

ESM 245: Cost Benefit Analysis

Fall 2024, Monday/Wednesday 8:00-9:15 (Bren 1424)

Professor: Christopher Costello

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Office Hours: Mondays 4:30-5:30 (4410 Bren Hall)

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Office Hours: Tuesdays 12:00-1:00 (3526 Bren Hall), Tuesdays
4:00-5:00, Thursdays 2:00-3:00 (1520 Bren Hall)

Overview

Solving environmental problems requires making deliberate interventions. How can a government agency, NGO, or private company decide between alternative interventions? And how can we look back at past interventions and know which ones were successful? In short: how do you know how to solve an environmental problem?

Cost-Benefit Analysis (CBA) is an approach to compiling, analyzing, and comparing the costs and benefits of environmental interventions. These include “market” costs and benefits, which are generally easy to quantify, and “non-market” costs and benefits, which are harder to quantify. The CBA approach is a rigorous, transparent, repeatable, and open source approach to doing this kind of evaluation of the tradeoffs between costs and benefits of alternative interventions (including no intervention at all).

CBA is not just one thing. To evaluate an intervention, costs and benefits have to be measured; relevant parties determined; timelines decided; risk accounted for, and discount rates selected. To understand these decisions, this course will cover the underlying theory of social decision-making based on a comparison of economic costs and benefits. We will consider numerous applications in the context of environmental and natural resource management, including your own Group Projects. We also will read the peer-reviewed literature and recent US government guidelines on key issues in cost-benefit analysis. This course will build on what you have already learned in the Bren MESM program, but will delve more deeply into many challenging topics and will focus on applying the knowledge to real-world problems.

This will be a **technically challenging course and will use computer programming** (for most of you, in the language R) to help perform complicated calculations. I will assume you are proficient in R (you can start up R, write a program on your own, read others' code, lookup solutions to coding problems, and that you know how to turn math from a whiteboard into code in a computer). If you are not proficient in R, you will need to become proficient to be successful in this course.

Students in ESM 245 will:

- Learn the conceptual foundations of cost-benefit analysis,
- Acquire the skills necessary to conduct the components of an original and competent cost-benefit analysis,
- Understand how to interpret the results and validity of cost-benefit analyses conducted by others, and
- Gain an appreciation for the potential advantages and disadvantages of cost-benefit analysis.

Readings

We are fortunate to be able to draw on very recent developments in CBA and US federal government guidance on environmental CBA. The main reference is:

- *Circular A-4* (November 2023). "Regulatory Analysis" (A guide for cost-benefit analysis by US government agencies)

We will also draw from a classic CBA resource:

- *Cost Benefit Analysis and the Environment: Recent Developments*, David Pearce, Giles Atkinson, and Susana Mourato, OECD, 2006.

PDFs of these resources are available on Canvas. You will also have supplemental readings from other sources that will be posted on Canvas. The goal is to provide you with readings that will be useful for this course and also serve as a resource for your future career.

Attendance and professional conduct

You all have opportunities and demands on your time other than ESM 245. That said, you will get more out of this class if you are a regular and active attendee. I expect you to conduct yourselves professionally at all times. That includes showing up on time to all classes, being respectful to your classmates/TA/me, being prepared, taking responsibility for knowing what is due when, being honest, etc.

Personal laptops are encouraged when we are conducting in-class work (for example, if we are coding together). But during lecture time, I ask that you keep your laptops closed. I have found that this increases student engagement, comprehension, and questions during lecture.

Office hours for Prof. Costello will be held in his office (4410 Bren Hall), and Mauricio's office hours will be held in 3007 Bren Hall. Please attend these sessions if you have questions. Should you wish to discuss something in private or you absolutely cannot attend during the scheduled office hours, send an email to schedule another time.

Grading

Your course grade will be based on short assignments, a term project, and one exam.

Short Assignments (50% of final grade): There are a total of 5 short assignments in this class. You will have about one week to complete each assignment. You may work in groups of up to 3 (if you do this, please include all co-authors' names on one submission; you will all receive the same grade). Assignment due dates are firm. The **penalty for a late submission** is 50% of the total possible points. If it is more than one week late, you will receive a zero.

Term Project (25% of final grade): You will conduct a term-long project that focuses on some aspect of cost-benefit analysis, applied to a real-world problem you care about. The topic you choose to focus on is entirely up to you! Typically, students will focus on some aspect of their MESM group project, but this is not required. There are 3 deliverables for your term project: (1) Early in the term you will propose the problem you choose to focus on (5% of final grade), (2) Late in the term, you will submit a written summary of what you found in your term project (10% of final grade), and (3) Late in the term you will present your findings to the class (in a 5 minute presentation; 10% of final grade).

Final Exam (25% of final grade): There will be a closed-note, closed computer final exam on the last day of class that will test you on the material covered in the course.

You are expected to attend all lectures (unless you have cleared it with me prior to class). If you miss a lecture without approval, your grade will drop by 5% (for each absence).

Class Schedule

Class meets regularly on Monday and Wednesday from 8:00-9:15 with Professor Costello teaching, with a few exceptions:

- Wednesday, October 9 we will have a guest lecture by Professor Andrew Plantinga on establishing causality in cost benefit analysis
- Monday, November 11 is a University holiday so there is no class
- Monday, November 25 (Thanksgiving week) is an optional class where Mauricio will help advance your term project and answer questions about the final exam
- Wednesday, November 27 (Thanksgiving week) there will be no class. Please use the time to catch up on your term project or studying.
- Monday, December 2: In-class presentations of your term project
- Wednesday, December 4: In class final exam
- Friday, December 6: Written report of term project is due