Environmental Issues in East Asia

EA30e Spring 2021

May 13, 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!

LaTeX 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

0.4.1 Latex Book Class

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

0.4.2 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.

0.4.3 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:

```
#read csv data  // read data into R
my.dataframe <- read.csv(file.choose())   // read data from a popup window.

str(my.dataframe) // display data structure
```

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

0.4.4 Mathematics and Specialized Characters

Warning: Special Characters

When you use percent and ampersand symbols, hash tags, and other non-standard ASCII characters, LATEXwill be very uncooperative. LATEX doesn't like a range of characters or they reserved for special behavior. 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!

The following symbols $, %, #, &, è, ñ, " and " do not reflect the key stroke you might expect.

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. If you want to show use the ampersand or one of these characters, put a backslash in front of the dollar sybmol, e.g. \$. See Table 1.

If you want to a superscript (raised to 3nd power), we can create text in math mode, with $ to start and end the text in math mode, e.g. m^3 is written in LATEXas m^3. A subscript uses an underscore, x$_1$ creates x_1. If you need more than one character as a subscript or superscript then enclose the content in curly brakets, e.g. x^{2c} (x^{2c}) and t_{step} (t$_{step}$).

Table 1: Table of Symbols in LATEX

Symbol	LATEXcode	Symbol	LATEXcode
&	\&	$	\$
"	``	"	''
mg L^{-1}	mg~L^{-1}		

0.4.5 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 $u_1, \ldots u_{n-1}$ in H,

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

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

0.4.6 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.

Figure 1: My plot's caption is here!

0.4.7 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*

0.4.8 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.]

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

Figure 2: Carbon Dioxide Concentrations (Mauna Loa, HI). Data demonstrate the CO2 concentrations are increases, but that a seasonal impact is embedded in the long-term trend. Source: Scripps/NOAA.

```
## 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 2, 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 – For now a decent caption about what the reader is seing is super helpful.

0.4.10 Using Boxes

0.4.11 minibox X

Some text

0.4.12 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.*

Template Chapter Title

Chapter Author Name

[1]

0.5 Section Heading

0.5.1 Subsection Headings

Some text here...The hierarchy structure is described in the Author Guide, Section 0.4 – NOTE: This is a section cross reference.

if you cut and paste, be sure to make sure you don't include formatted characters outside the ASCII values. See Author Guide, Section 0.4.4. NOTE: This is a subsection cross reference.

Optional Subsubsection Headings

some text here.... and a subsubsection cross reference (See Section 0.5.1).

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)
```

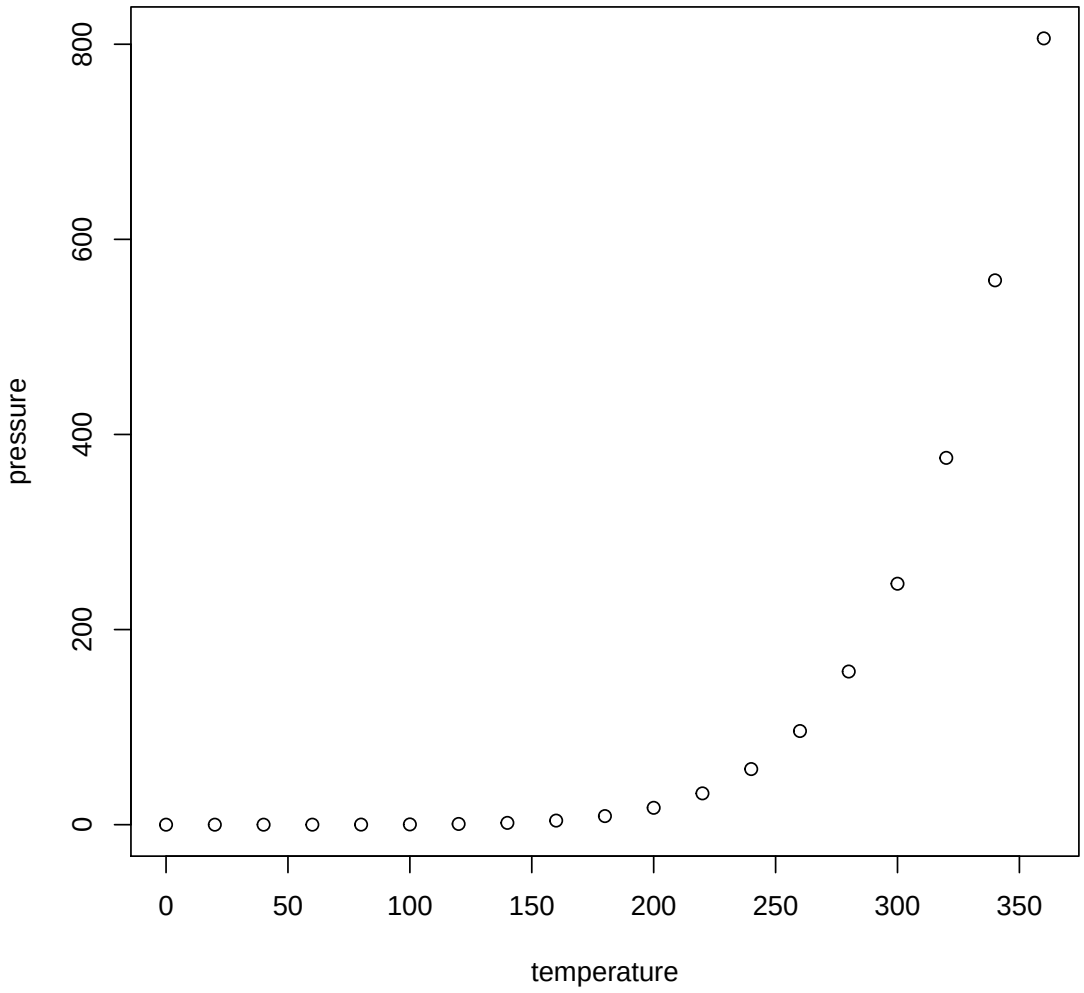


Figure 3: Figure Caption...we should turn "echo=False" in the R chunk options, but I left it true for now. (source: ??)

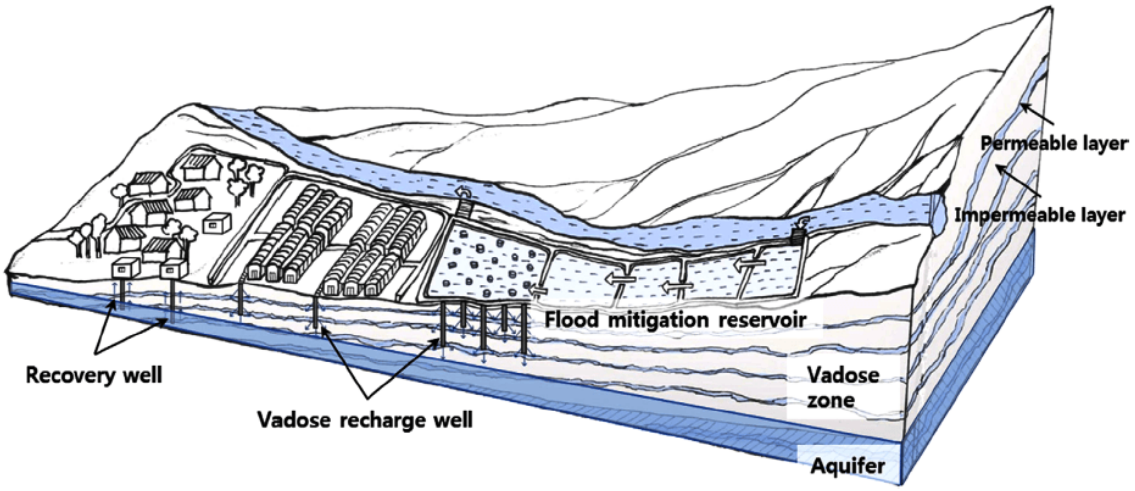


Figure 4: Vadose zone is neato (Source: Lee et al. [2017]).

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.

Plastic

Nora

→
chekcing on this today, 4-020-2021 pull request test 1.2
changes at 3 pm, 4-1-21
changes at 3:20 pm, 4-1-21
changes at 3:29 pm 4-1-21
changes at 3:33 pm

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.

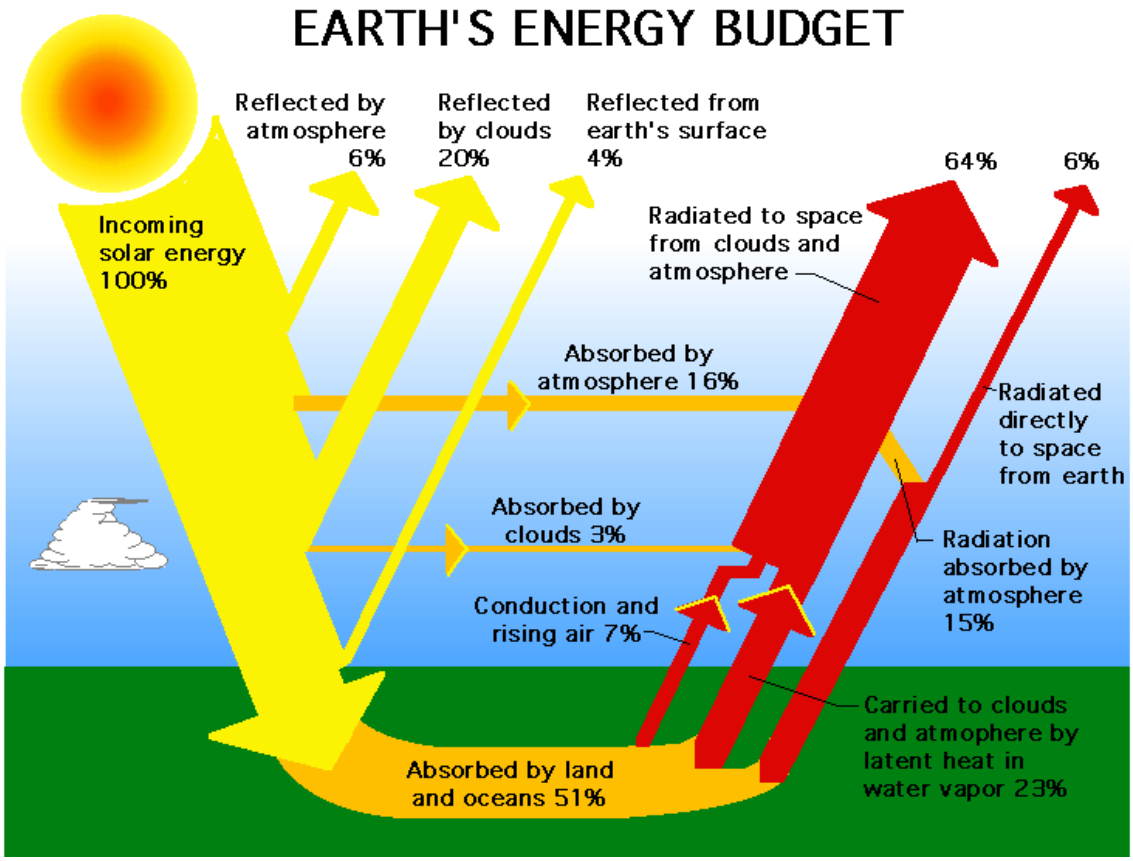


Figure 1.1: caption

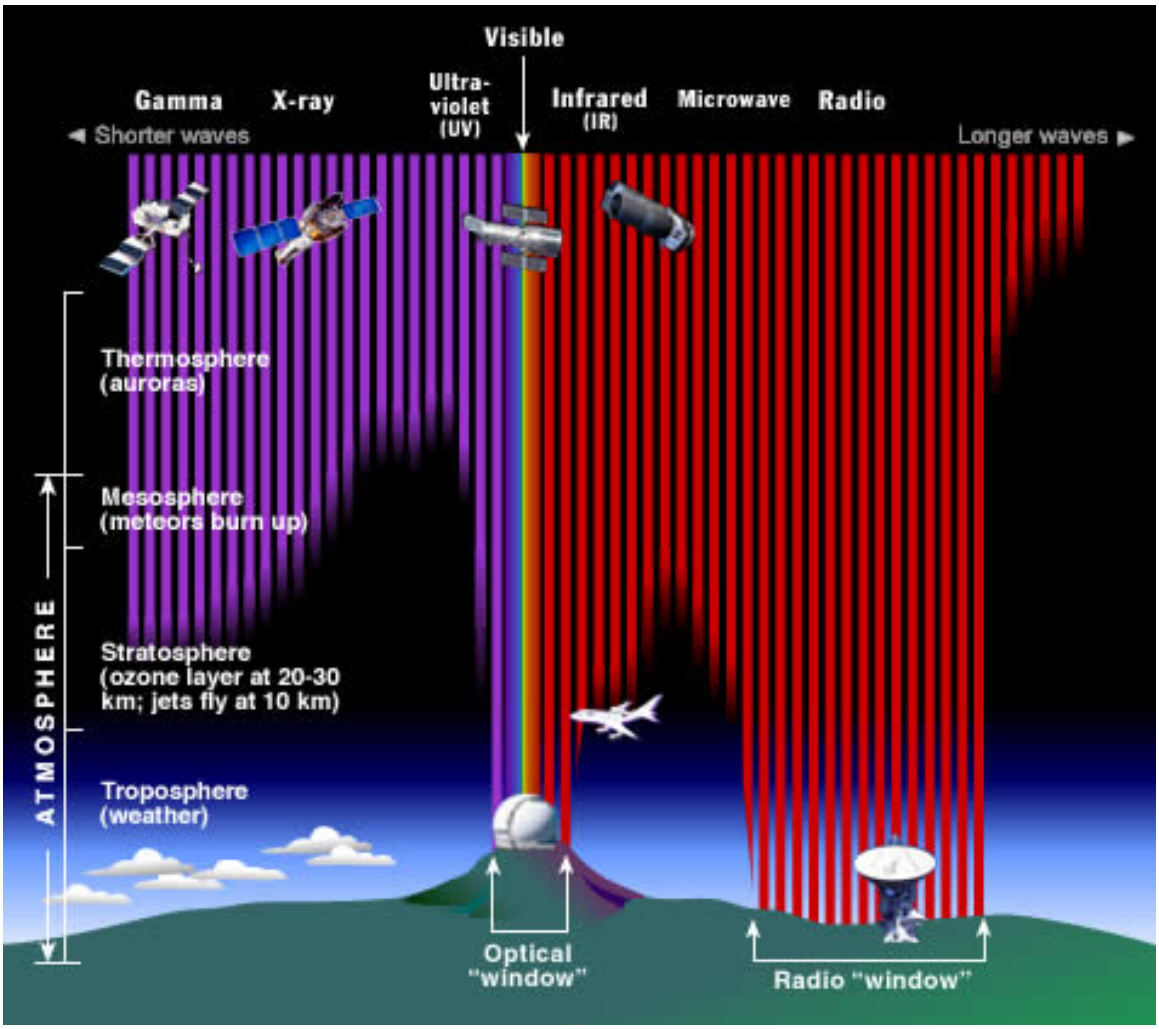


Figure 1.2: Various wavelengths of solar electromagnetic radiation penetrate Earth's atmosphere to various depths. Fortunately for us, all of the high energy X-rays and most UV is filtered out long before it reaches the ground. Much of the infrared radiation is also absorbed by our atmosphere far above 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.

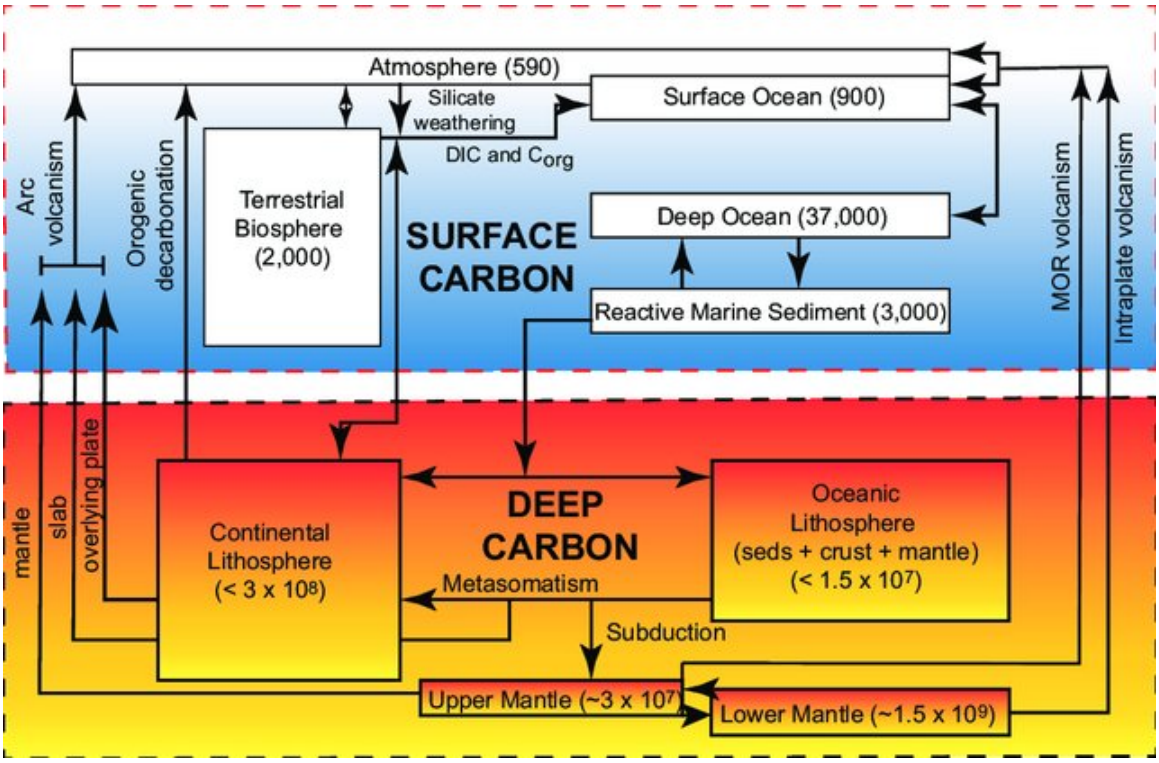


Figure 1.3: Carbon reservoirs and cycles in the Earth. The figure shows short-and long-term cycles; biosphere and geologic carbon reservoirs and fluxes, and the relative sizes and residence times (y axis) of respective carbon. Numbers in brackets refer to the total mass of carbon in a given reservoir, 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

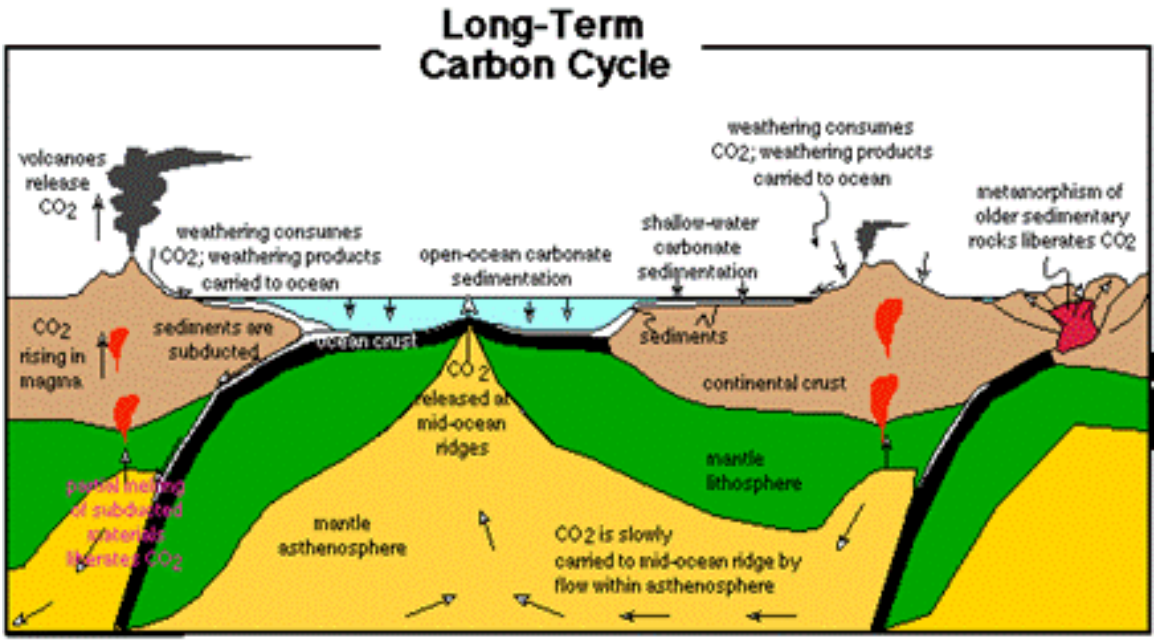


Figure 1.4: Schematic of the long-term carbon cycle (from Bice, 2001)

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

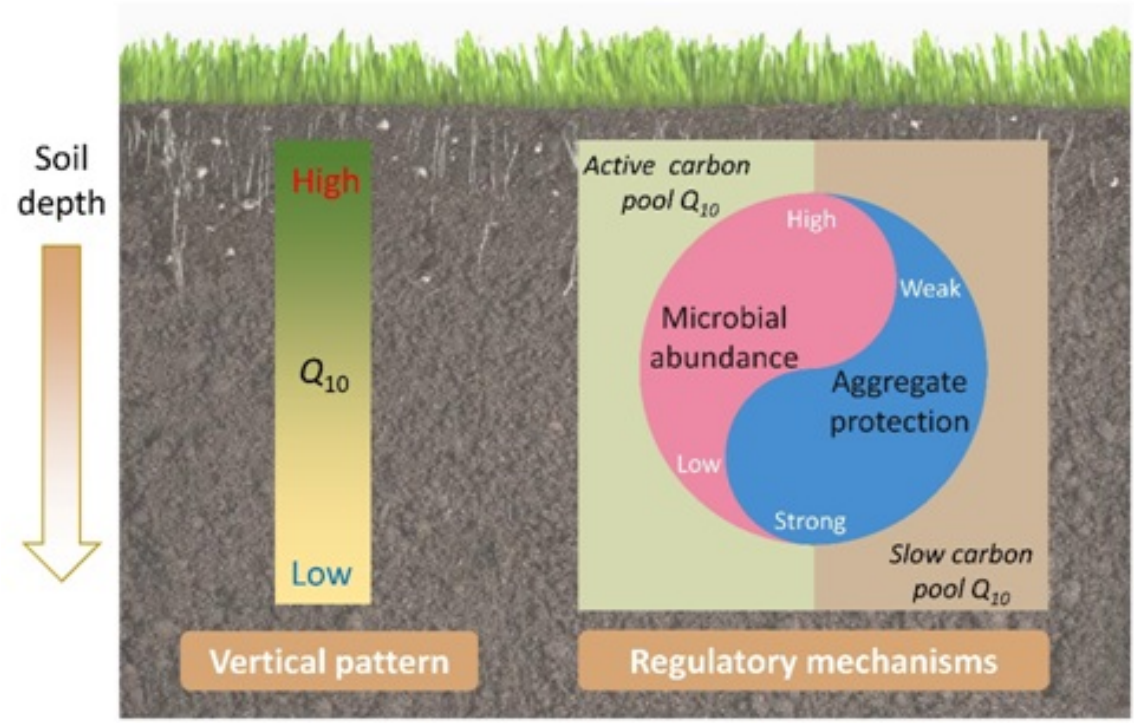


Figure 1.5: Regulatory Mechanisms of the Temperature Sensitivity of Soil Organic Matter Decomposition in Alpine Grasslands (Source: Qin et al. [2019], Institute of Botany [2021]).

```
## 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.

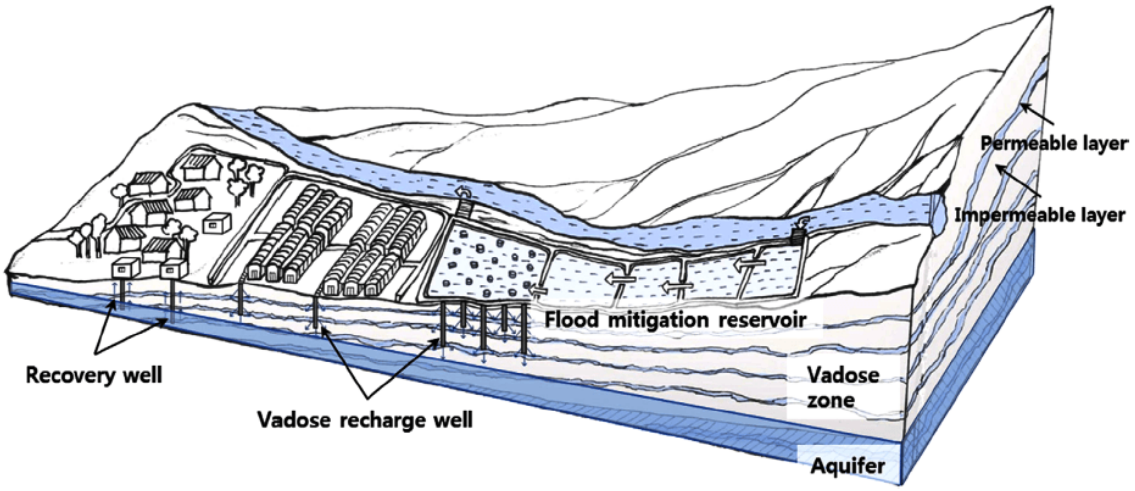


Figure 3.2: ... (Source: [Lee et al., 2017]).

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

Invasive Species

Soliel

[1]

5.1 Section Heading

[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.

Chapter 6

Nuclear Power and Nuclear Waste

6.1 Current and Future Energy Needs

Chapter 7

Air Pollution & Social Justice in Hong Kong

Neenah Vittum

7.1 Science of Air Pollution

7.1.1 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

7.2 Major Sources Use as geographical overview

7.2.1 General common sources of air pollution all over the world

7.2.2 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 8

Flood Pulse System in East Asia

Kristin Gabriel

8.1 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 9

Hydroelectric Dams in East Asia

9.1 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)

9.2 Conclusion

Chapter 10

Climate Change and Food Security in Myanmar

10.1 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

10.2 Conclusion

Reminders/Areas of Focus

Chapter 11

Disasters, Typhoons and Phillipines

Ian Horsburgh

11.1 What are Typhoons?

Chapter 12

Climate Change Adaptation and Infrastructure in Vietnam

Jay Scott

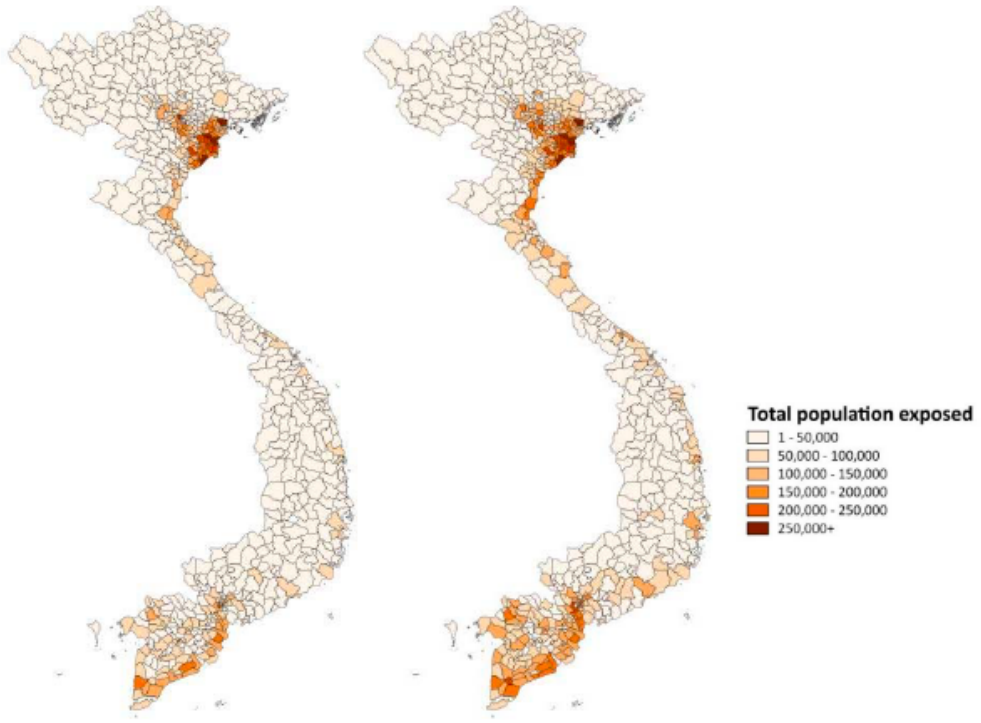
12.1 Introduction

As a low-lying, coastal nation with heavy dependence on its two river deltas, Vietnam is a country with severe risk factors for climate-related disaster. Even without the added effects of sea level rise, Vietnam frequently experiences typhoons during its wet season, at an average of 4-6 times each year (SCFF). Current dyke systems arent strong enough and their effectiveness will only worsen with increased storm surges (Garschagen et al). An increase in runoff could have a catastrophic impact on rural rice economies, with an estimated reduction in yields of 12% and 24% in the Mekong and Red River Deltas, respectively (Evers et al). Rural residents rely on the rivers as their main source of drinking water, and both rivers at risk from the construction of hydroelectric dam projects, saltwater intrusion, and increased demand for irrigation (Evers et al). Vietnams urban population is steadily on the rise as well, growing from 20% of the population to 30% from 1985 to 2009 (World Bank). This number is expected to continue to rise, as people migrate to Vietnams cities for economic opportunities, with estimates expecting cities to account for 57% of the countrys population by 2050 (Garschagen et al). This unprecedented increase in Vietnams urban population has the potential to overwhelm local governments, which have struggled with a simultaneous decentralization and tight control from Vietnams federal government (Garschagen et al).

12.2 Climate Change Impacts on Vietnam

12.2.1 Flooding

Most of Vietnam has a wet and dry season, bar the northernmost regions of the country. Unlike the four distinct seasons experienced in other parts of the world, Vietnams close proximity to the equator means its temperature rarely fluctuates, making the idea of summer and winter inadequate to describe conditions. Wet and dry are used as descriptors instead, and the seasons directly relate to the suns position over either the Northern or Southern hemisphere (Center for Science Education).



Map 6. Absolute exposure at the district level (total number of people in a district exposed), for a 25-year historical flood (left) and a 25-year historical flood under high climate change (right).

Figure 12.1: This map shows the number of people impacted currently in the case of a 25-year flood on the left, shows a future number of people impacted on the right

During the wet monsoon season, the warm air holds more water droplets, and flooding occurs along the coast and river deltas. Flooding is something that Vietnam has been adapted to over centuries. In the Mekong River Delta, there are a variety of housing types adapted to floods, including boat houses, floating houses, and stilted houses (Nguyen 2015). Farmers almost exclusively planted rice resistant to floods until the 1990s, when funding from the World Bank helped build dykes in order to produce a second rice crop during the rainy season (Nguyen 2015).

While these adaptations have proved sufficient in the past, they may not be enough to protect against current and future conditions. A 2018 study found that 33% of Vietnams population is currently exposed to a 25-year flood, and cautioned that climate change could increase this number of exposed to up to 46% (Bangalore 2018).Figure 12.1

Flooding can have a profound impact on health. Incidences of drowning are relatively low compared to indirect health effects, such as diarrheal and skin diseases (WHO 2004). In addition, Commune Health Services (CHS), an important part of Vietnamese healthcare, can become damaged during floods, worsening epidemics (WHO 2018). In urban areas, floods have a major economic impact, shutting down roadways and preventing people from leaving their homes (World Bank).

12.2.2 Drought

In addition to its wet season, Vietnam has a long dry season that is expected to become even more dry with the addition of climate change. While drought risk is everywhere, it is especially concentrated in Vietnams mountainous regions (cite).

Drought has a negative impact on human health, that is especially pronounced amongst children and young girls in particular. A 2001 study found that children aged 12-24 months during a drought were an average of 1.5-2cm shorter than children born during average conditions (Lohman 2015). A separate 2009 study found that women born during years with higher rainfall were taller and had higher academic achievement than those born under average conditions (Lohman 2015). This suggests that there are long-term effects of drought on children that continue after the rains return.

Many rural homes are constructed of highly flammable materials, such as the aforementioned stilted houses constructed using melaleuca trees, and fires can spread quickly during the dry season (World Bank).

Vietnams most important crop, rice accounts for 47% of all agricultural production and is very water intensive (World Bank). As a staple crop, many rural households' economic stability is highly dependent on the years harvest. Evidence shows that in areas most affected by the drought, yields dropped 40% under drought conditions (Lohman 2015). Those who plant successful rice crops that year benefit from rices higher selling price, but there is a net negative effect on rice growers (Lohman 2015). Aside from rice, aquaculture, specifically of catfish and shrimp, is important to rural economies and drought poses a risk to their cultivation (World Bank).

12.2.3 Sea Level Rise

Vietnams long coast makes it particularly susceptible to the consequences of sea level rise. The coastline has been rising at about the global average of 3mm per year (Huong). If this rate is stable, Vietnam is expected to experience 75 cm of sea level rise by the end of the 21st century (MONRE 2009). This will have wide ranging effects, one of the most damaging being saltwater intrusion [Hens et al., 2018] [Ref, Year]. Salinization occurs when sea water, with its high salt content, vertically infiltrates through soil and contaminates underground sources of fresh water (Hens 2018). A higher sea level will bring seawater higher up the water table, causing this effect. Figure 12.1

A 1 metre rise in sea level is estimated to affect 11 percent of Vietnams population and 5% of total land area (United Nations). To combat this, the government has invested 280 Million VAT into building and fortifying sea dykes (United Nations). A rise in sea level could increase the frequency and severity of floods (Huong).

12.2.4 Urbanization

As climate change forces people out of agricultural villages, more Vietnamese are migrating to cities. The growing proportion of urban Vietnamese poses an issue for infrastructure already vulnerable to weather events during the monsoon season. For example, the rapid development of former wetlands in Ho Chi Minh City has led to poor drainage, exacerbating flooding brought on by storms. The urbanization of rural areas can often damage local aquifers as new residents drill for drinking water. The urban poor are one of the most vulnerable populations to climate disaster as they often have substandard housing, and rely on jobs in the informal economy that come with varied levels of stability.

Figure 12.2: This graphic by the National Environmental Education Foundation visualizes the process of saltwater intrusion.

12.3 Current Adaptation Plans and Policies

12.3.1 Strengthening Barriers and Existing Infrastructure

The World Bank and United Nations Development Program have both allocated funds to improve and erect barriers in Vietnam. In 2009, the UNDP funded a $180 million dollar project to enhance climate infrastructure$ million specifically dedicated to erecting barriers like sea walls and dykes.

12.3.2 Implementing Effective Policy and Encouraging Collaboration

In addition to just improving physical infrastructure, the UNDP also allocated funds to an exhaustive review of existing environmental policy, especially in rural coastal communities. The UNDP identified several social obstacles to effective climate policy in Vietnam (SCFF).

Vietnams climate change policy is handled by three separate government agencies: the Ministry of Agricultural Development (MARD), the Ministry of Construction (MOC), and the Ministry of Natural Resources and the Environment (MONRE). Historically, there has been a lack of collaboration between the three agencies. Construction of climate-resilient infrastructure is handled by MOC, while natural disaster relief is the responsibility of MARD. Climate change preparedness and mitigation is under the scope of MONRE. These three agencies work, for the most part, independently of each other (Garschagen).

The UNDP identified that institutional knowledge of climate change was lacking, and that administrators were somewhat unwilling to integrate climate into their policy and operations. Local governments were also noted as being indifferent to climate change, not seeing it as a larger threat than already common monsoons and other extreme weather events.

12.3.3 Ecosystems Based Adaptation

Ecosystems Based Adaptation, also known as EBA, is an approach to climate adaptation that prioritizes strengthening existing ecosystems. In Vietnam, this usually means strengthening ecosystems to protect against floods, landslides, and land degradation (Nguyen et al). Mangrove forests have historically provided protection during storm surges and their revitalization could be a key part of Vietnams EBA. Additionally, forest conservation can aid in retaining soil nutrients and prevent landslides. EBA often comes with co-benefits that can be economic, sociocultural, and promote biodiversity. Despite the effectiveness and affordability of EBA, it is often overlooked in favor of new physical infrastructure. A lack of coordination between provinces and between the aforementioned MONRE, MOC, and MARD can make it difficult to effectively integrate EBA into policy.

Three Facets of Adaptation Policy

The Vietnamese government has outlined three approaches to climate change: full protection, adaptation, and withdrawal. Full protection is the use of physical infrastructure to completely insulate an area. This is seen as an option for important economic centers in cities or cultural landmarks. Adaptation is the prediction and acceptance of some climate-related losses, and the design of new systems compatible with a changed climate. Adaptation is important in the agricultural sector, as farmers find solutions to integrate climate change into their practices. Withdrawal is complete avoidance of climate events by vacating an area extremely at-risk for climate impacts. This tactic will likely be focused in more rural areas of Vietnam.

12.4 Case Studies in Two Vietnamese Cities

12.4.1 Can Tho

Can Tho is the largest city on Vietnams river delta, currently at a population of 1.3 million. The city sits at a low elevation, an average of only 60-80 cm above sea level. The pace of population growth has not coincided with an improvement in

12.5 Climate Vulnerable Groups in Vietnam

12.5.1 Women and Climate

Women in Vietnam are an especially climate-vulnerable group. 60% of Vietnamese women rely on agriculture as their primary source of income, compared to a little under 50% of men. Therefore, heavy rainfall and storms impact on agriculture is more severely felt (World Bank). Furthermore, women heads of households are on the rise in Vietnam, with many women being the sole person carrying the financial burden in their households. Evidence points to women being more likely to put other family members first during climate disasters, at the expense of their own well-being. Additionally, many women in Vietnam lack basic swimming skills as young girls are not encouraged to learn to swim. This leads many to die avoidable deaths in survivable flooding conditions (World Bank).

Children and Climate

Children are a climate-vulnerable group in Vietnam, not only because of the immediate threat of flooding, but also because of their still developing immune systems that are highly susceptible to water-borne illnesses that spread after floods. Childrens propensity for playing outside can expose them to pollutants in the air and water. Extreme weather events can interrupt schooling and impact the success of a child long-term.

Migration and Climate in Vietnam

Not only is climate a major driver of internal migration in Vietnam, it also exposes migrants to environmental hazards caused by climate change. As Vietnams agricultural sector continues to produce diminishing returns, many Vietnamese people are leaving the countryside for large cities, with the hope of securing financial opportunities less reliant on the environment. Still, many of these migrants are undocumented and therefore more likely to hold exploitative, dangerous, or unstable jobs in urban centers. Migrants often live in substandard housing that is extremely vulnerable to weather events. The poorly managed nature of urban sprawl in Vietnams cities can eliminate ecosystem services formerly provided by surrounding wetlands or forests.

Conclusion

Chapter 13

Waste Management for a Circular Economy

13.1 Life-Cycle

13.1.1 Collection

13.1.2 Transport

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

13.2 Biomimicry

13.2.1 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 14

Plastic and Packaging in Japan

14.1 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.

14.2 Plastic Pollution and Waste Management in East Asia

14.2.1 Statistics/comparisons

graphs and images will help with perspective

14.2.2 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.

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