Third Assessment Report on Climate Change and Cities (ARC3.3)

Case Study Template

Instructions

As an ARC3.3 Contributing Author / Case Study Author (CA/CSA), you will select a city (and its metropolitan area if appropriate and related climate change topic about which to write. ARC3.3 case studies are designed to provide a detailed and action-oriented analysis and suggest implementable strategies for cities. Please be sure to include specific examples, data, metrics where available, and cite your sources by creating a reference list and using hyperlinks.

Be sure to refer to the ARC3.3 Case Study Template on the next page for further information. When writing your ARC3.3 case study, use descriptive phrases to answer the template questions. Create headings throughout your case study to convey take home messages and separate sections/thoughts.

Case studies have a page length of 3 – 5 pages and between 1200 – 2000 words. Please use Microsoft Word or Google Documents. A case study can have more than one author.

Figures, Images, and Headings

- Case studies should include a total of 2 – 3 high resolution figure and images. Visuals must be open source (available to the public), or you own the photo rights, or you obtain written permission to use them. Figures and images should be at least 300 dpi.

- Please see *Cambridge University Press'* Formatting Instructions, located on page 4, for heading formatting.

Data

At the top of your ARC3.3 case study document, please include keywords, the city and/or metropolitan region's population size and area, climate zone (using the Köppen–Geiger climate classification system), latitude and longitude ranges, Human Development Index measurement, and Gross National Income (GNI) per capita at purchasing power parity (World Bank). If some of these variables are only available at national or regional rather than urban areas, please note this. These variables will be used to enhance the searchability of UCCRN's Case Study Docking Station.

Case Study Docking Station

Each completed ARC3.3 case study will be added to UCCRN's Case Study Docking Station (CSDS). The Case Study Docking Station is designed as a tool to inform research and practice by allowing cross comparisons of city case studies for a broad range of social, biophysical, cultural, economic, and political contexts. It includes over 100 city case studies covering a range of topics such as climate change vulnerability, hazards and impacts, mitigation and adaptation actions, and sector-specific themes such as wastewater and flood management. The case studies highlight climate change action, both mitigation and adaptation, by cities all over the world.

ARC3.3 Audiences

As state-of-the-art summaries of essential topics for climate change and cities, ARC3 is aimed at researchers and professionals as its primary readership. It has also been used in numerous courses worldwide as a primary text in undergraduate and graduate classes and will be used amongst program managers and professionals engaged in urban adaptation and mitigation.

Questions should be directed to UCCRN Coordinator, Maria Dombrov, m.dombrov@columbia.edu with a cc to uccrn.arc3@gmail.com.
Please include "ARC3.3 Case Study Question" in the subject.

<div align="center">

ARC3.3 Case Study Template

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Introduction (1-2 paragraphs)
- What are the key issues addressed by the case study, and why should we care?
- What are the conflicts, controversies, parties, and interests involved?
- Briefly explain context and drivers (existing, past/future factors, conditions, trends).
- *Insert image or figure to support your explanation*

Brief History (1 - 2 paragraph)
- When, why, how and by whom was the key issue initiated and evaluated? Provide data and key metrics where available.
- What is the current governance structure? Explain the relevant actors (individual and institutional), politics, and outcomes (policy, law, plans, funding, programs, etc.).
- Who/which communities does this key issue impact?
- *Insert image or figure to support your explanation*

Analysis, Evaluation, and Implementation (3-5 paragraphs)

- Provide a step-by-step process of proposing and/or implementing the strategy, policy, plan, design, program, etc. intended to address the key issue.
- What steps have various actors taken to resolve the conflicts created by the key issue? How effective have the solutions been thus far? Provide data and key metrics where available.
- What are the advantages and disadvantages of addressing the issue through this implementation strategy? Have other strategies been considered?
- How does this solution fit within larger Climate Action goals or targets (city-wide, nationally, or globally)?
- *Insert image of figure to support your explanation*

Future Implementation and Concluding Thoughts (1-2 paragraphs)

- If the key issue is still being resolved, what else is needed to achieve the solution(s)?
- What actors and instruments should be involved (professional, political, financial, legal)?
- What additional research should be completed?
- Are there lessons learned from addressing the key issue and developing implementation techniques?
- What elements of the proposed actions are potentially useful in other cities?

Example of Data Collection Protocol for All Cities

Provided by Lehmann et al., 2021, https://doi.org/10.1016/j.ocecoaman.2021.105784

Exposure and Vulnerability Elements	Potential Indicators or Metrics	Potential Sources	Rationale	Class		Sub-class			
				Exposure	Vulnerability	Economic	Social	Governance	Cultural
Population	Permanent population, tourist equivalent, peak season population	Records, satellite, local knowledge	Size of adaptation challenge	☐			☐		
Future Population Change	Increasing/decreasing numbers	Records, literature	Whether greater or fewer adaptations needed	☐			☐		
Impact of historic coastal and/or fluvial flooding	Hours/days downtime of key infrastructure, number of buildings impacted, km of roads and other transport facilities impacted	Records, local knowledge	Assist in design of adaptation measures		☐	☐	☐	☐	
Human Development Index (national)	Index	UNDP	Possible indicator of local capacity		☐	☐			
GNP/capita (probably national)	$US Purchasing Power Parity	World Bank	Possible indicator of local capacity		☐	☐			
Proportion of national population that is coastal	% population within selected distances from coast and within selected heights above MSL	Records, satellite, literature	To determine whether coastal adaptation is/will be high on the national agenda		☐		☐	☐	
Governance	Type	National and local records	Aid in determining adaptive capacity		☐			☐	
Relationships to larger governmental entities	Larger entities to which it is related or of which the settlement is a part	National and regional records	Measure of joint capacity to adapt		☐			☐	
Relationships to international entities	UN, national aid agencies, NGO	National, local and NGO records	Measure of capacity to adapt		☐			☐	

Built Infrastructure	Number and location of buildings, transport infrastructure, key assets e.g. wastewater treatment plants, water abstraction, airports	Records, literature	Ascertain the potential assets that are exposed	□		□			
Natural Capital	Changes in ecosystem services, e.g. loss of coastal defence due to mangrove loss, loss of local biodiversity, e.g. reducing fish stocks, loss of key plant species, loss of income from agriculture/fishing	Records, satellite, literature, National, local and NGO records	Determine if changes in habitats and/or biodiversity may impact the local wellbeing and/or economy	□		□			□
Available geographic/GIS data	Housing, population, elevation	Records, literature	Assist in planning	□	□		□		
Minority status	Ethnic group, religion, indigenous, with population numbers	National, local and NGO records	Measure of need to adapt: aid design of adaptation measures		□		□		
Historical areas	Area (ha), buildings	National, local and NGO records	A measure of benefits from protection	□		□	□		□
Environmental areas	Area (ha), type	National, local and NGO records	A measure of benefits from protection	□		□	□		□
Cultural areas	Area (ha), type, cultural value impacts e.g. cultural connection to place and history	National, local and NGO records	A measure of benefits from protection	□		□	□		□
Tourism areas	Area (ha), type	National, local and NGO records	Economic measure of benefits from protection	□		□	□		□

Example of Data Collection Protocol for Hazards Facing Coastal Towns and Small Cities

Provided by Lehmann et al., 2021, https://doi.org/10.1016/j.ocecoaman.2021.105784

Hazard Elements	Potential Indicators or Metrics	Potential Sources	Rationale	Temporality		
				Historic	Current	Future
Settlement location	Latitude/longitude; km from present and future shoreline; cm above present and future MSL; island settlement, island size.	Records, satellite, local data, Global Climate Models System, literature	Link to regional or local (if available) CC forecasts, assistance agencies' programs		□	
Köppen–Geiger climate classification system	Temperature and other data; future change of classification		Guide assessment of impacts and possible adaptation methods		□	□
Isostatic rebound	cm/year	Literature	Add/subtract from SLR forecasts	□	□	□
Subsidence	cm/year	Literature	Add to relative SLR forecasts	□	□	□
Local/regional mass density changes	SLR adjustments in cm	From Global Climate Models and literature	Adjust global or large region SLR data	□	□	□
Coastal erosion	Presence of coastal erosion mitigation management; degree of historic and future coastal erosion	Satellite, records, literature, local knowledge	To determine if the settlement is located on/near erodible coasts	□	□	□
Slopes and angles on or near the shore	Beach: km and slope; Ocean floor: near shore slope	Satellite, records, literature	Suggest/determine nature of impacts and suggest adaptation methods		□	
Located in tropical or other storm zone	Geographical location, number of days water temperature above 26 °C	Records, forecasts of changes	Nature and frequency of impacts		□	
Inland Rainfall	Present and future intensity and frequency, including potential for drought	Records or local knowledge, GCMs	Need for interior protection and drainage improvements		□	□
Inland rivers	Fluvial reach located within the boundaries of the settlement, catchment characteristics e.g. proportion urban/rural, volume increase in upper 3% of flows over time, and capacity of catchment to cope with the high intensity precipitation.	Hydrologic data, literature	Determine whether there is a threat from simultaneous coastal and fluvial flooding	□	□	□
Extent and likelihood of coastal and/or fluvial flooding	Number and intensity of storms; future forecasts, past tsunami events	Records, local knowledge, GCMs	Assist in design of adaptation measures	□	□	□
Air temperature	Heat wave frequency and severity	Records, local knowledge, GCMs	Determine whether extreme heat may be an issue	□	□	□
Ocean/Coastal Parameters	Data on acidity, temperature, currents, pollution, frequency of algal blooms	Records, local knowledge, GCMs	Determine whether changes in coastal waters may impact upon local ecology and/or habitats	□	□	□
Habitats	Area and health of local habitats e.g. coral reef, seagrass, mangrove, tundra, sand dune	Records, local knowledge,	Determine if there is changes in habitats that offer key ecosystem services	□	□	□
Groundwater salinization	Aquifer size, changes in extraction location, volume, and water quality	Records, local knowledge, literature	Assist in design of adaptation measures	□	□	□
Base Rock	Type, km depth and width	Records	Determine physical impacts through salinization		□	
Other non-coastal natural hazards	Presence of active volcanoes, susceptible to earthquakes, heatwaves	Records, local knowledge, literature	Assist in design of adaptation measures	□	□	□

Title (18 point font, bold, centred)

Author Name (10 point font) – *Affiliation* (10 point font, italic)

Abstract: Indent your abstract, and preface with the word "Abstract" in bold. This should be no more than 150 words in length. Use standard 11 point font. The main text can follow immediately on from the abstract.

1. A-level Headings (16 point font, bold)

Paragraphs should be written in a standard 11 point font. There is no need to indent the first line of a paragraph. The first paragraph in a section should appear on the line immediately below the heading.

Second and subsequent paragraphs should have a line space before them. Make sure that you use a Unicode typeface (Times New Roman or Arial are good examples) when writing. This is especially important for any non-standard characters, such as Greek or mathematical symbols.

1.1 B-level Headings (14 point font, bold)

All headings should appear on a separate line preceded by a line space to distinguish them from paragraphs and running text. They should be numbered decimally by section (see examples given in this guide). Any heading below C-level, if required, should be un-numbered.

1.1.1 C-level Headings (12 point font, bold)

Figures and tables can be cited simply in the main text as follows. Figure 1 would show an Elements cover design. The figure call-out has been placed below, along with the caption. Remember to supply your figures as a separate, high resolution file.

[Insert Figure 1 here]
Figure 1. An Element front cover design.

1.1.2 Information on Tables

Tables can be cited in the same way. Tables can be inserted directly into the manuscript using the Microsoft Word table function. Table captions should precede the table, as shown with Table 1. Column titles should be in bold.

Table 1. This is a sample table.

Column 1 Title	Column 2 Title	Column 3 Title
Data	Data	Data

D-level Headings, if Required (un-numbered, 12 point font, bold)

In the event that you use any quotations that are longer than 50 words in length, these should be displayed as an extract. These should be indented on both sides, and start on a fresh line. As the Elements author guide says:

> Permission is required for any third party material that you are using in your Element. Authors are responsible for sourcing permission for any such material. For the latest advice on what is needed and how you should go about obtaining permission, please see our online guide here. Note, additional permissions may be required for Open Access content.

You can then continue writing on a fresh, un-indented line after the extracted material. Ensure the extract is preceded and followed by a line space.