# 14. An introspective essay on the virtues of teaching environmental economics to business students

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## PREFACE

The following is one of the stand-out memories from my early university life: It was the second semester of my undergraduate studies in the United States. I was sitting in the middle of a small classroom with about 15–20 other students. A charismatic professor spoke energetically while drawing graphs and scribbling down equations on the blackboard. As an international student, I still was not entirely used to the English-language setting. I knew I had to pay close simultaneous attention to the blackboard and what the professor was saying, while taking notes that would make sense to me afterward. The lecture was high-paced and obviously very important. I recall having a distinct fear of missing out on its essence. At the same time, it was deeply fascinating. I wanted to understand it all. Two students in front of me apparently did not share my state of mind, chatting away loud enough to bother both the teacher and other students in the classroom. Suddenly, somebody shouted: "*Shut the h*** up!*". The room went completely silent. Everything seemed in slow motion. My Norwegian friend to the left looked shell-shocked. The girl on my right gave a light nervous chuckle. Then, the two disruptive students turned around with red faces and annoyed stares. Lastly, the professor's eyes scanned the room, made eye contact with me, let out a faint smile of approval, and said: "*Thank you!*". The class was international economics. The lecture topic was comparative advantage. As it turned out, I had already been captured by the power of economics.

## INTRODUCTION

It should be evident to anyone with even the most rudimentary familiarity that the science of economics has a lot to offer business students conceptu-

ally, analytically, and empirically. At the heart of economics is the notion of scarce resources and their optimal usage, whether the analytical perspective is the individual consumer, a corporate division, a multinational conglomeration, a non-governmental organization (NGO), or society. In layperson's terms, optimization means doing the best as measured against some overall decision-making criterion or objective. Limited resources implies that choice comes with unavoidable sacrifices, or what economists refer to as *opportunity costs*.

For example, a farmer may seek to maximize net income from a plot of cropland. In doing so, different input configurations influence the crop's size, quality, and expected revenues. However, different input configurations imply different cost profiles. Boosting the expected harvest means incurring higher investment and operating costs. Furthermore, the farmer will likely have multiple plots of land and may face financial constraints limiting total expenditures on equipment, raw material, and labor hiring. Hence, *full* optimization requires simultaneously looking at production decisions on multiple plots of land. Further complications arise if some parts of the farmer's property can be converted into alternative revenue-generating economic activities, for example, agritourism, or the farmer has attractive outside employment opportunities.

The modern science of economics offers a toolbox of concepts, analytical models, and empirical approaches for addressing optimal decision-making in the above example and similar situations. In the famous words of John Maynard Keynes: "The Theory of Economics does not furnish a body of settled conclusions immediately applicable to policy. It is a method rather than a doctrine, an apparatus of the mind, a technique of thinking which helps its possessor to draw correct conclusions." The essence of economics lies in uncovering trade-offs, i.e., identifying and quantifying benefits and costs (i.e., the pros and cons) of different courses of action so that the decision-maker can make the best possible (optimal) choice, given contextual objectives and constraints. The analytical logic of optimization and making trade-offs applies to any decision context in any area of the business enterprise (managing human resources, executing marketing initiatives, investing in and financing new technology, and so on). Furthermore, it is equally relevant to modern businesses that take a broad stakeholder perspective and seek purpose beyond the narrow profit-maximizing bottom line. For example, in making strategic organizational and operational decisions concerning its social, environmental, and economic impacts, the modern firm must balance multiple objectives and maneuver a myriad of trade-offs. While potential complementarities and synergies can be uncovered, ultimately, there is no such thing as an opportunity costless decision context.

Therefore, it is perhaps no wonder that most business degree programs worldwide, at both bachelor's and master's levels, require students to be

exposed to the science of economics. Typically, knowledge of core concepts and models from microeconomics, macroeconomics, and international trade is required. However, the application of economic analysis to real-world problems is much more specific and interdisciplinary, and the science of economics has further specializations to offer, including *agricultural economics*, *labor economics*, *development economics*, *health economics*, *transportation economics*, *tourism economics*, *cultural economics*, *natural resource economics*, and *environmental economics*.

This observation raises the following overarching question: How much general versus field-specific economics exposure should business students have? That is, what is the optimal content configuration of required and elective economics courses in business schools?

Returning to my preface anecdote: at the time (1992), I was pursuing a bachelor's degree in business administration (BBA). The international economics class was an elective after a mandatory principle of economics course in the first semester. Through my undergraduate years, I became increasingly drawn toward the science of economics. Fortunately, I was studying at Pacific Lutheran University (Washington, US), a liberal arts institution encouraging students to pursue multiple majors.[1] As a result, I graduated with two degrees (BBA, and BA in Economics). In doing so, I took about every economics course it was possible to take at the undergraduate level.

My most formative experience came in a course called Environmental and Natural Resource Economics. This course delivered rigorous economic analysis with specialized concepts and analytical tools, focusing on real-world policies relevant to addressing acute resource scarcities and environmental degradation while exposing students to original scientific research. Most importantly, this course created an awareness of the power of *interdisciplinarity*, that is, the use of knowledge from multiple social and natural sciences at once.[2]

My last undergraduate economics course was Economics of Outdoor Recreation, a five-week intensive summer school taken by a select group of extra-motivated students. The course involved: (1) learning about an environmental valuation technique called the travel cost method (TCM); (2) designing a recreational demand survey; (3) collecting data at multiple sites; (4) carrying out econometric data analysis; (4) writing a scientific research paper; and (5) presenting results to the parks and recreation commission.[3]

These two courses were crucial for my subsequent pursuit of graduate school and an academic career in environmental economics. Thirty years later, I can reflect on having taught environmental economics to economics majors and non-economics students in five different countries (United States, Norway, Tanzania, Japan, and Brazil) and at all degree levels (bachelor's, master's, and PhD).

Since 2008, my home base has been the University of Stavanger (UiS) Business School. As is common in most business schools, our bachelor's program students must complete coursework in microeconomics and macroeconomics. Background knowledge and competencies in economics are also prerequisites for acceptance into our master's program. In addition, economics is offered as a specialization alongside core business fields.[4] Nevertheless, none of our master's students can be considered *true* economics majors in the sense of being in pursuit of an economics degree. Our degree programs share these characteristics with other programs around the world. Hence, it seems pertinent to consider the amount and content configuration of economics courses embedded into business degree programs.

In the remainder of this essay, I begin by defining environmental economics and summarizing some of its key conceptual and methodological pillars. Then I provide a personal account of related teaching engagements within and outside my current work setting and describe my pedagogical approach to teaching this specialized field of economics to non-economics majors in business degree programs as well as to students from other scientific subject areas such as biology, ecology, sociology, and political science. Lastly, I discuss the question: "Should all business students be exposed to environmental economics?" I reflect on this question based on my personal experiences, from the philosophical perspective of a higher purpose of higher education, and in light of the urgent challenges facing humankind today.

## WHAT IS ENVIRONMENTAL ECONOMICS?

Formally, *environmental economics* can be defined as the field of economics that studies the mechanisms behind, consequences of, and potential solutions to environmental problems caused by consumption and production activities. Historical accounts and perspectives on the emergence and evolution of this specialized field of economics can be found in Banzhaf (2023), Barkley & Barkley (2016), Bergstrom (2022), Groom & Talevi (2020), Sandmo (2015), and Pearce (2002). In short, the timeline takes us from the early economic thinking about land and natural resource scarcity (Malthus, Smith, Ricardo) through 20th-century movements promoting limits to growth, natural resource conservation, and environmental protection, and into the contemporary global threats of climate change and biodiversity loss (Bergstrom, 2022).

Two related economics fields, arguably preceding environmental economics, are *agricultural economics* and *natural resource economics* (Banzhaf, 2023; Brown et al., 2016; Kling et al., 2010). The former focuses on optimizing the production and distribution of food and other agricultural products (Barkley & Barkley, 2016), whereas the latter deals with the optimal depletion of non-renewable resources and the optimal management of renewable

resources (Conrad & Rondeau, 2020; Hotelling, 1931). Proceeding environmental economics is *ecological economics*, which offers an analytical enrichment with its interdisciplinary focus on human-environment interactions and social-ecological systems from a sustainability perspective (Beder, 2011; Boulding, 1966; Gowdy & Erickson, 2005).[5]

**Pillar 1: The Concept of Environmental Market Failures**

At the heart of environmental economics lies a recognition that the unregulated market economy generates a sub-optimal configuration of economic activities associated with overutilizing natural resources and the environment. In turn, this adversely affects social welfare and economic prosperity, both contemporaneously and over time. *Environmental market failures* arise primarily from *negative environmental externalities* (for example, air pollution) and the *public good characteristics* of environmental goods and services (for example, clean air). These concepts form the basis for various theoretical treatments in environmental economics.

The shortcomings of unregulated markets rationalize government intervention, that is, implementation of legal remedies (for example, environmental regulations), institutional arrangements (for example, environmental protection agencies), and economic policies (for example, pollution taxes). Furthermore, corrective actions necessitate monitoring environmental outcomes to measure the extent of market failures and identify causal relations and general equilibrium effects. For this reason, modern environmental economics embodies concepts, analytical models, and empirical methodologies. As an illustration, the structures of two representative textbooks, one undergraduate level (Field & Field, 2021) and one graduate level (Phaneuf & Requate, 2016), are given in Table 14.1. The table also provides the structure of a combined environmental/resource economics textbook (Perman et al., 2011), which can be used at both the undergraduate and graduate levels.

**Pillar 2: The Extended Circular Flow Model**

A common diagrammatic model used for introducing students to the science of economics is the stylized circular flow model of the economic system. This model is pedagogically helpful in motivating the basic ideas behind demand, supply, and market interactions. However, a severe conceptual shortcoming is its failure to recognize humans' dual reliance and impact on the earth's biosphere and other natural systems. Various extensions have been developed to motivate natural resource scarcity and environmental degradation issues. In particular, Figure 14.1 compares the basic circular flow model to the revised version utilized by Callan and Thomas (2013).

*Table 14.1 The structure of representative textbooks in environmental economics*

| **Field, B., & Field, M. K. (2021). *Environmental economics* . 8th edition. McGraw-Hill Education.** | **Phaneuf, D. J., & Requate, T. (2016). *A course in environmental economics: theory, policy, and practice* . Cambridge University Press.** | **Perman, R., Ma, Y., McGilvray, J., & Common, M. (2011). *Natural resource and environmental economics* . 4th edition. Pearson Education.** |
|---|---|---|
| **Section One: Introduction** | **Part I. Economics and the Environment:** | **Part I Foundations** |
| Chapter 1: What Is Environmental Economics? | 1. Environmental economics and the theory of externalities | Chapter 1: An introduction to natural resource and environmental economics |
| Chapter 2: The Economy and the Environment | 2. Environmental problems and policy issues | Chapter 2: The origins of the sustainability problem |
| **Section Two: Analytical tools** | 3. Introduction to the theory of environmental policy | Chapter 3: Ethics, economics and the environment |
| Chapter 3: Benefits and Costs, Supply and Demand | **Part II. The Design of Environmental Policy** | Chapter 4: Welfare economics and the environment |
| Chapter 4: Markets, Externalities, and Public Goods | 4. Imperfect information | **II Environmental Pollution** |
| Chapter 5: The Economics of Environmental Quality | 5. Competitive output markets | Chapter 5: Pollution control: targets |
| **Section Three: Environmental analysis** | 6. Non-competitive output markets | Chapter 6: Pollution control: instruments |
| Chapter 6: Frameworks of Analysis | 7. Environmental policy with pre-existing distortions | Chapter 7: Pollution policy with imperfect information |
| Chapter 7: Benefit–Cost Analysis: Benefits | 8. Institutional topics in cap-and-trade programs | Chapter 8: Economy-wide modelling |
| Chapter 8: Benefit–Cost Analysis: Costs | 9. Ambient pollution control | Chapter 9: International environmental problems |
| **Section Four: Environmental policy analysis** | 10. Liability | Chapter 10: Trade and the Environment |
| Chapter 9: Criteria for Evaluating Environmental Policies | 11. Innovation and adoption of new technology | **III Project Appraisal** |
| Chapter 10: Decentralized Policies: Liability Laws, Property Rights, Voluntary Action | 12. International environmental problems | Chapter 11: Cost-benefit analysis |
| Chapter 11: Command-and-Control Strategies: The Case of Standards | 13. Accumulating pollutants | Chapter 12: Valuing the environment |

| **Field, B., & Field, M. K. (2021). *Environmental economics* . 8th edition. McGraw-Hill Education.** | **Phaneuf, D. J., & Requate, T. (2016). *A course in environmental economics: theory, policy, and practice* . Cambridge University Press.** | **Perman, R., Ma, Y., McGilvray, J., & Common, M. (2011). *Natural resource and environmental economics* . 4th edition. Pearson Education.** |
|---|---|---|
| Chapter 12: Incentive-Based Strategies: Environmental Charges and Subsidies | **Part III. Valuing the Environment** | Chapter 13: Irreversibility, risk and uncertainty |
| Chapter 13: Incentive-Based Strategies: Market Trading Systems | 14. Theory of applied welfare analysis | **IV Natural Resource Exploitation** |
| **Section Five: Environmental policy in the United States** | 15. Revealed preference models | Chapter 14: The efficient and optimal use of natural resources |
| Chapter 14: Federal Water Pollution–Control Policy | 16. Discrete choice models | Chapter 15: The theory of optimal resource extraction: non-renewable resources |
| Chapter 15: Federal Air Pollution–Control Policy | 17. Recreation | Chapter 16: Stock pollution problems |
| Chapter 16: Federal Policy on Toxic and Hazardous Substances | 18. Property value models | Chapter 17: Renewable resources |
| Chapter 17: State and Local Environmental Issues | 19. Stated preference methods | Chapter 18: Forest resources |
| **Section Six: Global environmental issues** | 20. Health valuation | Chapter 19: Accounting for the environment |
| Chapter 18: Global Climate Change | **Part IV. The Practice of Environmental Economics** | |
| Chapter 19: International Environmental Agreements | 21. Cost-benefit analysis: modeling | |
| Chapter 20: Globalization | 22. Cost-benefit analysis: empirical | |
| Chapter 21: Economic Development and the Environment | 23. Final thoughts | |

The dependence of the economy and human welfare on natural systems is captured by the additional box (*Nature*) in the bottom diagram. This component serves two important purposes: first, it explicitly recognizes natural systems as the source of the raw materials that enter the production of goods and services (the *natural resources arrows* going from *Nature* into the economy). This observation motivates a discussion of how fast non-renewable resources should be depleted and how to manage renewable natural resources. Second, it explicitly recognizes the adverse effects of consumption and production activities on

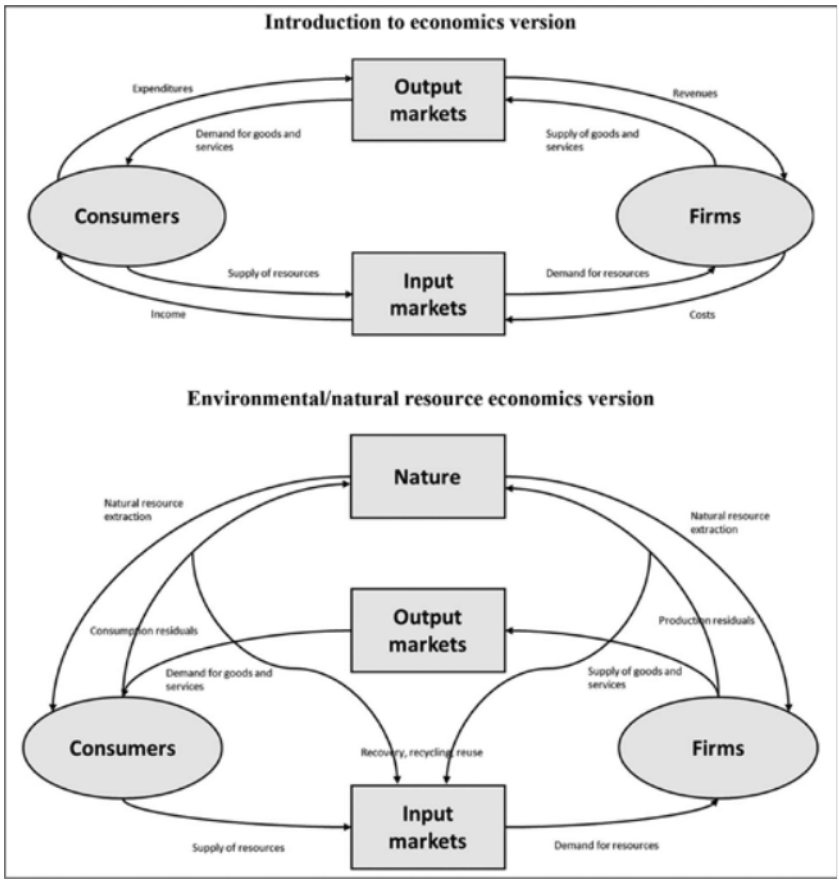


*Figure 14.1* *Extending the basic circular flow model to account for natural systems*

the health of the natural systems (the *residuals arrows* from the economy to *Nature*). This observation motivates a discussion of the consequences of waste, pollution, environmental degradation, and environmental-industrial policies necessary to mitigate these undesirable by-products from the economy.[6]

**Pillar 3: The Negative Externality Model**

The negative externality model is perhaps the most canonic in environmental economics. It extends the basic demand–supply market equilibrium model to account for external costs from economic activities; see Figure 14.2.

In the basic model (top diagram in Figure 14.2), demand reflects private consumption benefits, whereas supply reflects private production costs associated with a specific market commodity, e.g., automobiles. In a well-functioning economic system, the market will tend toward an equilibrium price ($P_X^E$) and equilibrium quantity ($X^E$). In the absence of "hidden" (external) costs or "hidden" (external) benefits, this equilibrium is economically efficient because the total economic surplus arising to consumers and producers is maximized. However, in reality, most goods and services generate additional costs external to the market transactions in the economy. For example, automobiles produce multiple environmental impacts in production and use, which the demand and supply curves will not fully reflect. The extended model (bottom diagram in Figure 14.2) accounts for these effects by including a third curve that captures the full cost of the commodity to society (MSC = marginal social costs). The economically efficient equilibrium is ($X^*$, $P_X^*$), implying a higher price and lower quantity than the unregulated market outcome ($X^E$, $P_X^E$). Accordingly, the case for government intervention can be made, e.g., imposing a corrective per-unit environmental tax on the commodity.

**Pillar 4: Environmental Valuation and Social Benefit-cost Analysis**

The magnitude of environmental market failure and the extent to which corrective measures are needed are empirical questions. For example, how large is the divergence between the socially desirable outcome ($X^*$, $P_X^*$) and the unregulated market outcome ($X^E$, $P_X^E$) in Figure 14.2?[7]

*Environmental valuation* refers to the scientific process of estimating the economic value of either (1) the hidden/external costs of environmental damage or pollution emissions, or (2) the hidden/external benefits associated with protecting nature or improving environmental quality.

The conceptual foundation of environmental valuation links people's welfare to goods and services beyond the marketplace. The basic microeconomic model stipulates that the consumer's welfare comes from the consumption of market goods and services $(\boldsymbol{x} = x_1, x_2, \ldots)$ and can be represented by the utility/preference function $U = U(\boldsymbol{x})$. Environmental economics explicitly recognizes welfare from environmental goods and services $(\boldsymbol{q} = q_1, q_2, \ldots)$ such that the utility/preference representation is extended to $U = U(\boldsymbol{x}, \boldsymbol{q})$. While the consumer can choose quantities of market goods and services ($\boldsymbol{x}$) subject to a budget constraint, the levels of $\boldsymbol{q}$ emerge exogenously through the combined economic activities of all consumers and producers in the economy and government regulatory actions. Nonetheless, it is helpful to consider the consumer's latent, implicit demand for environmental goods and services to motivate environmental valuation further. Figure 14.3 depicts

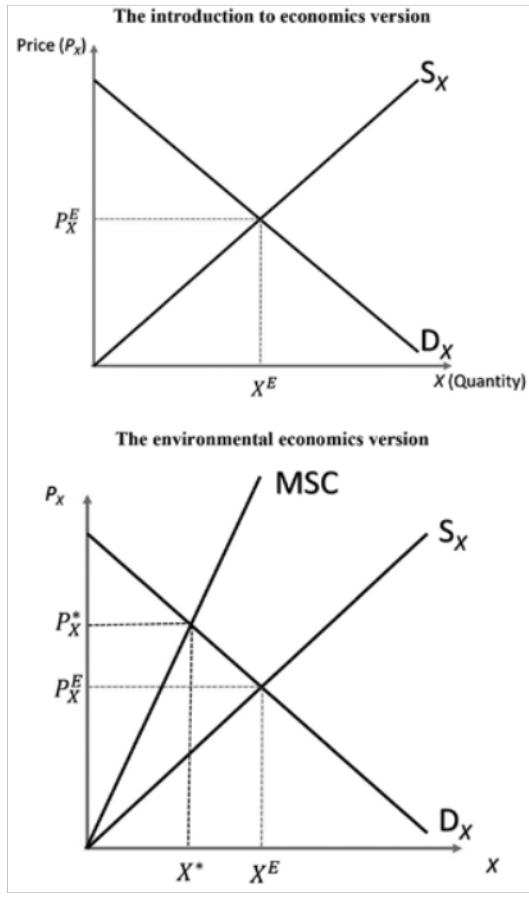


*Figure 14.2* *Extending the market equilibrium model to account for negative externalities*

consumer demand for general environmental quality, represented by the scalar index variable $q$.

Consider two different provision levels, $q^0$ and $q^1$. The geometric area under the demand curve between those two levels represents the consumer's monetary valuation of either (1) the welfare loss associated with going from $q^1$ to $q^0$ or (2) the welfare gain associated with going from $q^0$ to $q^1$. Conceptually, the objective of environmental valuation is to quantify this geometric area.

Furthermore, applied environmental valuation seeks to illuminate the *total economic value* (TEV) associated with environmental quality changes, both those that are reflected in market transactions (market values) and those

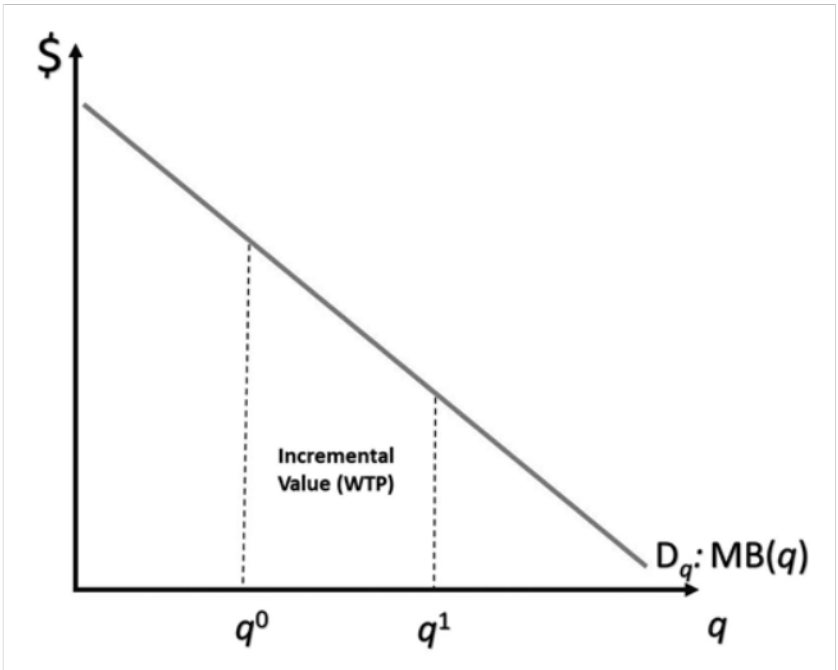


*Figure 14.3* *Implicit demand for and environmental valuation of environmental quality change*

that escape the marketplace (non-market values); see Freeman et al. (2014). Relatedly, environmental economics distinguishes between use and non-use/passive-use values. The latter category is often challenging to estimate, yet critically relevant for many applied environmental valuation contexts.[8] Figure 14.4 summarizes the TEV perspective and the available methodological toolbox. Methodologically, a distinction between revealed preference (RP) and stated preference (SP) approaches is made. The former (RP) category includes economic/market impact assessments, the TCM for estimating recreation demand, and various hedonic pricing approaches (Bateman et al., 2020). The latter category (SP) includes the contingent valuation method and discrete choice experiments (Johnston et al., 2017). Frontier environmental valuation research often seeks to integrate both approaches (Whitehead et al., 2012) and supplements monetary value estimates with non-monetary valuation metrics (Christie et al., 2012).

The ultimate empirical objective *of* environmental valuation is often to feed critical input values into an ex-ante or ex-post *social benefit-cost analysis* (SBCA). Such research can inform investment and resource allocation deci-

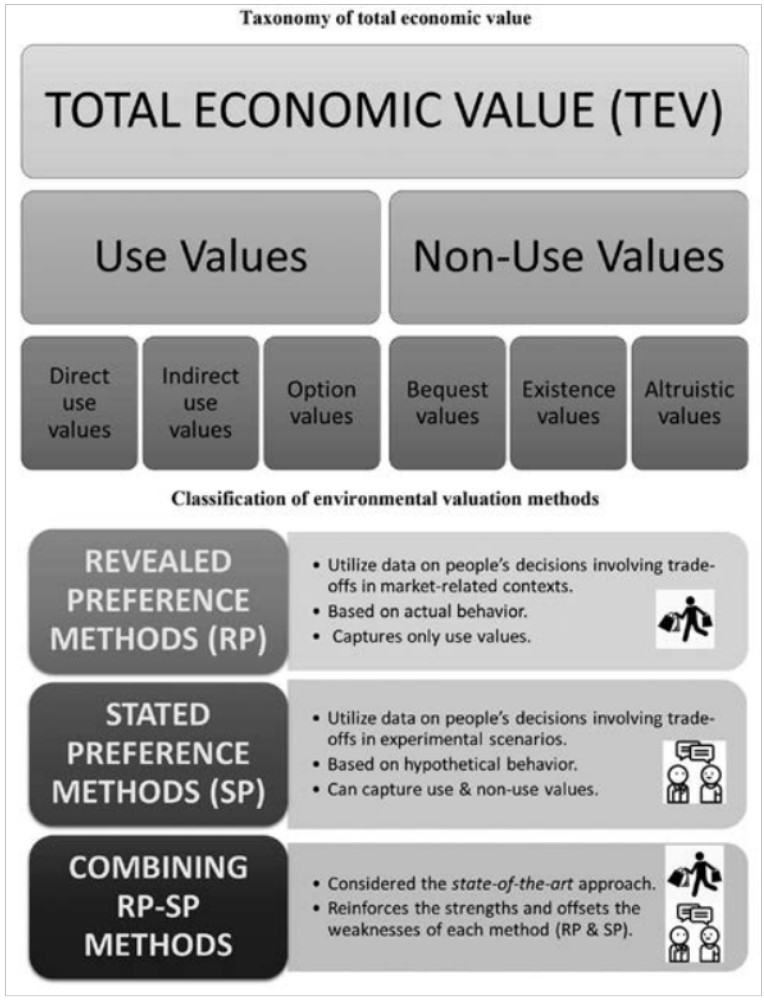


*Figure 14.4* *Relevant economic values and methodologies in environmental valuation*

sions in the public sector and help to shape public policy prescriptions. SBCA is at the core of the science of economics, as discussed in my introduction to this essay, namely, identifying and quantifying all trade-offs and associated opportunity costs so that the decision-maker can make the best possible (optimal) decisions.

**Beyond Economic Efficiency: Circular Economy and Sustainability**

To end this part of the essay, I would like to return to the nature-economy relationship depicted in Figure 14.1. Related to drawing attention to humans' simultaneous dependence and influence on natural systems, it is also a starting place for discussing the emerging *circular economy* concept (Kirchherr et al., 2017; Urbinati et al., 2017; Winans et al., 2017). Fundamentally, the *reduce, reuse,* and *recycle* side arrows from the consumption and production residuals represent an opportunity to create economic circularity to alleviate the overall stress on nature. An intelligent composition of (1) renewable resource management schemes, (2) environmental taxes and subsidies, (3) legislation to protect critical biodiversity and natural habitats, and (4) circular economy policies could go all the way toward achieving a steady-state, i.e., *sustainability*, in the human-economy-nature interface (Ayres, 2008; Costanza, 1992; Costanza, 2020; Hagens, 2020).

## TEACHING ENVIRONMENTAL ECONOMICS

Table 14.2 provides a chronological list of my teaching experiences in environmental economics. These experiences span complete semester/quarter courses, combined environmental/resource economics offerings, contributed learning modules and workshops, and introductory seminars to various audiences within and outside academia.

The first time I was placed in a teaching position was during graduate school in the Department of Agricultural and Resource Economics at the University of California-Davis. As a teaching assistant for a bachelor's course in environmental economics (ARE176), I gave supplementary lectures, hosted office hours, and marked quizzes and exams. Despite some initial ambivalence, I soon started enjoying the job tasks, particularly the challenge of explaining economic concepts and models to students needing help. Over the next few years, I became a well-regarded and versatile teaching assistant by contributing to various bachelor's courses in managerial economics.

The teaching assistant experiences were transformative. When I was hired as an assistant professor in the Department of Agricultural and Resource Economics at Colorado State University, I felt prepared to design, plan, and implement courses. Over the next couple of years, I gave courses in environmental economics at the bachelor level (AREC381) and master level (AREC541) and co-taught a PhD course covering selected topics in environmental/resource economics (AREC792).

By the time I became an associate professor at the University of Stavanger (my current place of work), I knew I had a unique combination of pedagogical dispositions and passion for the teaching dimension of academic work.

*Table 14.2 Personal teaching experiences in environmental economics*

| TEACHING CONTEXT | MY ROLE | STUDENT TYPES |
|---|---|---|
| Environmental Economics (ARE176), University of California, Davis (2000) | Teaching assistant | Undergraduate, managerial economics |
| Introduction to Environmental Economics (AREC381), Colorado State University (2007) | Primary instructor | Undergraduate, agricultural economics and business administration |
| Environmental Economics (AREC541), Colorado State University (2008) | Primary instructor | Graduate (master's), agricultural and resource economics |
| Selected topics in Natural Resource and Environmental Economics (AREC792), Colorado State University (2008) | Co-instructor | Graduate (PhD), agricultural and resource economics |
| Environmental and Resource Economics (MØA350), University of Stavanger (2012–21) | Co- instructor | Graduate (master's), business administration |
| Forest and Resource Economics – Part A. Selected readings in environmental economics (FA22), Kyoto University (2015) | Primary instructor | Graduate (master's), natural resource economics and management |
| Oil & Gas Environmental Management & Accounting (AC612), University of Dar Es Salaam (2016–2018) | Co- instructor | Graduate (master's), business administration |
| Business Ethics (BØK425), University of Stavanger (2017) | Guest lecturer | Undergraduate, business administration |
| NORBRA2020 – Biodiversity: Towards Sustainable Use of the Environment. Interdisciplinary summer school, University of Stavanger & Federal University of Rio de Janeiro (2018, 2019) | Member of instructor team | Graduate (master's), natural sciences & social sciences |
| Global Experience in Supply Chain Management (MØA 405/MKT 65), University of Stavanger & University of Wisconsin (2020) | Guest lecturer | Graduate (master's), business administration |
| NORBRA2025 – One Health: Key for a Sustainable Future. Interdisciplinary summer school, University of Stavanger & Federal University of Rio de Janeiro (2022) | Member of instructor team | Graduate (master's), natural sciences & social sciences |
| Valuing Environmental Goods and Services: A Brief Introduction to Environmental Economics and Environmental Valuation, popular scientific seminar (multiple occasions, ongoing) | Guest/host lecturer | High school students, stakeholders and general interest audiences |

Consequently, I decided to accept teaching loads above the standard norm, delivering mandatory undergraduate courses in both microeconomics and macroeconomics to hundreds of students. I would sprinkle some environmental/resource perspectives into the extended course topics. For example, I discussed environmental externalities in microeconomics and economic

dependence on natural resources in macroeconomics. Subsequently, I was asked to develop an environmental/resource economics course customized for master's students in our business degree program and made available to students from natural sciences and other social sciences. The resulting course (MSB350) is described later in the chapter.

Some of the most challenging yet gratifying teaching moments I have had are those associated with embedding environmental economics into broader course contexts. One example is the one-week intensive module integrated into a course in environmental accounting and management (AC612) at the University of Dar Es Salaam. This teaching assignment was part of an educational collaboration between the business schools at the University of Stavanger and the University of Dar Es Salaam, sponsored by a Norwegian energy company (Equinor). The target students were enrolled in a newly established master's program focused on business administration in petroleum industry contexts. While the students (about 30 in each cohort) had diverse personal interests and varying economics backgrounds (from virtually none to an economics bachelor's degree), they were all highly motivated to learn about environmental issues, especially those associated with the petroleum industry, from an environmental economics perspective.

Another example is the one-day intensive module I have contributed to the summer school of the NORBRA2020/NORBRA2025 project, an educational collaboration between the University of Stavanger and the Federal University of Rio de Janeiro. In this summer school, graduate students and university instructors from Norway and Brazil come together to co-create a unique interdisciplinary activity-based learning experience. While most attending students are from natural science fields, the summer school is also available for motivated social science students, including students from the UiS Business School.

Common to both the examples just mentioned is that students are first given short lectures on essential conceptual and methodological perspectives from environmental economics before immersing themselves in active learning activities focused on applied analysis. I will now outline my pedagogical approach to teaching environmental economics with that in mind.

## Teaching Philosophy and Pedagogical Considerations

Regardless of the teaching context and my audience, I take a fundamentally pragmatic approach to teaching environmental economics. What does this mean? I try not to overestimate (1) prior economics knowledge and (2) the level of interest in environmental/resource issues. Instead, I view the teaching context as an opportunity to enhance the students' economic intuition and analytical capabilities regardless of prior exposure while raising awareness

and knowledge of issues related to the overutilization of natural resources and environmental degradation. I seek a context-appropriate configuration of formal lectures, real-world illustrations, and applied learning activities. Importantly, I find the latter crucial to activate genuine interest and internalize core concepts and analytical tools.[9]

Some of the questions that I contemplate in developing a course, module, or workshop/seminar in environmental economics are the following:

- How much previous economics exposure (i.e., prior knowledge of core concepts/models; analytical skills) can be expected?
- What degree of interest in and awareness/knowledge of environmental/resource issues can be expected?
- How much formalism (i.e., math, graphs, versus verbal explanations) should be utilized in the lectures?
- What is the appropriate reading material (e.g., textbook chapters, scientific articles, etc.), and how should students be expected to process it?
- Which aspects of environmental economics should be the focal points (e.g., environmental market failures; environmental valuation; environmental policy; sustainability)?
- How many/which environmental issues should be covered (e.g., climate change; biodiversity loss; air/water pollution; renewable energy transitions)? Relatedly, how many/which specific examples and cases should be utilized?
- Which active learning components are most appropriate for the context (e.g., analytical problem-solving; case analysis/discussion; data analytics; projects/reports)?
- How much individual work versus team assignment should there be? Relatedly, what are appropriate feedback mechanisms and grading schemes?

The optimal configuration for any given teaching context depends on (1) how many days/hours are available and (2) student backgrounds. In the case of teaching environmental economics to business students, it is imperative to recognize heterogeneity in preparedness for and initial interest in the subject matter. Even greater variation in student backgrounds must be accommodated when the course is available to students from other study programs.

A commonly discovered dichotomy is that economics and business students tend to have a relatively strong proclivity toward economic analysis while being less tuned to environmental and natural resource issues. In contrast, students from other study programs tend to have stronger environmental motivations while often lacking prior economics knowledge. This dichotomy

creates highly challenging yet potentially rewarding teaching and learning opportunities.[10]

## Various Tools and Tricks

A minimum formalism, i.e., theoretical foundation, is likely necessary regardless of the teaching context. Typically, this foundation is ensured by assigning prudently selected readings from textbooks and supplementary sources. The core material is presented in real-time (physical or virtual) lectures or pre-recorded lecture videos. However, I believe the most powerful pathway to deep learning is active/interactive course components. Table 14.3 lists *tools and tricks* that I have utilized in various course contexts.

While some items listed in Table 14.3 can be deployed at the individual level, many are arguably more effective when assigned to student groups.[11] I recommend using the concept of a *work portfolio* (item 15) to combine multiple individual/group components. Require students to professionally compile the outputs from the work portfolio items into a final report to be submitted at the end of the semester. This report can then serve as the basis for grade determination, potentially combined with results from one or several traditional quizzes/exams. Importantly, students should receive feedback (item 16) that provides extended learning and output improvement opportunities before final submissions. The feedback processes (instructor-to-student feedback and/or peer-to-peer) should be carried out according to structured and transparent protocols.

A work portfolio can comprise any combination of items (1–7), and (13). For the classroom, items (8–10), and (12) help engage students. The latter, presentations, could relate to items (3), (6), (7), or (13). An ambitious course design could have students carry out interviews (item 10) or surveys (item 11), which could feed into an empirical analysis (item 2) and subsequent scientific writing (item 13), potentially all integrated into a larger class project (item 14).

## Course Example

The course MSB350: Environmental and Resource Economics, which was recently offered for the eleventh time at the UiS Business School, was initially designed in 2010/11. The course aims to introduce both *environmental economics* (module 1) and *natural resource economics* (module 2) to master's business students specializing in economics. It is also available to students from other business specializations and master's students from other study programs. I have been the course coordinator and the primary instructor of module 1, whereas module 2 has been delivered by an external/affiliate professor.

*Table 14.3 Pedagogical tools and tricks for environmental economics (and beyond)*

| ID | Item | Description |
|---|---|---|
| 1 | Theoretical analysis | *Students solve analytical problems using mathematical, graphical, and verbal triangulation.* [These problems can be integrated into graded or non-graded assignments given to individual students or groups/teams depending on the form of assessment used for determining final grades.] |
| 2 | Empirical analysis | *Students execute data analysis or statistical/mathematical model simulations.* [This analysis can be part of graded or non-graded assignments given to individual students or groups/teams depending on the form of assessment used for determining final grades.] |
| 3 | Graphical abstract | *Students read, decode, and summarize a scientific article with a graphical abstract.* [The article can be assigned by the instructor or selected by the students; the assignment can be done intensively (in one class session) or over a period that permits constructive feedback.] |
| 4 | Literature reviews | *Students read, decode, and summarize/analyze multiple scientific articles.* [The articles can be assigned by the instructor or selected by students; the review could revolve around a narrow research topic or be positioned against a specific research question; the output could be a multi-dimensional classification table and a written paper.] |
| 5 | Social media post | *Students write course-related blog posts, tweets, or op-eds or make audio/video communication products.* [The output could be for internal class usage or published online with required permissions.] |
| 6 | News analysis | *Students use relevant concepts, models, and analytical tools to identify, read, and analyze course-related news stories.* [This assignment could be limited to a single story with the analysis written as a discussion brief, or involve multiple stories presented/analyzed/discussed informally in class.] |
| 7 | Case analysis | *Students read, analyze, and discuss a case related to a specific environmental or natural resource issue.* [Ideally, the case revolves around a high-stake public management/policy decision context in the economy–nature intersection (e.g., a budget allocation; regulatory imposition; industrial licensing). Potentially, the students could be divided into different stakeholder groups.] |
| 8 | Games/experiments | *Students play games/partake in experiments related to environmental/resource management in class.* [For example, the externality game or the trust experiment.] |
| 9 | Debates | *Students engage in semi-structured debates on issues related to contemporaneous environmental policy.* [The aim would be to encourage the usage of concepts and analytical tools from environmental/resource economics.] |
| 10 | Interviews | *Students carry out stakeholder interviews that can be utilized for qualitative analysis.* [Such analysis could feed into components (2) and (9) above.] |

| ID | Item | Description |
|---|---|---|
| 11 | Surveys | *Students design and carry out a stakeholder survey to generate data for quantitative analysis.* [Such analysis could feed into components (2) and (9) above.] |
| 12 | Presentations | *Students give presentations during lecture time or are asked to video-record presentations to be shared with the rest of the class.* [Presentations can be done individually or in groups/teams and related to any other component.] |
| 13 | Scientific writing | *Students write a scientific report or term paper to be submitted for feedback processing and final grading.* [This component can be assigned as an individual requirement or to groups/teams and linked to a combination of components (2), (4), (10), and (11).] |
| 14 | Projects | *Design the course around an integrated thematic project that combines several of the abovementioned components.* [This component could be positioned against an empirical theme (e.g., climate change), a methodological theme (e.g., environmental valuation), or a conceptual theme (e.g., environmental preferences).] |
| 15 | Work portfolios | *Assess and grade students based on individual performance and respective group/team performance on multiple mandatory course activities and submitted products.* [The evaluation criteria and component weights should be outlined in the course syllabus and at the beginning of the semester.] |
| 16 | Feedback processes | *Select one or several work portfolio components for feedback processes that offer extended learning and improvement opportunities.* [Deadlines, submission requirements, and feedback protocols should be carefully and clearly laid out in the course syllabus and at the beginning of the semester. Feedback processes can be done instructor-to-students, external accessor–students, or students-to-students.] |

While the course has evolved over eleven iterations, the core thematic structure has remained the same. In particular, the course has been weighted 2/3 toward environmental economics and 1/3 toward natural resource economics. Module 1 has been balanced equally between the themes of (1) environmental market failures and policies, and (2) environmental valuation and social benefit–cost analysis. Module 2 begins with the fundamental theory of exhaustible resource depletion before going into forestry and fishery models and advanced renewable resource management themes.[12]

The reading assignments in the course include relevant chapters from Perman et al. (2011) and Conrad and Rondeau (2020), various government/institutional reports, and a set of scientific journal articles classified as *required*, *recommended*, or *optional* readings. Depending on the course configuration, which varies from year to year, students may be asked to identify and process additional source material independently (e.g., self-selected worktask-relevant scientific articles).

I have increasingly tried to steer students' attention away from grades and toward a genuine learning focus. For this reason, the course does not include any traditional quiz/exam in the grade determination system. Instead, grades are entirely determined by the assessed quality of the work portfolio report submitted at the end of the semester. To illustrate, Box 14.1 describes the work portfolio and the associated feedback and submission procedures as stated on the latest (2021) MSB350 syllabus.

## BOX 14.1 WORK PORTFOLIO, FEEDBACK PROTOCOL, AND GRADE DETERMINATION IN MSB350 (2021)

### WORK PORTFOLIO

| | | |
|---|---|---|
| (1) | Multi-part environmental economics assignment (*learning team*) | 25% |
| (2) | Sustainability economics literature analysis review (*individual*) | 25% |
| (3) | Sustainability economics presentation (*learning team*) | Pass/fail |
| (4) | Multi-part natural resource economics assignment (*learning team*) | 25% |
| (5) | Term paper/master's thesis proposal (*individual or student pair*) | 25% |
| TOTAL | | 100% |

Each of the graded components above (1, 2, 4, 5) will be evaluated on a scale from 0–100. **Overall course score** = 0.25 × (score 1 + score 2 + score 4 + score 5). **Individual course grades**: 90–100 = A, 80–89 = B, 70–79 = C; 60–69 = D; 50–59 = E, <50 = F.

### GUIDANCE AND FEEDBACK

Students are strongly encouraged to seek guidance and feedback from the instructor and student assistant throughout the semester. The following deadlines apply:

Seek verbal guidance by:
Component 1: September 24
Component 2: October 22
Component 4: November 12
Seek written feedback on complete drafts by:

Component 2: November 19
Component 5: December 3

FINAL SUBMISSION DEADLINE

Each individual student must submit the required work portfolio in a single professionally compiled PDF file by 17.12.2021.

Components (1) and (4) of the work portfolio (the environmental economics and the natural resource economics assignments) include multiple sub-tasks (a mix of theoretical and empirical analysis items). Specifically, the latest version of the environmental economics assignment included four theoretical problems requiring students to use mathematical, graphical, and verbal analysis (with combined sub-weight = 60%) and one empirical problem (with sub-weight = 40%). The latter involved writing a brief consultant report based on a statistical/econometric data analysis. A complete description of the data analysis task is reproduced for the interested reader in Box 14.2.

BOX 14.2 DATA ANALYSIS AND SCIENTIFIC REPORTING TASK IN MSB350 (2021)

5: DATA ANALYSIS – CLIMATE POLICY PREFERENCES (40/100 POINTS)

This problem involves analyzing data on *climate policy preferences and willingness to pay (WTP)* of the Norwegian population based on a survey conducted by NORSTAT on behalf of the UiS Business School in 2016. The sample (N = 1 000) was drawn from a pre-recruited panel of representative Norwegian households.

The key outcome variables for the requested analysis are WTP_GR1, WTP_GR2, WTP_GR3, and WTP_GR4. These variables represent the respondents' expressed WTP for Norwegian climate policies. Each respondent was randomized into one (and only one) WTP question. Hence, these four variables contain only information for about 25% of the respondents. The four experimental treatments were as follows.

1. Financing reductions in greenhouse gas emissions to achieve Norwegian and international climate goals requires extensive government grants. How much of the state budget should be used for this purpose on behalf of Norwegian households? **[NOK alternatives given both per household and in total over all households.]**

2. In Paris, December 12, 2015, the global community reached an agreement on reductions in climate emissions, technology development, climate change adaptation and financing (the Paris Agreement). Norway was a key player in these negotiations. Financing reductions in greenhouse gas emissions to achieve Norwegian and international climate goals requires extensive government grants. How much of the state budget should be used for this purpose on behalf of Norwegian households? **[NOK alternatives given both per household and in total over all households.]**
3. Financing reductions in greenhouse gas emissions to achieve Norwegian and international climate goals requires extensive government grants. How much of the state budget should be used for this purpose on behalf of Norwegian households? **[NOK alternatives given per household.]**
4. In Paris, December 12, 2015, the global community reached an agreement on reductions in climate emissions, technology development, climate change adaptation and financing (the Paris Agreement). Norway was a key player in these negotiations. Financing reductions in greenhouse gas emissions to achieve Norwegian and international climate goals requires extensive government grants. How much of the state budget should be used for this purpose on behalf of Norwegian households? **[NOK alternatives given per household.]**

## YOUR TASK

*Create a short consultant report (max 3–5 pages) with a combination of analysis text and statistical objects (i.e., tables and figures) that addresses the four research questions listed below.* Use the available dataset (and any supplementary Google/Google Scholar searches that you deem necessary) to answer these research questions. Ensure that the report is understandable and visually appealing to non-scientists. Feel free to use your creativity and judgement to organize and format the report. Make sure to give it a catchy title.

**Research questions:**

1. What is the mean and distribution of willingness to pay (WTP) for climate action in the Norwegian population?
2. Do the framing of the climate change issue and its policy solutions influence WTP for climate action?

3. Is WTP for climate action among Norwegians affected by gender, education, income, and/or attitudes toward climate change?
4. How does WTP for climate action in Norway compare with people's preferences in other countries?

**Some references:**

Kotchen, M. J., Boyle, K. J., & Leiserowitz, A. A. (2013). Willingness-to-pay and policy-instrument choice for climate-change policy in the United States. *Energy Policy*, 55, 617–625.

Longo, A., Hoyos, D., & Markandya, A. (2012). Willingness to pay for ancillary benefits of climate change mitigation. *Environmental and Resource Economics*, 51(1), 119–140.

**Some technical hints**

The dataset is provided to you in its original *SPSS* format (file name: HHUiS_Norstat2016_English_GK). All variables and how they are coded are described in the "variable view" of this file.

Some variables may have to be transformed/recoded and/or combined, as appropriate, prior to your analysis. For example, the WTP variables should be transformed into money amounts (NOKs, €€, or $$).

As with any secondary dataset, variable coding mistakes may occur. If you encounter potential coding errors, use your own judgement in implementing a remedy (recoding, deletion, "guess-estimation", or similar).

Once you have decided on research question, you could create a new dataset by selecting only the variables that you need for the analysis. While you are strongly encouraged to use R, it is also possible to use SPPS, STATA, or even Excel.

## The Power of Thesis Projects

Another meaningful way students can be exposed to environmental economics is through bachelor's/master's thesis work. Even with a modest background in economics, it is possible to position a thesis around an environmental/natural resource issue and leverage analytical tools from the environmental economics toolbox. To illustrate, Table 14.4 provides a sample of thesis work that I have supervised at the University of Stavanger.

*Table 14.4 Selected BSc and MSc theses related to environmental or resource economics*

| Thesis title (full reference in the case of MSc) | Degree | Year |
|---|---|---|
| Preferences and willingness to pay for environmentally-friendly hotel rooms | BSc | 2009 |
| On the economics of rare earth elements: Are they scarce or not? | BSc | 2011 |
| Demand and willingness to pay for wind power and renewable energy: preferences and attitudes in Rogaland County, Norway | BSc | 2012 |
| Preferences and willingness to pay for energy-efficient homes and passive houses | BSc | 2013 |
| Degrowth: An alternative to economic growth? | BSc | 2014 |
| Dambrane, L. (2016). The Prevalence of Energy-Related Rebound Effects in the Transportation Sector. (Master's thesis, University of Stavanger, Norway) | MSc | 2016 |
| Egeland, I. & Frøystein I. N. (2016). Willingness to pay for preventing an oil spill in Vestfjorden: The role of use versus non-use values. (Master's thesis, University of Stavanger, Norway) | MSc | 2016 |
| Gilje, H. L. (2018). *Surfonomics: The value of a wave.* (Master's thesis, University of Stavanger, Norway) | MSc | 2018 |
| Kleppe, A., & Jensen, J. (2018). *Valuing the recreational benefits of Bore and Hellestø Beaches*. (Master's thesis, University of Stavanger, Norway). | MSc | 2018 |
| Rupp. K., & Spanne R. (2018). How would the Norwegian aviation industry be affected by an empty seat tax? (Master's thesis, University of Stavanger, Norway) | MSc | 2018 |
| Brimsøe, T. S., & Østerhus, E. M. (2019). Exploring waste management in the circular economy concept trough a literature review and a case study (Master's thesis, University of Stavanger, Norway) | MSc | 2019 |
| Tursun, D., & Basefer, R. F. (2019). Can a nudge perform a miracle? A quasi-experimental field study on employees' stated and revealed preferences towards plastic recycling at Haukeland University Hospital. (Master's thesis, University of Stavanger, Norway) | MSc | 2019 |
| Nessler, B., & Veen, S. H. (2020). Temporal stability of Norwegians' willingness to pay to avoid an oil spill in Lofoten. (Master's thesis, University of Stavanger, Norway) | MSc | 2020 |
| Quyen, N. (2020). Factors affecting the willingness to use car sharing service: A case study of Stavanger. (Master's thesis, University of Stavanger, Norway) | MSc | 2020 |
| Chuenjai, J., & Haugvaldstad H. (2021). On scope sensitivity and its determinants in environmental valuation. (Master's thesis, University of Stavanger, Norway) | MSc | 2021 |

Over the years, the student thesis work has been increasingly linked to my own research projects. For example, I recently led a large research project funded by the Norwegian Research Council, the Coast-Benefit project (NOK 8 million; 2017–20). In the final project report, I counted 15 master's theses as part of its scientific production. In addition, several master's theses have been extended into scientific journal publications (e.g., Gellein et al., 2015;

Kipperberg et al., 2019). For example, Kipperberg et al. (2019) bring together results from two master's theses that investigated the non-market economic value of outdoor recreation opportunities and the potential impacts on recreational experiences from wind energy projects.

## SHOULD ENVIRONMENTAL ECONOMICS BE TAUGHT IN BUSINESS SCHOOLS?

Any business degree program should carefully weigh the pros and cons of economics courses included in its mandatory or elective curriculum. There is simply no way of escaping the fact that *x additional* credit units in economics mean *x fewer* credit units dedicated to a core business field. Nonetheless, as I argued in the introduction of this essay, the science of economics has a lot to offer business students. In particular, the analytical logic of optimization and making trade-offs is highly relevant to all business fields. Furthermore, economics offers specialized fields related to specific business sectors and industries and associated entrepreneurial opportunities. The modern business enterprise needs the analytical toolbox of economics more than ever as it maneuvers through the myriad of trade-offs in the triple-bottom-line, multi-stakeholder nexus of emerging business models (e.g., Nosratabadi et al., 2019; Urbinati et al., 2017).

Therefore, in my mind, the right question to ask in a business program curriculum committee is not whether or not business students should be exposed to economics. Instead, the pertinent overarching question is: "How much general versus field-specific economics exposure should business students have?" More narrowly, in this essay, I have set out to illuminate the question: "*Should all business students be exposed to environmental economics?*"

It should not surprise the reader that my answer to this question is an unequivocal "yes." I base this answer partly on my experiences teaching economics in a business school setting for over a decade and partly on the notion of a *higher purpose of higher education*. In the next section, I refer to these as demand-side and supply-side arguments, respectively.

### Demand-side Argument: "The Students Want it"

I have encountered numerous business students who quickly discover the shortcomings of the core economic models and are keen on expanding the analytical framework to richer expositions of the human–economy–nature connections. Furthermore, I sense an increasing trend toward more environmentally concerned students who want to examine issues related to natural resource scarcity and environmental degradation from both business decisions and public management viewpoints. In general, I observe a growing student

interest in the concepts of (1) corporate social responsibility (CSR), (2) green economic transitions, (3) circular economy, (4) environment, society, and governance (ESG), and (5) sustainability. Regarding the latter, one could easily argue that environmental/resource economics is relevant directly to the analysis and promotion of at least 10 out of the 17 United Nations' sustainable development goals (SDGs), to wit, goals 2–3, 6–8, and 11–15.[13]

**Supply-side Argument: "Society Needs it"**

One could also make an independent case for teaching environmental economics in business programs, regardless of student preferences and proclivities. Arguably, university education has a purpose beyond being a place for vocational training and preparing students for the labor market. Indeed, most universities and affiliated business schools articulate mission statements that reflect higher purposes. To illustrate, Box 14.3 reproduces the current mission statement from the business schools at Pacific Lutheran University (where I obtained my undergraduate degrees nearly 30 years ago) and the University of Stavanger (where I currently work). Based on such mission/vision/purpose statements, one could argue that a *modern responsible business school* should proactively seek to raise its students' social and environmental consciousness and engagement. To this end, environmental economics becomes a natural and potentially critical component in the study programs of business schools.

BOX 14.3 TWO EXAMPLES OF MISSION, VISION, OR PURPOSE STATEMENTS OF MODERN BUSINESS SCHOOLS

PACIFIC LUTHERAN UNIVERSITY (PLU)

PLU seeks to educate students for lives of thoughtful inquiry, service, leadership and care – for other people, for their communities, and for the earth.

**The PLU School of Business**

The PLU School of Business is a community of engaged faculty, staff, and administrators who provide an excellent business education in a student-centered learning environment grounded in the liberal arts that inspires students to:
LEARN for life,
LIVE purposefully,
LEAD responsibly, and

CARE for others.

UNIVERSITY OF STAVANGER (UIS)

We will be an open and innovative university that demonstrates a high quality of education, research, and artistic development work. Our common direction will be guided by the responsibility for sustainable transition. We will be characterized by a high level of well-being among students and staff. Energy, health, and welfare and learning for life constitute our areas of priority.

**UiS Business School**

We are an internationally oriented business school with a regional identity. We aim to attract top research faculty and motivated students to an international research and learning environment in an attractive and vibrant region. Our strategic location, in a region at the heart of the Norwegian energy industry, which is now embarking on a green transition, provides us with a natural advantage in making sustainable changes to business and management practices.

## Last Words: An Intriguing Idea

In discussing the pedagogical challenges of finding the best way to introduce environmental economics to students, Haab (2022) states the following dilemma (p. 131): "You can't study economics without considering the environment, and you can't study the environment without considering economics." Interestingly, his solution is to reframe students' first meeting with the science of economics (p. 132): "Imagine if all students learn the principles of environmental and natural resource economics instead of the principles of economics." He then discusses the critical components of such reframing and arrives at the extended (nature–economy) circular model as its cornerstone (Haab, 2022, p. 147).

While arrived at logically by an experienced instructor of environmental/resource economics, I believe this idea would be considered radical and met with a great deal of skepticism (if not outright protests) if proposed in a room full of mainstream economists. Nonetheless, it is an intriguing idea worthy of serious consideration. I believe introducing economics through environmental/resource economics could dramatically reshape the discipline and compel it toward much-needed conceptual/methodological interdisciplinarity/pluralism.

Modern responsible business schools could be at the forefront of implementing this approach and thus play a critical part in reshaping and modernizing the science of economics. I believe this idea echoes the thoughts and sentiments of other contributing authors of this book (e.g., Asheim, 2022; Bessant, 2022; Hunnes, & Olsen, 2022).

## NOTES

1. https://www.plu.edu/.
2. For example, it combined economics, biology/ecology, and political science to analyze the optimal management of the world's fisheries.
3. Banzhaf (2010) provides an excellent introduction and historical account of the development of recreational demand models, including the TCM.
4. The MSc program at the UiS Business School offers specializations in (1) Applied Finance, (2) Economics, (3) Strategic Marketing and Analytics, (4) Business Development and Innovation, and (5) Strategy and Leadership.
5. Many environmental economics courses also cover natural resource economics and embed ecological economics perspectives. See, for example, the description of the course MSB350 later.
6. The origin of this conceptualization of this nature–economy relationship is Ayres and Kneese et al. (1969); see also Kneese et al. (2015). The model can also be extended to account for the public sector and government's role and to distinguish between market-related and non-market human activities. These extensions are also useful in teaching environmental economics.
7. To give a more specific example, we can think of X as kilometers driven by fossil fuel vehicles and Px as the cost per kilometer driven. In an unregulated market, external costs associated with local air pollution (sulfur dioxide, nitrogen dioxide, particulate matter, etc.) that are harmful to humans, and carbon dioxide emissions that contribute to global climate change, mean that X is too high and $P_X$ is too low, relative to what is socially optimal.
8. The philosophical/theoretical importance and empirical relevance of non-use values emerged from the seminal *American Economic Review* paper "Conservation reconsidered" (Krutilla, 1967). The judicial legitimacy of considering such values for damage assessment and public policy were established through a series of court cases after the infamous Exxon Valdez oil spill and further reinforced after the BP Deep Water Horizon catastrophe (Bishop et al., 2017; Carson et al., 2003).
9. After conceptualizing and outlining this essay, I discovered, to my pleasant surprise, the publication of Bergstrom and Whitehead (2022), an entire book dedicated to teaching environmental/resource economics! This book is an invaluable resource for any course designer/instructor within this specialized field of economics. In particular, the first part (chapters 1–6) provides different teaching paradigms, whereas the second part of the book (chapters 7–14) focuses on pedagogical tools and applications.
10. Haab (2022) discusses this dichotomy and the associated challenge of balancing the *environment(al)* versus *economics* parts of "environmental economics". He writes (p. 130): "Because for much of my career I have taught classes on environmental and resource economics to non-economics majors, I often find myself

trying to walk a fine line between teaching an environmental/resource class with economic principles sprinkled in or teaching a principles of economics class with sprinkles of environmental/resource topics."

11. *Collaborative learning* and *co-creation of knowledge* are pedagogical pillars of the study programs at the University of Stavanger Business School. Students carry out a combination of individual work and group work. For the latter, students are quasi-randomly assigned to *learning teams*, which implement a set of work tasks throughout the semester.
12. Overarching topics of environmental justice, distributional effects, and sustainability have usually been intwined in both modules. An exception is the most recent course offering (2021), which included an explicit sub-module on "sustainability economics".
13. The SDGs are are described, tracked, and reported on here: https://sdgs.un.org/goals.

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