



**University of Toronto Scarborough**  
**Department of Physical and Environmental Sciences**  
**EES1136HS Climate Change Adaptation**  
**Wednesday 9-11 am, Winter 2022**

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Recurring Zoom Meeting link:  
<https://utoronto.zoom.us/j/86217590728>  
Meeting ID: 862 1759 0728  
Passcode: 044344

## 1. Course Details

### 1.1. Course Description

Climate change affects all sectors of society, natural ecosystems, and future generations. The impacts of climate change are becoming more visible, presenting a wide variety of risks to different sectors in society, including health, water, food, and infrastructure, among other. These impacts are affecting livelihoods of people and exacerbating pervasive inequalities. Adapting to climate change depends on the capacity of human systems to respond to the perceived risks of climate change and how these risks are managed. However, the complexity of climate change adaptation relies not only on how we as humans perceive and comprehend the risks posed by climate change impacts but also on the pervasive scope of climate change and the heterogeneity of its impacts. Additional challenges to climate change adaptation rely on the uneven distribution of responsibilities, resources, and capacities to respond to climate change between different levels of government, stakeholder groups and rights holder groups. Climate change adaptation relies in how climate change risks are managed before or after a climate change impact has taken place. (IPCC 2014a, b)

This course asks: What is climate change adaptation and what agency do we have against climate change risks? How can human systems adapt to climate change? How are climate change risks perceived, communicated, and managed? What are the complexities and challenges in adapting to climate change? How does one prepare a climate change adaptation plan? How do we monitor and

evaluate climate change adaptation actions? And how adaptation can decisions be made when resources are constrained? In this course students will understand what climate change adaptation entails at different governance levels and learn the required skills that a climate change adaptation expert requires. Moreover, the course also focuses on building critical thinking, research and writing skills.

## 1.2. Course Objectives

Upon completion of this course, students should be able to:

- Understand key concepts of climate change adaptation.
- Understand climate change impacts in previous years.
- Understand decision-making processes to assess and manage climate change risks.
- Develop a climate change adaptation plan for a municipality.

## 2. Course evaluation

### 2.1. Class participation

Given the complex nature of the topic class participation is highly recommended. We may also be hosting guest speakers, who will bring their knowledge and experience to bear on course topics; the content of all lectures will be open to examination (midterm and final).

### 2.2. Assignment 1: Gap analysis – Informing the development of a city climate change adaptation plan

For this assignment, students will perform a gap analysis to understand the needs and constraints of a city that intends to develop a climate change adaptation plan. This gap analysis requires to perform a literature review of primary and grey literature. This assignment will be the basis for assignment 2.

### 2.3. Assignment 2: Report – Informing the development of a city climate change adaptation plan

Building upon the gap analysis (assignment 1), students will develop a report meant to inform the previously selected city for the development of a climate change adaptation plan. Students will use the ICLEI Framework (ICLEI 2010) as guidance for the development of the report. The report must respond to the specific needs and constraints for the selected city and should be done from the perspective of your specialty and expertise.

### 2.4. Examinations

The midterm will be based upon all the material covered in the lectures prior Reading Week. It will also cover the required reading “The Discovery of Global Warming” Weart (2008). The final examination will take place during the regularly scheduled examination period following the end of the term. It will cover the material covered in the lectures, including that of guest

lecturers. Both the midterm and final exam will follow a take home format (see Table 1 below for due dates).

Table 1 Course evaluation components, points, and due dates

Course Component	Points	Due
Class participation	05%	Various dates
Assignment 1: Gap analysis – Informing the development of a city climate change adaptation plan	20%	February 9
Take home Midterm	20%	February 28
Assignment 2: Report – Informing the development of a city climate change adaptation plan	30%	April 06
Take home Final exam	25%	April 15

## 2.5. Readings

For the midterm:

Weart, Spencer R. 2008. *The discovery of global warming*. Cambridge, Massachusetts: Harvard University Press. Available online at the University of Toronto Library (online).

For the gap analysis and the climate change adaptation planning report:

ICLEI, 2010. *Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation*, Toronto, Canada. Available at: <https://icleicanada.org/project/changing-climate-changing-communities-guide-and-workbook-for-municipal-climate-adaptation>

Other suggested readings will be posted on Quercus throughout the course.

## 2.6. Handing in Your Assignments:

All assignments and exams for this course are to be submitted via Quercus as either Word or PDF files.

## 2.7. Extensions

Students **MUST** submit a request for extension **in ADVANCE** of the deadline in order to receive a decision. For extensions of time beyond the examination period you must submit a petition through the [Office of the Registrar](#).

Please follow the University of Toronto procedure to be completed in order to be considered for academic accommodation for any course work such as missed tests or late assignments. Verification of Student Illness or Injury forms can be found on the [Office of the Registrar's webpage](#).

## 2.8. Missed Term Work

Late assignments will be subject to a late penalty of 5% per day (including weekends) of the total marks for the assignment. Due dates for the assignment are posted in Table 1 above.

## 3. Academic Integrity

### 3.1. Cheating and plagiarism

University of Toronto Code of Behaviour on Academic Matters states that "*it shall be an offence for a student knowingly: to represent as one's own any idea or expression of an idea or work of another in any academic examination or term test or in connection with any other form of academic work, i.e., to commit plagiarism*" For accepted methods of standard documentation formats, including electronic citation of internet sources please see the University of Toronto writing website at: <http://advice.writing.utoronto.ca/using-sources/documentation>

The full Code of Behaviour regulations could be found from consulting: <https://www.sgs.utoronto.ca/policies-guidelines/academic-integrity-resources/>

Normally, students will be required to submit their course essays to the University's plagiarism detection tool (Original) for a review of textual similarity and detection of possible plagiarism. In doing so, students will allow their essays to be included as source documents in the tool's reference database, where they will be used solely for the purpose of detecting plagiarism. The terms that apply to the University's use of this tool are described on the Centre for Teaching Support & Innovation web site (<https://uoft.me/pdt-faq>).

### 3.2. Material, recordings, and use of intellectual property

The presentations and recordings are intellectual property and only meant for the EES1136 class purposes. Sharing and/or redistribution of the course material (e.g., presentations, documents, recordings, etc.) is expressly prohibited.

Because recordings will be provided for all lectures, students may not create additional audio or video recordings without written permission from the instructor. Permission for such recordings will not be withheld for students with accommodation needs.

This course, including your participation, will be recorded on video and will be available to students in the course for viewing remotely and after each session.

Course videos and materials belong to your instructor, the University, and/or other source depending on the specific facts of each situation, and are protected by copyright. In this course, you are permitted to download session videos and materials for your own academic use, but you should not copy, share, or use them for any other purpose without the explicit permission of the instructor.

Students violating this agreement will be subject to disciplinary actions under the Code of Student Conduct. For questions about recording and use of videos in which you appear please contact your instructor.

#### 4. Equity, diversity, and inclusion

The University of Toronto is committed to equity, human rights and respect for diversity. All members of the learning environment in this course should strive to create an atmosphere of mutual respect where all members of our community can express themselves, engage with each other, and respect one another's differences. The University of Toronto does not condone discrimination or harassment against any persons or communities.

#### 5. Accessibility and Communication Policies

##### 5.1. Accessibility

Students with diverse learning styles and needs are welcome in this course! In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. I will work with you and AccessAbility Services to ensure you can achieve your learning goals in this course. Enquiries are confidential. The UTSC AccessAbility Services staff are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or [ability@utsc.utoronto.ca](mailto:ability@utsc.utoronto.ca)

##### 5.2. Writing and English language

As well as the faculty writing support, please see English Language and writing support at University of Toronto: <http://www.sgs.utoronto.ca/currentstudents/Pages/English-Language-and-Writing-Support.aspx>

Students have commented that they found the latter address extremely helpful for writing term papers.

The following are also useful:

Sylvan Barnett, A Short Guide to Writing About Art. 5-7th edition (New York: Harper-Collins, 1997)

William Strunk Jr., E.B. White. The Elements of Style (New York: MacMillan Publishing)

##### 5.3. Communicating With You

The best way to communicate with me is during office hours. However, I also respond to student emails within two business days (Monday-Friday) and within business hours (9am-5pm). Please note that emails sent to me Friday after 5pm and during the weekends will be responded to on Monday during business hours.

#### 6. Course Schedule

Date	Topic
January 12	Course introduction, climate change adaptation key concepts and agency
January 19	Climate change impacts in review and introduction to the ICLEI Framework
January 26	Adapting to climate change – dynamic knowledge, risk perception, and risk management
February 2	Guest lecture: Dr. J. I. MacLellan - Decision systems and risk assessment (ICIMOD)
February 9	Decision making in climate change adaptation <i>Due: Assignment 1: Gap analysis – Informing the development of a city climate change adaptation plan (February 9)</i>
February 16	Adaptation needs and options
February 23	Reading week
March 02	Climate change adaptation dimensions and planning: Is climate change adaptation local or global? <i>Due: Take home midterm (February 28)</i>
March 09	Knowledge applications - Adaptation opportunities, challenges, and constraints
March 16	ICLEI Framework Worksheets ws1-8
March 23	ICLEI Framework Worksheets ws9-17
March 30	Gender mainstreaming in climate change adaptation and loss and damage
April 06	Climate change adaptation pathways <i>Due: Assignment 2: Report – Informing the development of a city climate change adaptation plan (April 06)</i>
April 13	<i>Due: Take home final (April 15)</i>

## Assignment 1: Gap analysis – Informing the development of a city climate change adaptation plan

**Value: 20% of overall mark**

**Due: February 09, 2022**

**Length: 6-7 pages**

**Formatting requirements: Times New Roman, single spaced, 12-point font, 1-inch margins. An academic writing style should be used for this assignment.**

### **General directive:**

Climate change represents one of the most profound environmental challenges facing modern society. To meet this challenge, mitigation and adaptation have been identified as the two fundamental responses that are available to society, with preference traditionally directed towards mitigation efforts so that we might forestall climatic changes outright. Unfortunately, it is becoming increasingly clear (IPCC 2014a, b, 2018) that we are already committed to dramatic changes in climate which will impact a broad range of environmental and human systems. By extension therefore, society is already committed to an adaptive response, the nature of which is open to interpretation.

Adaptation (CCA) represents an ‘adjustment(s) in natural or human systems’ to actual and/or expected climatic stimuli and their effects, whose purpose is to minimize harmful, and/or maximise beneficial opportunities (IPCC 2001). Identified as a priority of national and international organizations, as codified in the United Nations Framework Convention on Climate Change (United Nations 1992), the ambiguity and inclusivity of the concept hints at inherent difficulties in its’ operationalization. This project is anchored in the assumption that the ability to develop and implement environmental solutions requires actual exposure to the challenges associated with their development and implementation.

For this assignment, students will choose a specific city (within Canada or abroad) and support their efforts in the development of a Local Climate Change Adaptation Plan. Fundamental to this challenge, is the identification of an entry point through which the student can ‘support’ these efforts. The manner in which the student chooses to support the local community thus represents a large component of this assignment. Students will effectively preform a gap analysis with respect to the adaptation planning needs of a selected city and then respond to those needs in the most efficacious manner possible given institutional and resource constraints.

The gap analysis is essentially a living document which you will update throughout the remainder of the term, and which will inform your final climate change adaptation plan (i.e., assignment 2).

The gap analysis (20% of course grade) should be between 6-7 pages (single spaced) and should contain the following components:

**Area of interest:** Select a city and describe why you have selected this location for as the focus of your climate change adaptation plan.

**Main impacts and vulnerabilities to climate change:** Describe the main climate change vulnerabilities and impacts of the selected city. It is very likely that scarce information is available on the impacts and vulnerabilities to climate change. For this reason, the gap analysis should be supported by a review of primary and grey literature. News media articles can also be used as supporting material, but these are only optional (i.e., news media articles are not mandatory). In other words, primary and grey literature should be prioritised.

**Challenges and concerns:** Describe what are the major challenges and concerns that may hinder the development, implementation, and progress of the climate change adaptation plan. For this, think about the institutional, knowledge, or resource constraints and challenges that need to be considered.

**Equity and inequality:** Briefly describe equity and inequality challenges in the selected city. Use an intersectional lens as guidance to disaggregate who are the most vulnerable within the selected city.

**Key stakeholders and rights holders:** Define and briefly describe who are the key stakeholders and rights holders within the selected city. This is not to be meant an extensive list, but only a mention of who should be the key stakeholders and rights holders responsible and (or affected) for (by) the development and implementation of the climate change adaptation plan. You can use Worksheet 1 Stakeholder Identification and Worksheet 2 Building an Adaptation Team from the ICLEI Framework (ICLEI 2010) as guidance.

**Previous studies, adaptation plans and measures:** Briefly describe if previous studies on climate change adaptation have been undertaken for the selected city. Additionally, describe if there are any existing adaptation plans for the selected city and if adaptation measures have been previously attempted or deployed.

**Addressing the first three ICLEI milestones:** Describe briefly how your plan will address the first three milestones of the ICLEI framework based on the findings of your gap analysis for the selected city.

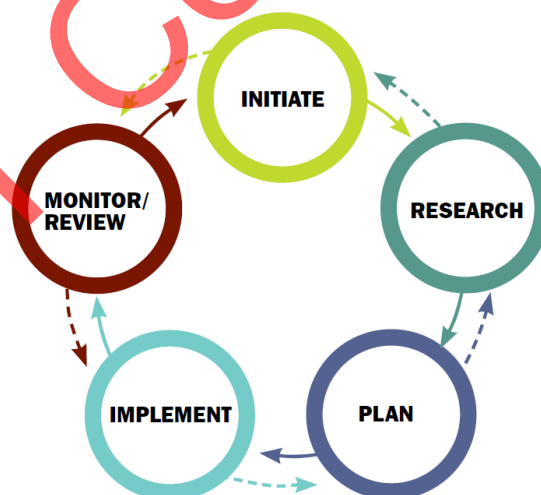


Figure 1 ICLEI Milestone Framework (ICLEI 2010)



**Milestone 1 Initiate:** The first milestone is meant to start the process of planning for adaptation. Within this milestone, communities will identify possible internal and external stakeholders that should be part of a climate change adaptation team. From here they will assess their existing knowledge on how regional climate is changing and begin to brainstorm anticipated climate change impacts, positive and negative, relevant to their community. As part of this milestone, it is important to establish political support for the process and identify a climate change champion to lead your community's efforts and/or help keep momentum for the process.

**Milestone 2 Research:** The second milestone is meant to further develop your community's understanding of climate change impacts and the major service areas which are likely to feel these impacts most acutely. Within this milestone you will scope the climate change impacts for your region and conduct both a vulnerability and risk assessment.

**Milestone 3 Plan:** Based on the impacts previously identified, the third milestone provides guidance on how to establish a vision and set adaptation goals and objectives, identify adaptation options, and examine possible constraints and drivers to action. From there you will begin drafting your Adaptation Action Plan, within which you will establish baseline data, address financing and budget issues, create an implementation schedule, determine who is responsible for implementation, and estimate how implementation progress will be measured and evaluated. With this information you will then finalize your Adaptation Action Plan.

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## Assignment 2: Report – Informing the development of a city climate change adaptation plan

**Value: 30% of overall mark**

**Due April 06, 2022**

**Length: 3500-4500 words without references**

**Formatting requirements: Open format. The plan should use a writing style as if it was informing and guiding decision-makers.**

### **General directive:**

This assignment is meant to think how a consultant would attend to the needs of a city. The previously selected city (assignment 1) wants to develop a climate change adaptation plan and has hired you to develop a report—based on your previous gap analysis—to inform the directions that could be taken by the city to develop a climate change adaptation plan. The city wants to use the ICLEI Framework (guide and worksheets) to develop their plan. The report that you are going to develop is going to provide direction to the city in how they could produce their climate change adaptation plan using the ICLEI framework. The report to inform the climate change adaptation plan should respond specifically to milestones 1, 2, and 3 of the ICLEI Framework (ICLEI 2010) and needs to be supported by using the worksheets of the ICLEI Framework (only those applicable, more information below). With this report, you should inform the city what information already exists (e.g., climate change impacts, vulnerabilities, policies, tools, plans, actions), what knowledge gaps exist (e.g., vulnerabilities), what challenges and constraints exist and should be considered by the city, and how would a climate change plan could look like (Milestone 3).

It is highly likely that, as a professional, you will be required to quickly assess the needs of your collaborators\clients and identify how your specific skill set can be utilized to meet their mandate, goals, and/or objectives. The ICLEI approach is meant to frame this process in a high level and inclusive manner which is one of the major advantages of the framework. But its' generality has also been identified as one of the primary shortcomings of the system. ICLEI itself makes reference to the plethora of valid, and often more thorough methods and approaches:

*“The purpose of the guide is to convey a straightforward approach for how municipalities can investigate climate change impacts at a general level and devise strategies for addressing those impacts. There are many other guides available which take various approaches to adaptation planning. For instance, there are guides specific to risk and infrastructure (i.e. A Risk-Based Guide for Local Governments in British Columbia), climate change and health (i.e. Human Health in a Changing Climate), or profession specific (i.e. Engineers Canada or the Canadian Institute of Planners). This guide does not intend to supplant those resources, rather it is intended to provide a holistic process for how local communities can address the array of impacts likely to occur as a result of climate change. ICLEI encourages users of this guide to also utilize existing sector or impact specific resources to further advance their adaptation efforts.” (ICLEI 2010, 5)*

In other words, the ICLEI guidebook is a very broad framework that cannot be comprehensively implemented without interpretation. Its' utilization presumes that you are able to make allowances for the inherent shortcomings of the method(s). It also presumes that methodological and resource choices are made in accordance with the needs of the primary adaptive agent. The guidebook makes

it readily apparent that it may be necessary to utilize tools, data and expertise that exist outside its' content.

**Milestone 1 Initiate:** The first milestone is meant to start the process of planning for adaptation. Within this milestone, communities will identify possible internal and external stakeholders that should be part of a climate change adaptation team. From here they will assess their existing knowledge on how regional climate is changing and begin to brainstorm anticipated climate change impacts, positive and negative, relevant to their community. As part of this milestone, it is important to establish political support for the process and identify a climate change champion to lead your community's efforts and/or help keep momentum for the process.

**Milestone 2 Research:** The second milestone is meant to further develop your community's understanding of climate change impacts and the major service areas which are likely to feel these impacts most acutely. Within this milestone you will scope the climate change impacts for your region and conduct both a vulnerability and risk assessment.

**Milestone 3 Plan:** Based on the impacts previously identified, the third milestone provides guidance on how to establish a vision and set adaptation goals and objectives, identify adaptation options, and examine possible constraints and drivers to action. From there you will begin drafting your Adaptation Action Plan, within which you will establish baseline data, address financing and budget issues, create an implementation schedule, determine who is responsible for implementation, and estimate how implementation progress will be measured and evaluated. With this information you will then finalize your Adaptation Action Plan.

In addition to the ICLEI guidebook, worksheets are provided as supporting guidance and each worksheet contain a series of guiding questions and examples that will assist in informing each of the three milestones. **As minimum, your report should also be guided<sup>1</sup> by the following worksheets:**

Worksheet 1 Stakeholder Identification

Worksheet 2 Building an Adaptation Team

Worksheet 3 Taking a First Look

Worksheet 6(a) Recording Climatic Changes

Worksheet 6(b) Refining Impact Statements and Identifying Service Areas

Worksheet 7 Conducting a Vulnerability Assessment

Worksheet 8 Conducting a Risk Assessment

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<sup>1</sup> The worksheets contain a variety of questions and templates. The purpose of this exercise is to critically think how you could use the questions, templates and other guidance provided in the worksheets. In other words, the worksheets are only meant as an additional support, but you, as a professional, need to identify how to use this support accordingly. For example, if you do not have the information required to answer a question from the worksheets, then that could mean that there is a knowledge gap that requires attention by the city. The final report does not need to use every template or every question in the worksheets, only those that are necessary or applicable. The worksheets in the end are not a standard that requires to be followed step by step; the worksheets are an additional support, and you should use it as you deem necessary.

Worksheet 9 Establishing a Vision and Setting Goals and Objectives

Worksheet 10 Identifying Adaptation Options

Worksheet 11 Identifying Drivers and Constraints

Worksheet 12 Using Indicators and Creating a Baseline

Worksheet 13 Drafting an Adaptation Plan

As mentioned above, the assignment is open format, but it has to follow a logical sequence and use the resources provided by the ICLEI Framework (guide and worksheets) accordingly. Moreover, the report should be meant to guide the responsible stakeholders, thus, writing style should be written in a neutral tone. The main audience for your report on climate change adaptation planning are decision makers and politicians.

### **Evaluation Criteria**

The following criteria will be used to evaluate each component of your work. Check the syllabus for the weighting of the project's components and due dates:

- The student chose an appropriate means of facilitating and augmenting the development of a city climate change adaptation plan within the broader theoretical context of adaptation science. 35%
- The student has demonstrated her or his own thinking and analysis by integrating ideas or examples from the literature and other information sources, rather than simply following planning protocols that are outlined within various guidebooks. 25%
- The student has presented relevant, reliable literature on the topic, and augmented that information with credible information sources. 25%
- The information is presented in a clear, interesting, and dynamic way. Good written assignments have clear paragraphs with topic sentences, logical progression of ideas, and concluding statements. The student uses correct grammar, spelling, and word choice in their written, oral or online work. Words specific to a certain discipline are defined. All sources are fully cited in a consistent format. Acronyms are defined (written out in full) when first used. 15%

## References

- ICLEI. 2010. *Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation*. Toronto, Canada.
- IPCC. 2001. *TAR Climate Change 2001: Impacts, Adaptation, and Vulnerability*.
- IPCC. 2014a. *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. edited by C.B. Field, V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L. White. Cambridge, United Kingdom and New York, NY, USA: Cambridge University Press.
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- IPCC. 2018. *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*. edited by Masson-Delmotte, P. Zhai V., H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor and T. Waterfield.
- United Nations. 1992. *United Nations Framework Convention on Climate Change*. edited by General Assembly United Nations. New York.
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