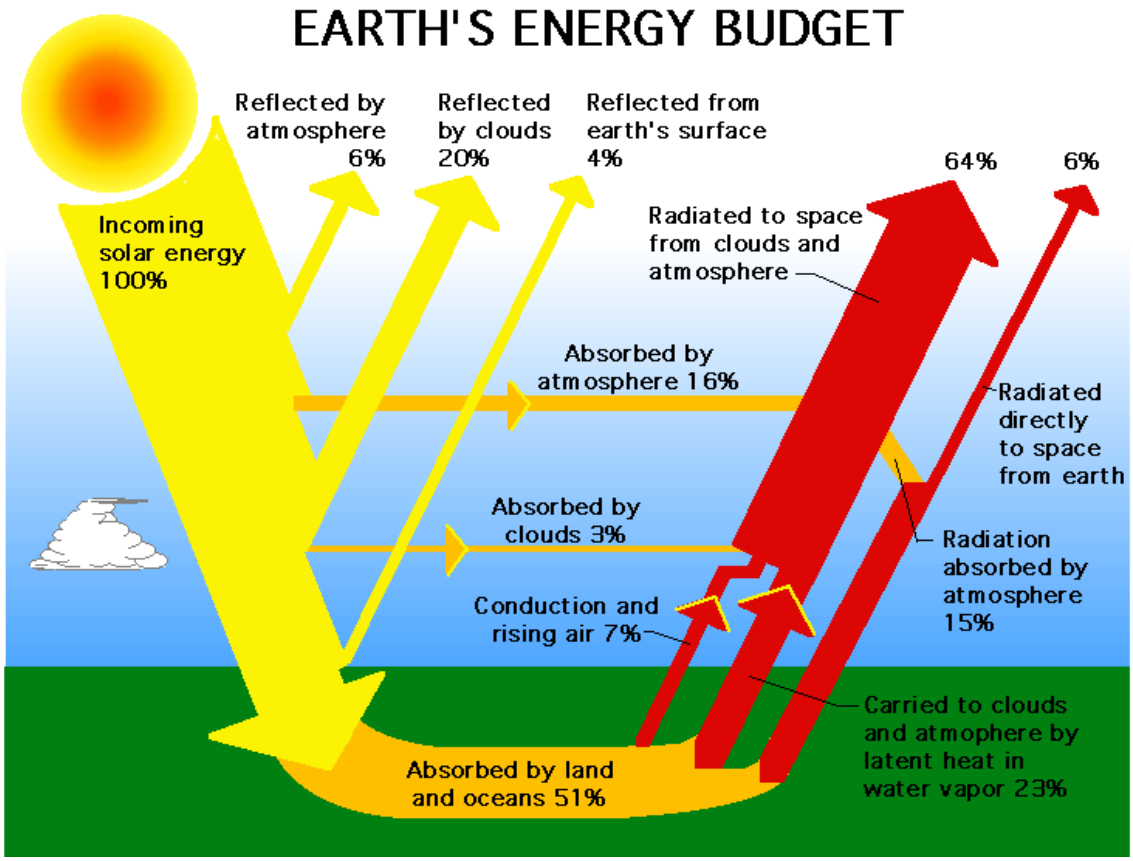


Figure 1.1: caption

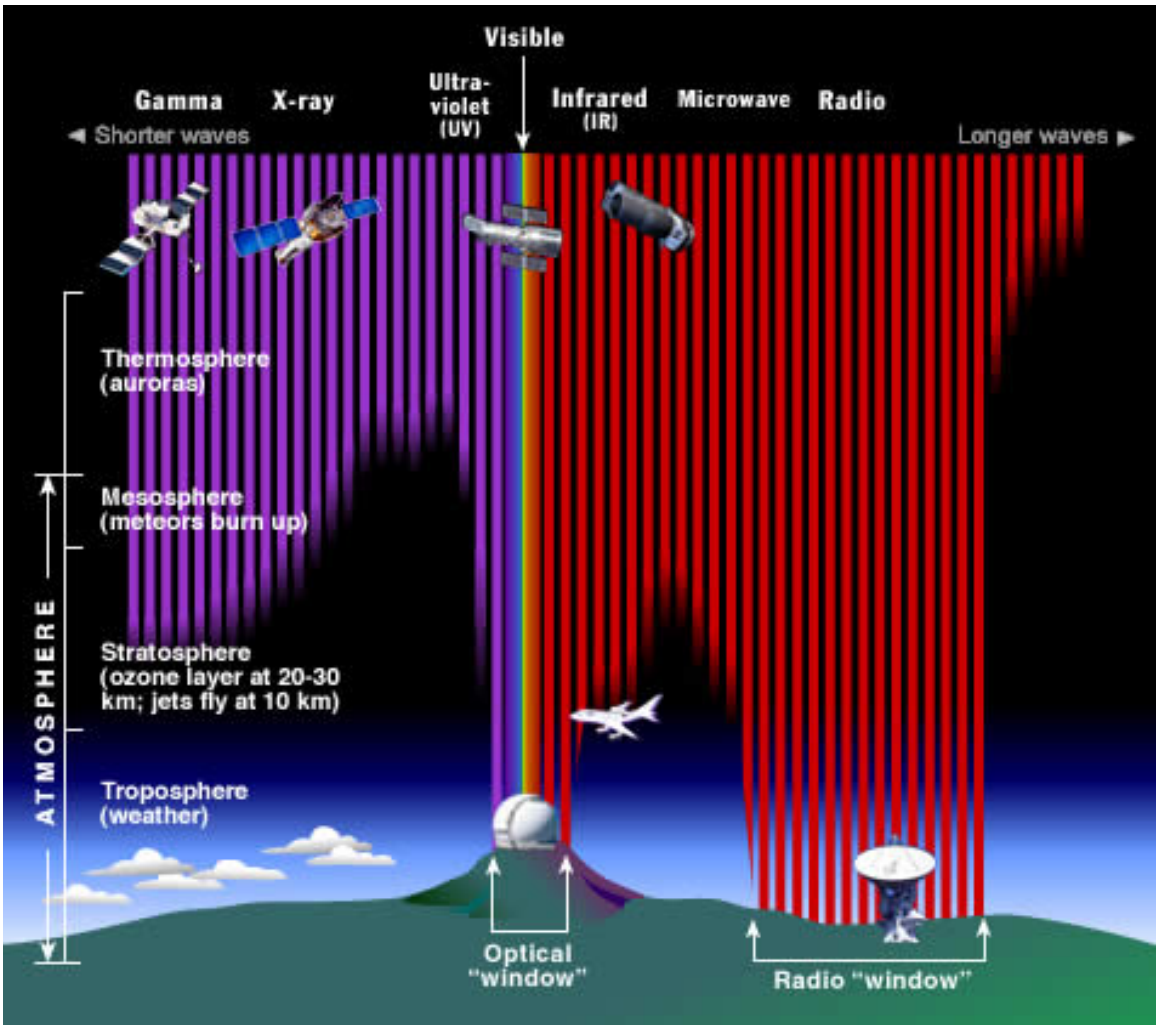


Figure 1.2: Various wavelengths of solar electromagnetic radiation penetrate Earth's atmosphere to various depths. Fortunately for us, all of the high energy X-rays and most UV is filtered out long before it reaches the ground. Much of the infrared radiation is also absorbed by our atmosphere far above our heads. Most radio waves do make it to the ground, along with a narrow 'window' of IR, UV, and visible light frequencies. Source: STCI/JHU/NASA.

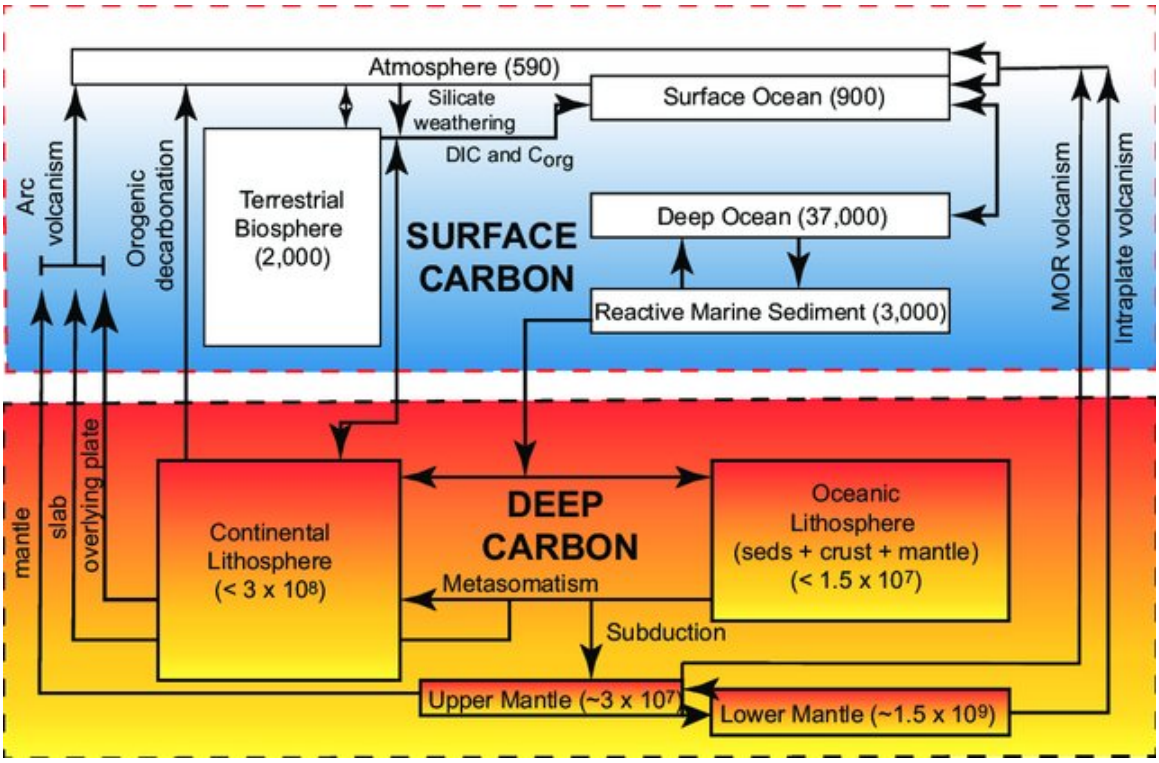


Figure 1.3: Carbon reservoirs and cycles in the Earth. The figure shows short-and long-term cycles; biosphere and geologic carbon reservoirs and fluxes, and the relative sizes and residence times (y axis) of respective carbon. Numbers in brackets refer to the total mass of carbon in a given reservoir, in Pg C (1Pg C = 10^{15} g carbon). All reservoirs are pre-industrial. Abbreviations: C org = organic carbon; DIC = dissolved inorganic carbon; MOR = mid ocean ridge; seds = sedimentary rocks. Adapted from Lee et al. (2019 And references therein).

Mountains and Erosion

1.3

Subduction Burial and Carbon Recycling

Figure **??**

1.2.3 Photosynthesis, Respiration, and Biosphere Carbon

Soil Respiration and the Soil Profile

Carbon in soils is respired – but different pools might have different rates of respiration. Sometimes these pools are distinquished as an active soil organic carbon pool and slow soil organic carbon pool. Although the reference of "slow" causes confusion with long-term, geologic carbon, but soil organic carbon remains a component of what we are refering to as biosphere carbon.

The surface of the soil tends to have more SOC and microbes that can use that carbon for respiration. Lower down in the soil profile, we tend to see lower amounts of SOC and lower microbial

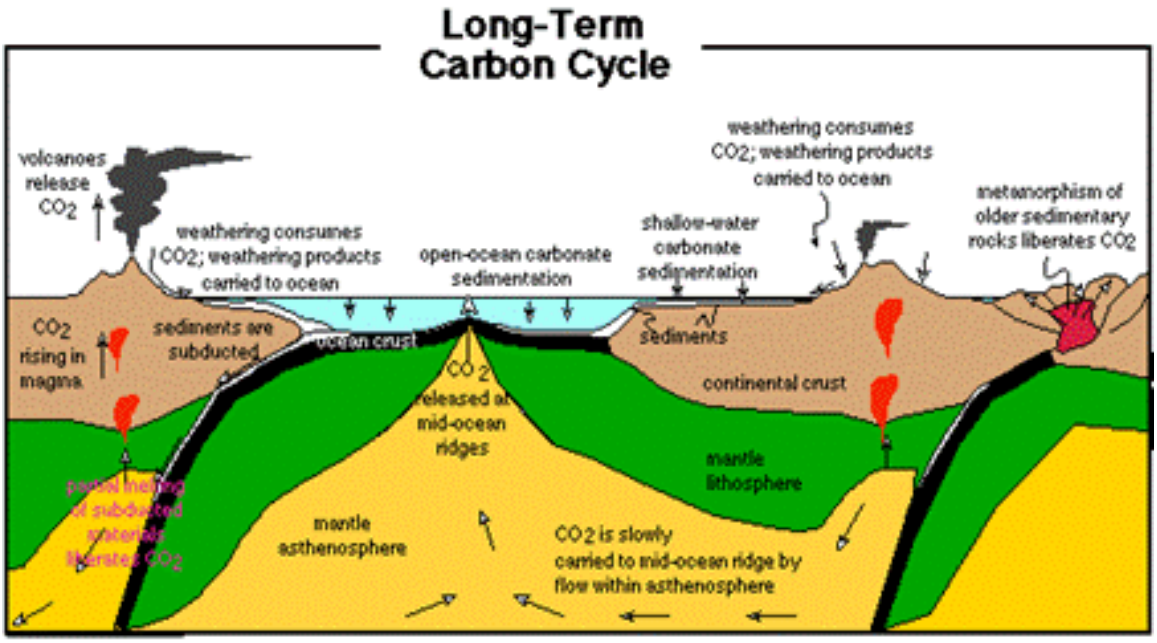


Figure 1.4: Schematic of the long-term carbon cycle (from Bice, 2001)

biomass (Figure **??**. In addition, soils in the lower part of the profile tend to have more aggregation that protects SOC from microbial attack, thus a key area that soil carbon can seqeustor carbon.

In addition to these microbial biomass and aggregate patterns, the microbes aree more senstive to temperature changes near the surface as measured by Q10 – the rate of biochemical processes with a 10 degree C increase in temperature. Thus, soil processes, such as respiration, is likely to increase more near the surface with global warming that the lower part of the soil profile.

1.3 Fossil Fuels and Carbon Dioxide Trends

As part if the industrial revolution, our energy sources have put more CO_2 from the biosphere (soils and forests) and geologic carbon (coal, petroleum).

1.3.1 The Signal of Geologic and Biosphere Carbon in Atmosphere

The combined contribution from geologic and biosphere carbon in the atmosphere is clearly documented from numerous sources. First, look at data collected at the Mauna Loa where CO_2 measurements have been taken continuously since the late 1950s.

Figure 1.6

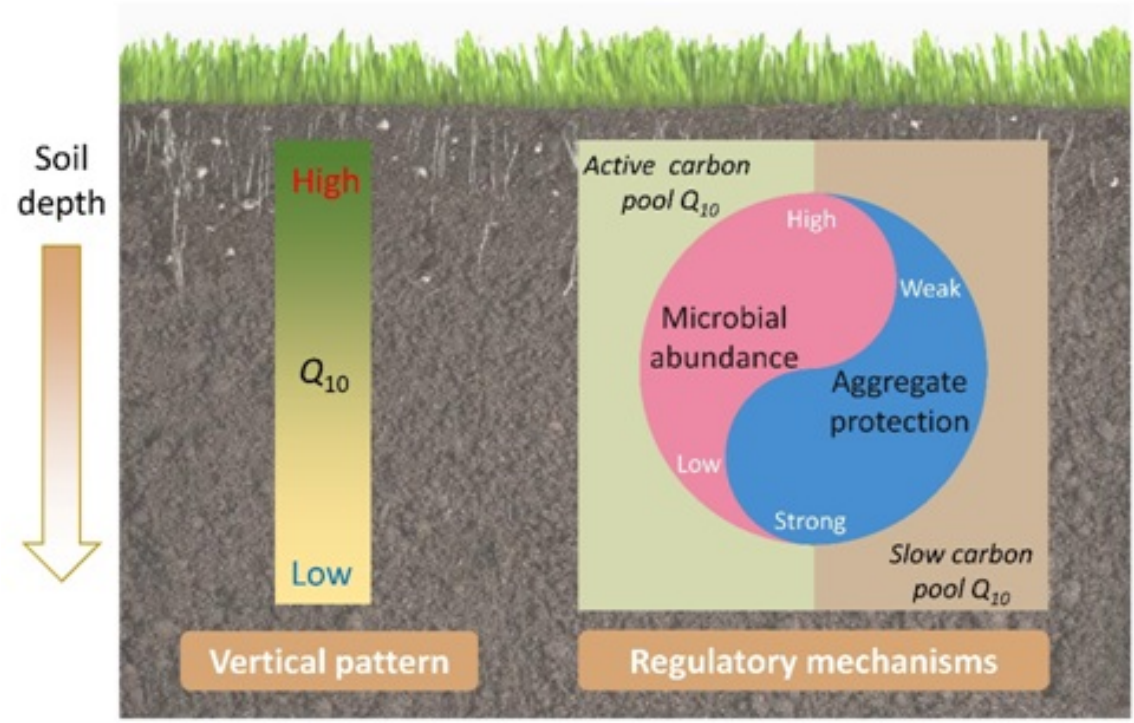


Figure 1.5: Regulatory Mechanisms of the Temperature Sensitivity of Soil Organic Matter Decomposition in Alpine Grasslands (Source: Qin et al. [2019], Institute of Botany [2021]).

```
## Error in ggplot(train.data, aes(decimal.date, average)): object 'train.data'
not found
```

Figure 1.6: Carbon Dioxide Measure on Mauna Loa, HI

Chapter 2

Monsoons and East Asia Climates

2.1 Temperature Gradients and Latitude

Chapter 3

Critical Zone

Marc Los Huertos

[1]

3.1 What is the Critical Zone

The crticical zone refers the the portion of the Earth's skin where the zone where rock meets life. The Critical Zone supports all terrestrial life.

The critical zone includes the following:

- A permeable layer from the tops of the trees to the bottom of the groundwater;
- An environment where rock, soil, water, air, and living organisms interact and shape the Earth's surface;
- Water and atmospheric gases move through the porous Critical Zone, and living systems thrive in its surface and subsurface environments, shaped over time by biota, geology, and climate.

All this activity transforms rock and biomass into the central component of the Critical Zone - soil; it also creates one of the most heterogenous and complex regions on Earth.

Its complex interactions regulate the natural habitat and determine the availability of life-sustaining resources, such as food production and water quality.

These are but two of the many benefits or services provided by the Critical Zone. Such 'Critical-Zone Services' expand upon the benefits provided by ecosystems to also include the coupled hydrologic, geochemical, and geomorphic processes that underpin those ecosystems.

3.1.1 What are the environmental implications of the Critical Zone?

The critical zone as a concept and as a material space pushes us to think of the porousity of the Earth's surface — the gas and fluid flows through rocks, soils, and plants. We can begin to appreciate the complexity of the transport and fate of chemical pollutants as they enter the soil and become part of the vadose zone and perhaps the ground water table – moving with water and diffusing through the water, simultaneously.

[1] The chapter was first drafted by Marc Los Huertos (2021). The author recieved valuable feedback from X, and Y and Z to improve the chapter.

Figure 3.1: The Critical Zone is an interdisciplinary field of research exploring the interactions among the land surface, vegetation, and water bodies, and extends through the pedosphere, unsaturated vadose zone, and saturated groundwater zone. Critical Zone science is the integration of Earth surface processes (such as landscape evolution, weathering, hydrology, geochemistry, and ecology) at multiple spatial and temporal scales and across anthropogenic gradients. These processes impact mass and energy exchange necessary for biomass productivity, chemical cycling, and water storage.

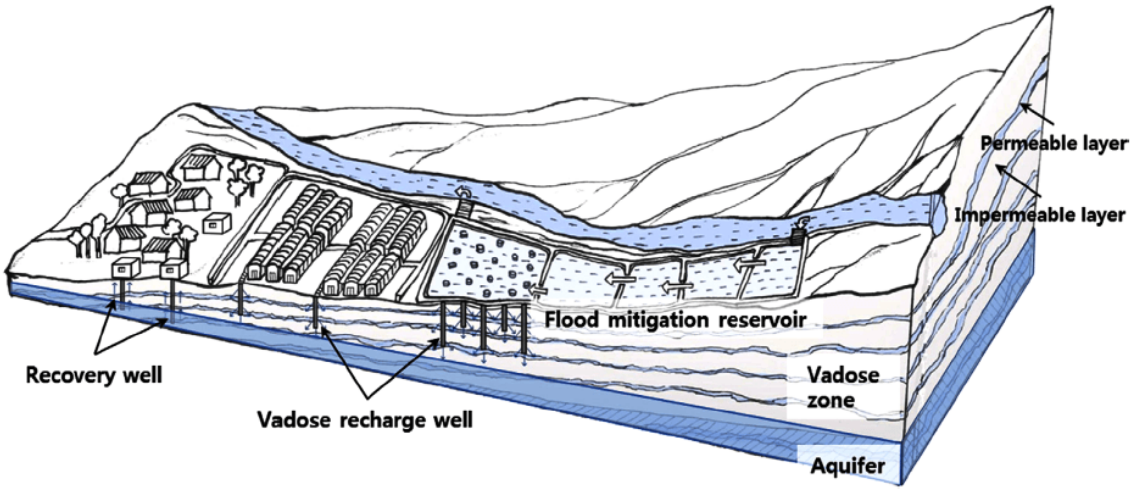


Figure 3.2: ... (Source: [Lee et al., 2017]).

3.2 Hydrologic Aspects

3.2.1 The Vadose Zone

Jeji is a volcanic island is located some XX km south of the Korean Penisula. Water runs off the steep slopes quickly and water supplies are limited on the island. To adddress this...Lee et al. [2017].

Chapter 4

Land Use in East Asia

chapterauthorSamantha Beaton
What is Land Use Change?
What Factors Drive Land Use Change?
How Land Use Change is Measured and Quantified
Integration of sociology
with data science: spatial data compiled from aerial photos, Landsat satellite images, topographic maps, GPS data, etc.
Requires classification and division of land-space types
Ecological Effects of Land Use Change on Soil, Air, and Water

4.1 Impacts on Soil

Deforestation and soil degradation
lack of stability (erosion) and loss of carbon sequestration potential
Forests
coupled with monoculture agriculture
Example Case Study: representative of monoculture agriculture-rice paddies in SE Asia (potentially...)
Impacts on Local Watersheds
hydrology
infiltration/pollution, groundwater recharge, flow of river basins, runoff
Higher risk of flooding and droughts

4.2 Conclusion & Prospect of Sustainable Urbanization/Land Use Change

Chapter 5

Nuclear Power and Nuclear Waste

5.1 Current and Future Energy Needs

Chapter 6

Air Pollution & Social Justice in Hong Kong

Neenah Vittum

6.1 Science of Air Pollution

6.1.1 Overview of the layers of the atmosphere/atmospheric gases

What part of the atmosphere does air pollution affect?
- What is air pollution?
- Overview of different types of air pollution

6.2 Major Sources Use as geographical overview

6.2.1 General common sources of air pollution all over the world

6.2.2 East Asian countries/communities and their prominent air pollution sources

Shipping
- Traffic Emissions
- Commercial and otherwise
- Coal
- Urban Development
- Manufacturing
- Other
- The transboundary issue and its implications in regulation and politics
- Impacts
- Human health
- Environmental Health
- Greenhouse gas emissions and global warming
- Both

Visibility
Environmental Justice
Case Study: Hong Kong
The Intersection of Air Pollution and Other Environmental Issues
Many environmental issues are interconnected
Air pollution and deforestation
Air pollution and urbanization/industrialization
Other Issues (To Explore)
Goals/Other Ideas/Questions
Ground information in geography and relevant examples
Incorporate stories and person accounts
slow violence environmental justice issues
Maybe activist or someone who has suffered the issues firsthand
Draw people into the empathy
Use stories and descriptions to describe places
What is the best way to section the chapter?

Chapter 7

Flood Pulse System in East Asia

Kristin Gabriel

7.1 Introduction

What is the flood pulse system?
- Seasonality
- Ecosystem Services
- Fish stocks
- Flooded forests
- How the flood pulse system influences the Tonle Sap Ecosystem
- Timing of Flood Pulse
- Magnitude of Flood Pulse
- Duration of Flood Pulse
- Influence of flood pulse system on people and their livelihoods
- Fisheries
- Immigration and emigration
- Human Impacts on the flood pulse system
- Climate change
- Dam development
- Case Study: Cambodia and the Tonle Sap

Chapter 8

Hydroelectric Dams in East Asia

8.1 Introduction

Basic facts about dams in East Asia
Statistics on how many, size, scale, location etc.
Function of the Dam
How it generates electricity/how much
Different types of dams (multi/single use etc.)
Immediate ecological impacts
Positive:
Flood control, electricity generation, improved water quality
Negative:
Decreased water quality, flooding, sedimentation, habitat loss, deforestation, salinization etc...
*note: the ecological impacts may be too many to go completely in depth into so perhaps a paragraph or subsection of each as opposed to a 7 page explanation of each
Anthropological impacts
Supposedly positive (I.e. employment etc...)
Negative: displacement, loss of cultural sites, diseases
Displacement
Policy/government action/regulation (policies that exist or propose solutions)

8.2 Conclusion

Chapter 9

Climate Change and Food Security in Myanmar

9.1 Climate Change, Climate Change Response in Myanmar

General history of rice production and food demand in Myanmar.
- Impact on credit policy on rice
- Impact of infrastructure development on rice production
- Study of the constraints of rice production in Myanmar
- The effect of a command economy on food production in Myanmar
- Overall review on demand for food in Myanmar
- Possible implementation of SRI (systemic rice intensification) in order to increase rice yields in Myanmar
- Transition from talking about rice production
- sea-level rise
- subsidence
- coastal erosion
- coastal flooding
- Impact of climate change on rice production in Southeast Asia
- Monsoon Season effect on Ayeyarwady River Badin
- Sea Level Rise
- Sea level rise effect on global markets/rice production
- Subsidence
- Subsidence in Yangon, Myanmar
- interview segments/personal experiences of rice farmers
- Roles of the Burmese government

9.2 Conclusion

Reminders/Areas of Focus

Chapter 10

Tropical Cyclones in the Philippines

Ian Horsburgh

10.1 Tropical Cyclones in the Philippines

10.1.1 A Storm is Coming

The day is Wednesday, November 6th 2013. In the Visayan Islands, the central islands of the Philippine archipelago, the people prepare for a storm. Just days earlier, after a south Asian weather station had begun monitoring a low pressure area east of Micronesia, the storm had been named Haiyan, and been declared a category 5 super typhoon. While Hayian is expected to be the most powerful tropical cyclone ever to hit land, devastating tropical cyclones are not new to the Philippines. One rural Fillipino agricultural worker, Angeles Grefiel, speaks of how past storms have wiped out his crops, leaving him with no money to provide his children with a healthy diet. "We have generations of children that have grown up without having proper access to the right types of food," says Grefiel, a sentiment echoed by Evangeline Aloha, a resident of Leyte Province in the central Philippines, who worries she will have no income if the harvest is wiped out by the storm. As certain cash crops are easily wiped out by heavy rain, many farmworkers like Evangeline and Angeles are "so vulnerable to disasters that when one strikes, it takes them further and further into that cycle of poverty," says a local social worker, also in Leyte Province. To see why certain crops are planted and how they make the country so much more vulnerable to tropical cyclones, we must take a look back on the history of agriculture in the Philippines.

10.1.2 Agriculture and Cyclone Vulnerability?

Rural Filipino farmers are vulnerable to tropical storms in part due to their integration into world-wide markets. In particular, famine is often a product of the conditions surrounding access to food. "Famine must be seen not as an absolute scarcity of food in particular regions, but rather as a loss of ones entitlements to food and/or the means of subsistence," writes Warren [2018]. As for Fillipino farmers, this loss of entitlement goes back to the colonial era. Throughout history, rice has been a staple crop in the Philippines. Due to the favorable and temperate climate, Fillipino farmers were able to harvest rice twice a year, while simultaneously planting root crops such as

sweet potato. When typhoons "created severe food shortages for those who grew rice, these root crops became...the refuge of the poor"[Warren, 2018]. However, in the nineteenth century, this dynamic began to change. Spanish colonization of the Philippines began in the 1500s, although major agricultural change, especially as it relates to globalization and integration into market economies started in the early 19th century. This began with "the Spanish practice of rewarding the Catholic orders for their conversion efforts with land," which "turned the church into the largest landlord in the islands"[Ventura, 2016]. Spanish catholic landlords then divided up their land, and under this system, "Inquilinos (tenant landlords) paid annual rents for lands they then subdivided among sharecroppers, who often further subdivided their portions, which would be worked by families living in a central town near the fields"[Ventura, 2016]. This system was a major step towards the integration of Filippino farming into the global economy, due to the fact that "as estates commercialized, they increasingly shared management with Chinese-Philippine mestizo businessmen," who had access to British capital [Ventura, 2016]. When America resumed colonial control following their defeat of Spain in the Spanish-American war in 1898, there were a number of changes to this system, but integration into global markets continued. At the beginning of the United States rule, the new leadership feigned effort to give farmers independent ownership over their land, but just two years later abandoned this effort, apocryphally citing lack of interest in this initiative by the peasants [Ventura, 2016]. Former president William Howard taft, the civilian governor of the Philippines from 1901 to 1904, then changed direction entirely, saying that "easing the homestead laws limitations on corporate ownership to 2,500 acres...was a much better path to development." Following this reversion to a similar corporate control as implemented by Spain, "prevailing inequalities of landholding and rural wealth during the Spanish period multiplied under US rule." Ventura [2016] summarizes the issue, saying that the United States "failure to establish independent homesteads was akin to other alleged shortcomings in hygiene and sanitation, education, and banking, thus justifying the US presence in the islands," and consequently "ownership for large scale plantation agriculture." US Civil Service Advisor Roy Franklin Barton talks of the American reforms in the agricultural region of Ifugao, describing how the new "availability of wage labor jobs" makes way for "the introduction of money into the province replacing the old rice currency," and thus "the integration of a market economy" [Klock, 1995]. Thus, Spanish and American policies in the Philippines transitioned the country from local to large scale plantation agriculture. This incorporation into large scale plantation agriculture and world trade had large impacts on the vulnerability of the area to natural disasters, such as typhoons "There is persuasive evidence that peasants and farm laborers became dramatically more pregnable to natural disasters after 1850 as their local economies were violently incorporated into the world market," writes Davis [2002]. "The vulnerability of tropical agriculturalists to extreme climate events after 1870 was magnified by simultaneous restructurings of household and village linkages to regional production systems." In refuting claims that farmers chose to adopt to this new age agriculture because it provided a better life, Davis argues that Recent scholarship confirms that it was subsistence adversity (high taxes, chronic indebtedness, inadequate acreage, loss of subsidiary employment opportunities, enclosure of common resources, dissolution of patrimonial obligations, and so on), not entrepreneurial opportunity, that typically promoted the turn to cash-crop cultivation. This cash crop cultivation became the primary type of farming in the Philippines by the mid 19th century, and even farmers who still owned land were increasingly "encouraged to plant cash crops of abaca, copra, tobacco and sugar, and were often forced to sell rice below market prices"[Warren, 2018]. By the 20th century,much of the rice still produced by the Philippines was exported to China, while poor Filipinos lived "almost exclusively on imported rice, tubers and corn" [Warren, 2018]. Thus, rather than the pre-colonial model of growing rice and root crops, a model that was fairly robust in the face of typhoons, farmers in the colonial Philippines who were encouraged to grow cash crops and buy imported rice, as well as those who now worked

Figure 10.1: A Ship is washed ashore in Tacloban City

plantations for a wage, were left with no money and thus no food when cash crops were wiped out by typhoons. As many cash crops rely on long fertile growing seasons for harvest, and thus were much more easily disrupted by storms, "subsistence farmers, who increasingly chose to cultivate cash crops, counting on a better standard of living, often found they had no visible means of sustaining themselves, because of the economic predicament triggered by typhoons," writes Warren [2018], again. Thus, in the shift from a diversified to monocrop economy, agricultural, and thus economic disaster became "a fact of life" In sum, as colonial powers such as the United States and Spain implemented policy that shifted Filippino agriculture toward cash crop cultivation within worldwide markets, and away from a local multicrop system, the country became more vulnerable to typhoons.

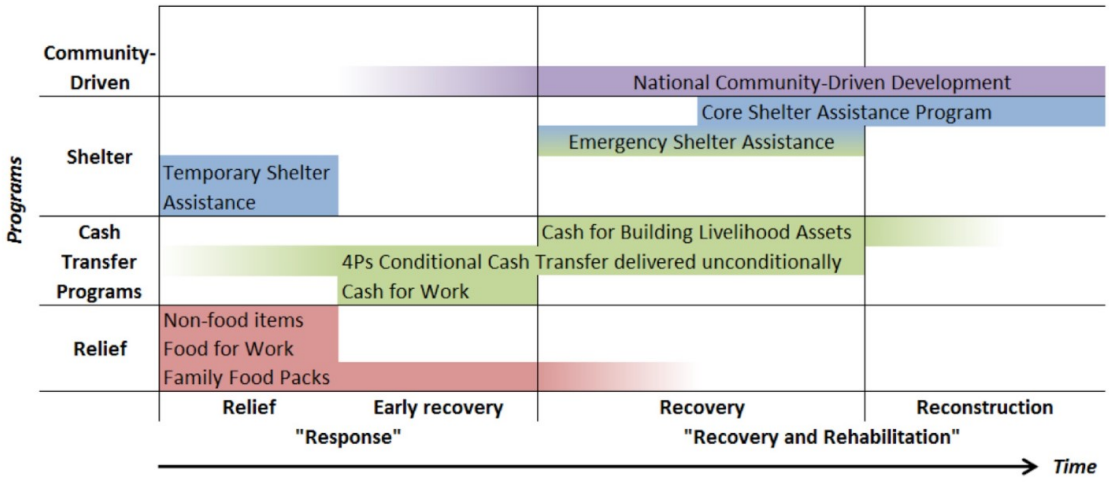
10.1.3 Ready or Not

As the supertyphoon Hayian approached the Philippine islands, the government scrambled to alert those in danger, but to various degrees of success. While some in danger, like Retche Ycoy, did not receive any warning–"We didnt expect this was going to happen. We were just sitting around in our house and the wind suddenly started"–others, like 62 year old taxi cab driver Eduardo did not realize what the warnings meant. Recalling the situation, he said, "What I understood was that there would be a strong wind. We never understood what a storm surge meant." Others still, like Celina Camposano of Leyte were told to evacuate. While these responses vary from having heard no warning whatsoever to being evacuated and sent to higher ground, they all share one sentiment: their past experiences with tropical storms did not prepare them for what was about to come. From educating and warning those in danger to helping those affected find food and shelter, the federal Philippine response to tropical cyclones like Haiyan has many obligations. In this section, we will investigate what this response entails, what areas it is successful in, and how it can improve. While disaster mitigation can mean many things, we will separate it into post disaster recovery, and pre-disaster preparation.

10.1.4 Philippine Disaster Mitigation

The Philippines has a number of programs aimed at disaster relief, as seen in figure 10.2.Typhoon Haiyan, locally know as Typhoon Yolanda, was disasterous. With 195 mph 1-minute sustained wind speeds, Yolanda was the most powerful storm ever to make landfall at the time. With 6300 people dead, and a million houses destroyed or damaged, the Philippine government had much work to

Figure 1: The primary response, recovery and reconstruction programs of DSWD in the case of Typhoon Yolanda



Note: "Relief, early recovery, recovery and reconstruction" refer the typical international conception of the post-disaster phases over time. "Response" and "recovery and rehabilitation" represent the GoP conception of these phases. They align as illustrated on the figure's x axis

Figure 10.2: DSWD Relief Programs

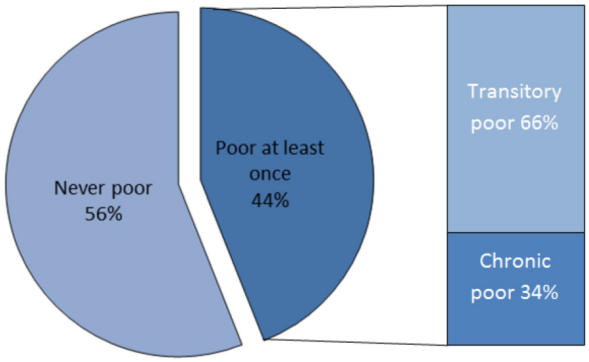
do to provide relief for those that survived the devastating storm. Immediately after the storm, the Department of Social Welfare and Development (DSWD) provided shelter assistance to many displaced households. For nearly 60,000 household, this came in the form of emergency shelter kits. Although the kits were helpful in providing emergency shelter, the number of families that received the emergency shelter assistance was limited due to an insufficient supply of kits delivered. [Bowen, 2015]. In addition to these kits, DSWD helped to coordinate the delivery of 136,267 roofing solutions to help with roofs that had been blown off, like Papooses. Concurrently, other families were sent to shelters or bunkhouses, and by the 5th month of the response, many of the families who were originally living in emergency shelter kit housing were transferred to more substantial bunkhouses as well. However, this relief housing was not sufficient for all. Another program implemented by DSWD was Food for Work.

In the DSWDs food for work program, "Beneficiaries were given food packs in exchange for the provision of their labor to assist in the repacking and distribution of relief goods" [Bowen, 2015]. This both helped to expedite the processing and distribution of food packs, and employ/guarantee food for those who lost their job as a result of the tropical cyclone. As the needs of the workers moved beyond immediate shelter and survival, this Food for Work program was replaced with Cash for Work. In the Cash for Work (CFW) program, which continued long into the relief effort, jobs included "loading/unloading of goods, repacking of relief goods, food preparation, sorting and inventory of damaged property, clearing of debris, coastal clean-up, and canal dredging, among other things" [Bowen, 2015]. By 2014, 15,188 people were participating in CFW, which "helped to provide much needed additional assistance to DSWD relief programs on the ground, while providing beneficiaries with cash based assistance"[Bowen, 2015]. Programs like Cash for Work, however, would

not have been possible without existing cash transfer infrastructure. The DWWD, with the help of humanitarian organizations, capitalized on strong pre-existing social welfare programs, especially cash transfer infrastructure, to provide monetary relief in the wake of Hayian. In total, "Four agencies alone in the inter-agency response distributed around US$34 million, benefitting 1.4 million disaster-affected people"[Bowen, 2015]. This money was distributed in various ways, with around 70 percent of cash transfers being conditional (Cash for work, etc), and 23 percent being unconditional. Although this system works well, the Phillippine government should learn from and refine this cash distribution process for future disasters, as a number of issues in "coordination leading to coverage gaps and duplication" of funds were reported during the Hayian relief period[Bowen, 2015]. In addition to government aid, local relief and community driven development was key to post-Haiyan recovery. Community driven development refers primarily to the subsection of the DSWD called the National Community Driven Development (NCDD) program that operates primarily on local levels and was established in 2002 to help alleviate rural poverty, especially surrounding disasters. In addition to implementing general infrastructure, the NCDD is well poised for disaster relief due to its geographical breadth and "has a well established network of community facilitators and community volunteers on the ground"[Bowen, 2015]. Following Yolanda, the NCDD played a large part "in the rebuilding/rehabilitation process" of affected communities by taking on projects such as rebuilding roads, paths/trails, schools, flood/drainage control structures, water systems, and health stations. Thus, "The Yolanda experience has also demonstrated the important role that community driven development programs can play in the recovery of poor and vulnerable people from disasters"[Bowen, 2015]. Finally, the Core Shelter Assistance Program helped those affected by the storm find housing. In an effort to build more secure and resilient housing, the DSWD implemented the Core Shelter Assistance Program (CSAP), which aims to establish permanent safe housing for the rural poor. Following emergency housing after a storm, the CSAP builds "a standardized two-room structure that is built to withstand 220 kmph wind-speeds"[Bowen, 2015]. As a testament to the durability of these shelters, a local Social Welfare and Development officer stated that "The core shelter units built through the CSAP of DSWD are still standing even after the mighty force of Typhoon Yolanda...all 80 units built in 1991, 2000 and 2010 in Barangays Cansuso, San Marcelino, San Sebastian, and San Guillermo remain standing"[Bowen, 2015]. Thus, this program provides robust housing that not only serves as relief for typhoon victims, but actually serves to mitigate future damage caused by natural disasters. Overall, the Philippine government has established a fairly robust system for addressing typhoon relief, combining immediate food and shelter relief with one of the best social protection programs in the region, which helps many residents with both immediate survival and monetary subsistence. However, despite these systems to address relief, many residents still live close to the poverty line. As seen in the figure 10.3, 44% of Philippine residents experience poverty at least once, and of those that do, 2 out of 3 are in and out of poverty, often triggered by typhoons like Yolanda. While the systems described above do well to provide relief following a tropical storm, thus making the poverty triggered by the storm only transitory, other adaptation and mitigation measures could help reduce the need for such extensive post disaster support as well as decrease the number of deaths immediately caused by typhoons. While some measures described above, such as robust housing, function in this way, there are a number of other measures that can be taken to reduce the effects of tropical cyclones.

Disaster mitigation takes many forms, from long term prevention to recovery. As we have previously discussed recovery and post-disaster mitigation, which the Philippines has demonstrated great competency in, we will now talk about prevention, a sector which the south asian archipelago will need to invest in to mitigate damage caused by future storms. The first form this investment could take is protecting natural land features. While man made structures such as walls and barriers offer some protection and psychological reassurance, they are not an ideal long term solution to cyclone

Figure 3: Poverty Status 2003, 2006, and 2009



Source: World Bank (2014), Country Partnership Strategy for the Republic of the Philippines for the Period FY2015-2018, p 4

Figure 10.3

mitigation [King et al., 2010]. This stems from a few factors, the first of which being their high maintenance costs, which leads to neglect, and thus causes a dangerous scenario of false security, as was observed in hurricane Katrina in New Orleans in 2005. Another downside of man made structures is that if they are breached, they often keep water in, creating a ponding effect that "severely constrains response and recovery"[King et al., 2010]. Instead of man made infrastructure, many researchers emphasize the importance of retaining natural land features. Natural features such as coral reefs, mangroves, and dune ridges "are extremely effective in controlling storm surge flooding," writes King et al. [2010]. While coral reels are able to absorb "some of the power of tropical cyclone wind-generated waves and surges" before they hit land, mangroves are crucial to providing relief as they are extremely resilient to tropical storms, and often provide shelter and safety to people and boats around them [Williams et al., 2007]. While only 20% of the once 500,000 mangroves in the Philippines remained by the early 1990s, local and national authorities observed this effect of mangrove protection from tropical storms, and have planted 600,000 mangroves since 1996. In addition to typhoon protection, this has had other benefits such as improved fishing and ecotourism [Williams et al., 2007]. Williams et al. [2007] notes, however, that although Philippine legislature in planting mangroves for cyclone protection could be considered a success story, enforcement is "often wanting," and continuous efforts must be made to maintain the progress the country has made in this respect. The final natural feature that has been observed to help prevent typhoon damage is coastal dunes, behind which "lagoonal wetlands absorb immundation"[King et al., 2010]. Unfortunately, these are in great danger, as "coastal zones have been cleared, settled, and built over"[King et al., 2010]. Thus land use planning and legislature are crucial to maintaining, or many cases such as that of mangroves, rebuilding natural infrastructure to mitigate typhoon damage. In addition to infrastructure, education is imperative to disaster mitigation. Mitigation measures have little to no impact "if the people do not know the hazard risk" or "are unaware of evacuation routes, sheltering strategies, and appropriate response to warnings," as demonstrated by Eduardo and Maria [King et al., 2010]. "Many people who may have been through a Category 1 or 2 cyclone have no awareness from that experience of what a Category 3 or 4 will do," writes King et al. [2010], again. As the pre-existing idea of what the storm will look like may contradict official reports, vulnerable

populations must be educated on what different categories of storms mean, and what responses are appropriate for the divergent levels. Once these warnings are understood, a robust warning system is extremely helpful in preventing injuries and casualties due to storms. In sum, the Philippine government has created a robust post-disaster relief system that encompasses housing, food, and work. However, to mitigate the damage caused by future storms, the country must invest in protecting natural features such as mangroves, coral reefs, and coastal dunes, as well as strengthen education programs on tropical cyclones.

10.1.5 A Changing Game

Compounding issues of lack of education on tropical storms is the fact that the nature of these storms is changing. Some residents, such as Maria Flora Orbong of Tacloban City understood what the storm surge meant, yet was still underprepared for storms of Haiyans magnitude, remarking that "We knew that a strong typhoon was coming but we didnt really expect the water [levels] to rise that high our neighbors evacuated but we thought we were safe. We were in the middle, surrounded [by cement houses]." Less than an hour after the storm hit the Island, however, things were far from expected. "The waves rose to six or eight metres (20 to 26 feet)...many people started to escape but the ships washed up and many people died," recalls Orbong. Celina Camposano of Leyte echoes the novelty of this storm, saying "Weve never experienced something like this before weve never had to evacuate before." While some of this gap between expectations and reality is due to lack of education on cyclone threat, another reason locals were unprepared for what typhoon brought was that the nature of these types of storms are changing. To understand this change, we must look at how tropical cyclones work and how they are affected by climate change.

10.1.6 Tropical Cyclones and Climate Change

Tropical cyclones, referred to as typhoons when taking place over the Pacific Ocean, occur in southeast Asia primarily in the late summer and fall. Distinct from the monsoon season, which describes the prevailing wind that causes a predictable rainy season in the summer months, typhoons are isolated and severe events, sometimes accounting for more precipitation than the entire monsoon season brings. Typhoons typically form in warm equatorial ocean waters, as the warm air near the surface rises, leaving an area of lower pressure below. Soon, a cycle forms, with surrounding air moving into the lower pressure region before heating up and rising itself. Once the risen air cools off, it forms clouds, which are then fed into the cycle, as seen in figure 10.4 Other characteristics often accompany this air and cloud flow, such as torrential rains and a storm surge which can elevate the sea surface 20 feet and cause widespread flooding.

To represent how these tropical cyclones operate, climate scientists often employ the Carnot Engine model, a theoretical thermodynamic cycle that provides an upper limit on how powerful a storm can be [Emanuel, 1987]. The model depicts fluid that performs work (a measure of energy transfer that occurs when an object is moved) on its surroundings while undergoing four stages, the fourth of which returns to the first, making it cyclic. In the case of a cyclone, this fluid takes the form of a mixture of dry air, water vapor, and suspended condensed water, all of which are in thermal equilibrium (the same temperature). However, as the ocean and the atmosphere are in thermal disequilibrium (not the same temperature), the ocean loses heat to the atmosphere by evaporation of water, which has a large heat of vaporization [Emanuel, 2006]. The carnot cycle uses this heat flow as an input to estimate the maximum power output that could be produced if the storm was perfectly efficient. Although this perfect efficiency is impossible, the carnot cycle is useful to give an upper bound on storm power, operating as described in figure 10.5.

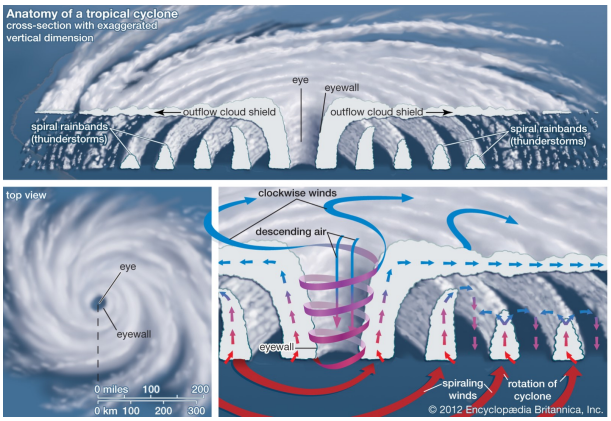


Figure 10.4

A quick aside on the greenhouse effect: Youve probably heard the term "the greenhouse effect" thrown around, but if you forgot what it is or never learned, heres a brief summary. Of the light radiated by the sun, 30% is reflected by the clouds or surface and the rest is (mostly) absorbed by the earth. The earth then transmits energy up by radiation and convection currents, some of which are absorbed by certain elements in the atmosphere such as water vapor, methane, and carbon dioxide. These molecules are known as greenhouse gasses because they act on the climate as a greenhouse does on a garden, trapping heat in the atmosphere. As a higher concentration of greenhouse gases in the atmosphere leads to a higher temperature, the disequilibrium between the atmospheric temperature and the water increases, thus amplifying the heat flow powering the carnot cycle, which results in a higher upper bound for the intensity of the cyclone[Emanuel, 2006].

All this physics on tropical cyclone modeling provides good intuition for why an increase in greenhouse gas concentration in the atmosphere could lead to more powerful storms, but to really quantify this change, we must look to climate simulations and statistics. To investigate one statistic that is particularly pertinent to quantifying cyclone power and potential destructiveness, we look to meteorologist Kerry Emmaneuls work. In his 2005 article Increasing Destructiveness of Tropical Cyclones, Emanuel [2005] noted that "Basic theory," such as what we have looked at with the carnot cycle, "establishes a quantitative upper bound on hurricane intensity, as measured by maximum surface wind speed." Observing that "the actual monetary loss in wind storms rises roughly as the cube of the wind speed," Emmanuel created the Power Dissipation Index, which he defines as:

$$PDI \equiv \int_0^t \mathsf{V_{max}}^3 \, \mathsf{dt}$$

A quick refresher in calculus: the integral represents the area under a curve, so in this case the curve would be a graph of the maximum sustained wind speed of a storm over time (Velocity cubed), and the integral of V3 would be the area under this curve starting at the beginning of the storm $\mathsf{t0} = 0$, and ending at time t. This is shown by the 0 and t at the bottom and top, respectively, of the integral symbol. A simplification of a previous statistic that was problematic as it input data that was seldom recorded, Emanuel [2005] notes that "this [new] index is a better indicator of tropical cyclone threat than storm frequency or intensity alone." Because it does well to estimate the damage of tropical cyclones, only requires one input, and is easy to evaluate, it is often used to represent tropical storm damage. Using PDI to gauge storm intensity, numerous studies conclude that tropical cyclone intensity will increase under climate change [Zhang et al., 2017], [Emanuel, 2013], [Chen

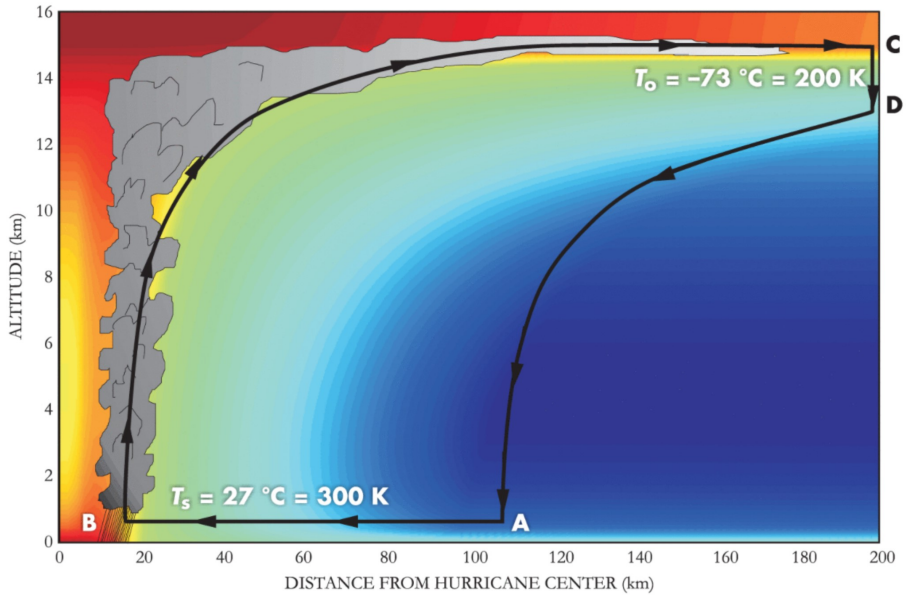


Figure 10.5

et al., 2021]. To apply physics to large scale climatological events, scientists use climate models, which divide up the earth's surface into grid cells, and use complex equations based on fundamental laws of physics, fluid motion, and chemistry to describe how energy and the materials within the grid move through it [NOAA]. A visual of this type of model is given in the figure below.

When a model is run, scientists set the variables to certain predictable climate conditions, such as greenhouse gas concentration, and solve the equations for those conditions [NOAA]. The results are then plugged into the next grid, and so on, representing the passage of time. To test the models, climatologists run the models back in time, ensuring the results are similar to what has actually been observed before simulating future conditions. Applied to tropical cyclones and climate change, these models allow scientists to make conclusions about how greenhouse gasses will affect storms. While the effects of climate change on storm frequency are unclear([Emanuel, 2013], [Chen et al., 2021]), multiple studies have shown an increase in tropical cyclone intensity due to climate change [Zhang et al., 2017], [Emanuel, 2013], [Chen et al., 2021]. This finding is in consonance with what the physics of tropical storms predicted [Emanuel, 1987]. Presented graphically, this can be seen by an increase in PDI in climate models set for expected greenhouse gas concentrations over the next century (recall that PDI is calculated using wind speed, one of the physical processes modeled in climate models). In sum, tropical cyclones can be modeled with the carnot cycle to predict the maximim power output of the storm. This model predicts that an increase in greenhouse gas concentration will cause storms to become more powerful, a prediction that is backed up by climate modeling.

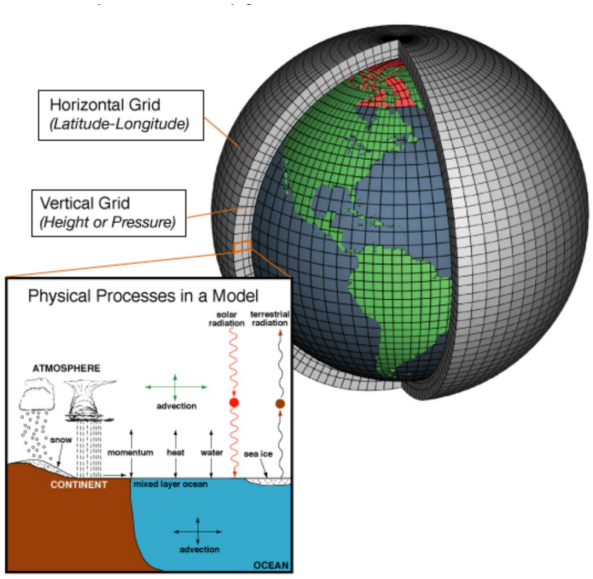


Figure 10.6

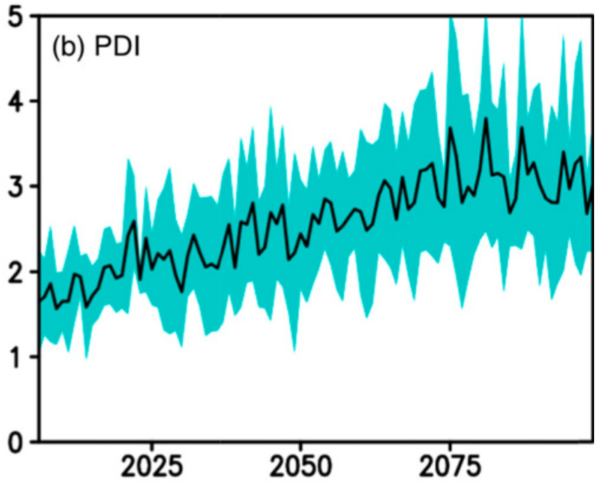


Figure 10.7

Chapter 11

Climate Infrastructure in Vietnam

11.1 Introductory

How climate change will impact Vietnam
- Flooding (especially coastal urban areas)
- Sea Level Rise
- Land Erosion
- Health outcomes

Current Adaptation Plans
- Strengthen existing barriers and infrastructure
- Adapt cities expecting sea level rise
- Withdraw from the coastlines in areas that are well below sea level

What's Needed for the Future
- Stronger healthcare system
- Support for farmers and agricultural workers
- Support for rural population near Mekong and Red river deltas

11.2 Conclusion

Implications for other places in the region

Chapter 12

Waste Management for a Circular Economy

12.1 Life-Cycle

12.1.1 Collection

12.1.2 Transport

Treatment
- Disposal
- Sectors:
- Industrial
- Household
- Biological
- Types of Waste:
- Solid:
- Liquid
- Gaseous waste

12.2 Biomimicry

12.2.1 Circularity

Examples in Nature
- Education:
- Teach people to be mindful and live sustainably
- Social PsychologyProblems and New Approaches:
- Sustainability
- Incineration & Dumping
- Recycle & Reuse
- Resource Recovery

Chapter 13

Plastic and Packaging in Japan

13.1 Introductiona and Goals?

Plan: Use Japan's unique plastic packaging as a lens to view plastic waste management. I can bring in benefits of their plastic use, like cultural significance of beautiful wrapping and food safety, and then discuss plastic pollution as a larger issue in East Asia, bringing in examples of blame placing, and of course discussing potential solutions on both international and local scales.

13.2 Plastic Pollution and Waste Management in East Asia

13.2.1 Statistics/comparisons

graphs and images will help with perspective

13.2.2 History of plastic waste issues in East Asia

Are specific companies/industries responsible responsible

what kinds of plastic waste are there (sector break down)?

Where in the world did the ubiquitous usage of single use plastics come from?

General blame placing/biases/rhetorical

examples of discourse around plastic waste in East Asia. Why does any of this matter(needs its own section)?

Plastic waste trade?

https://link.springer.com/article/10.1007%2Fs10163-004-0115-0

https://www.sciencedirect.com/science/article/abs/pii/S0956053X20305602

Blame placing through both rhetoric and scientific studies

(this source is a very data based study that concluded that the vast majority of plastic pollution comes from a few sources in Asia/Africa... I want to explore what they might not have taken into account when collecting data)

https://science.sciencemag.org/content/347/6223/768

https://pubs.acs.org/doi/10.1021/acs.est.7b02368

https://www.dw.com/en/whose-fault-is-plastic-waste-in-the-ocean/a-49745660 (found the two above studies through this article)

Japan Specific (I need to break these into hierarchies of significance), some sections, the first few will be more data based, the second half will be more rooted in sociological primary sources.

Waste management issue overview

Sector Break Down/ responsible parties in Japan

Impacts of plastic pollution on different groups within Japan

Cultural significance of wrapping

Food safety

Gov action/recycling/current efforts

Activism

Potential solutions moving forward rooted in current activist efforts/respect to culture

https://www.pnas.org/content/117/33/19844.short

https://www.jstor.org/stable/432317?seq=1

https://onlinelibrary.wiley.com/doi/abs/10.1002/1099-1522(200003/04)13:2%3C45::AID-PTS496%3E3.0.CO;2-%23

Part I

Backmatter

The back matter often includes one or more of an index, an afterword, acknowledgments, a bibliography, a colophon, or any other similar item. In the back matter, chapters do not produce a chapter number, but they are entered in the table of contents. If you are not using anything in the back matter, you can delete the back matter TeX field and everything that follows it.

References

Thomas Bowen. *Social protection and disaster risk management in the Philippines: the case of typhoon Yolanda (Haiyan).* The World Bank, 2015.

Yu Chen, Zhongdong Duan, Jian Yang, Yi Deng, Tiantian Wu, and Jinping Ou. Typhoons of western north pacific basin under warming climate and implications for future wind hazard of east asia. *Journal of Wind Engineering and Industrial Aerodynamics*, 208:104415, 2021.

Mike Davis. *Late Victorian holocausts: El Nino famines and the making of the third world.* Verso Books, 2002.

Kerry Emanuel. Increasing destructiveness of tropical cyclones over the past 30 years. *Nature*, 436 (7051):686–688, 2005.

Kerry Emanuel. Hurricanes: Tempests in a greenhouse. *Physics Today*, 59(8):74–75, 2006.

Kerry A Emanuel. The dependence of hurricane intensity on climate. *Nature*, 326(6112):483–485, 1987.

Kerry A Emanuel. Downscaling cmip5 climate models shows increased tropical cyclone activity over the 21st century. *Proceedings of the National Academy of Sciences*, 110(30):12219–12224, 2013.

Hidefumi Imura, Sudhakar Yedla, Hiroaki Shirakawa, and Mushtaq A Memon. Urban environmental issues and trends in asia-an overview. *International review for environmental strategies*, 5(2):357, 2005.

Chinese Academy of Sciences Institute of Botany. Researchers reveal regulatory mechanisms of the temperature sensitivity of soil organic matter decomposition in alpine grasslands, 2021. URL http://english.ib.cas.cn/Research/Progress/201911/t20191129_226584.html.

David King, Jim Davidson, and Linda Anderson-Berry. Disaster mitigation and societal impacts. In *Global perspectives on tropical cyclones: From science to mitigation*, pages 409–436. World Scientific, 2010.

John S Klock. Agricultural and forest policies of the american colonial regime in ifugao territory, luzon, philippines, 1901-1945. *Philippine quarterly of culture and society*, 23(1):3–19, 1995.

Jin-Yong Lee, Kang-Kun Lee, Se-Yeong Hamm, and Yongcheol Kim. Fifty years of groundwater science in korea: a review and perspective. *Geosciences Journal*, 21(6):951–969, 2017.

Marc Los Huertos. *Overview of R*. Pomona College, 2018.

NOAA.

Shuqi Qin, Leiyi Chen, Kai Fang, Qiwen Zhang, Jun Wang, Futing Liu, Jianchun Yu, and Yuanhe Yang. Temperature sensitivity of som decomposition governed by aggregate protection and microbial communities. *Science Advances*, 5(7), 2019. doi: 10.1126/sciadv.aau1218. URL https://advances.sciencemag.org/content/5/7/eaau1218.

Theresa Ventura. From small farms to progressive plantations: the trajectory of land reform in the american colonial philippines, 1900–1916. *Agricultural History*, 90(4):459–483, 2016.

James F Warren. Typhoons and droughts: Food shortages and famine in the philippines since the seventeenth century. *International Review of Environmental History*, 4(2):27–44, 2018.

Meryl J Williams, Robert Coles, and Jurgenne H Primavera. A lesson from cyclone larry: An untold story of the success of good coastal planning. *Estuarine, Coastal and Shelf Science*, 71 (3-4):364–367, 2007.

Yihui Xie. *knitr: A General-Purpose Package for Dynamic Report Generation in R*, 2021. URL https://yihui.org/knitr/. R package version 1.31.

Lei Zhang, Kristopher B Karnauskas, Jeffrey P Donnelly, and Kerry Emanuel. Response of the north pacific tropical cyclone climatology to global warming: Application of dynamical downscaling to cmip5 models. *Journal of Climate*, 30(4):1233–1243, 2017.