Environmental Science and Public Policy
EVPP 641: Spring 2023
Tuesday 7:20-10:00
Course website: Blackboard: log in at https://mymasonportal.gmu.edu
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Office Hours: Tuesday 6-7 pm or by appointment (in person or virtual)

Course Description:

Environmental science is the interdisciplinary study of the natural world and the impact of human activity on it. It involves the use of the physical, chemical, biological, engineering, and social sciences. Environmental scientists study the impact of pollution and other human-caused environmental problems on the planet and its inhabitants, and applied environmental scientists often work to reduce that impact. Studying environmental science allows us to develop the knowledge and tools needed to address pressing environmental issues such as climate change, air and water pollution, and loss of biodiversity.

In this course, we will take a broad look at the natural environment and anthropogenic activities that impact it. For some topics, we will pivot to policy approaches that seek to protect human health and the environment. These conversations may include specific case studies or narratives about focused topics. Additionally, we will have several guest speakers, including federal government officials and representatives from non-governmental organizations. Their talks are structured to complement the day's lectures and last approximately 30-45 minutes, with ample time for discussion.

Tentative Schedule (Subject to change based on class flow and speaker availability):

Date	Subject	Notes
Jan. 24	Introduction, the conservation ethos, and sustainability	
Jan. 31	Water	
Feb. 7	Biodiversity, Natural Resources, and Invasive Species	
Feb. 14	Conservation and Resource Management	
Feb. 21	Chemicals and Pesticides	
Feb. 28	Air and Climate **Midterms Distributed**	
Mar. 7	NO CLASS (time allowed for midterms)	Midterms Due NLT COB Friday March 10
Mar. 14	NO CLASS (Spring Break)	
Mar. 21	Energy Production, Impacts, and Policy	Guest Speaker: Matt Cline, Director, Office of American Affairs, Department of Energy
Mar. 28	U.S. Environmental Policy Paradigms; Federalism	Guest Speaker: Alan Roberson, Executive Director, Association of State Drinking Water Administrators

Apr. 4	**Virtual Class (via Zoom)** Developing Effective Applied Environmental Science for use in Public Policy Mitigation approaches and technologies	Guest Speaker: Tom Speth, Associate Director, Center for Environmental Solutions and Emergency Response
Apr. 11	Our connected world – the international environment Introduction to Ecosystem Services and valuing Environmental and Public Health Protection (*this may get pushed to the 25th*) ***Student Presentations***	Note – dependent on enrollment, we may only have student presentations the 11th and 18th.
Apr. 18	Advocacy ***Student presentations***	Guest Speaker: Lynn Thorpe, Campaigns Director, Clean Water Action
Apr. 25	**Virtual Class (via Zoom)** Cost Benefit Analyses ***Student presentations***	Guest Speaker: Erik Helm, Senior Economist U.S. EPA, Office of Water
May 2	From Science to Effective Environmental Policy – case studies **Papers Due**	

Grades:

Active Participation/engagement*	20%
Midterm:	20%
Presentation/Resources:	20%
Final Paper/Bibliography	40%

*This will be evaluated in large part by engagement with colleagues on their ideas in class and presentations and engagement in conversations with guest speakers

Key Dates:

February 21: Presentation/Term Paper proposed topics due
February 28: Midterms Distributed (electronically)
March 10: Midterms Due
April 18/25: Student Presentations
May 2: Final Paper Due (ideally hard copy and electronic)

Midterm:

The midterm will be a take-home, open book essay exam. Questions will be designed to allow the student to rely on the foundational information learned in the course, combined with their reasoning and logic, to develop concise, thoughtful answers.

Presentation:

All participants will prepare a presentation focused on case study/topic that ties into the theme of the course. Each presentation shall include both substantive science and policy elements, and explore the interface and relationship between the two.

Proposed topics are due February 21, with individual feedback given within one week. Example topics include:

- How proposed tax credits in the Inflation Reduction Act function to reduce Carbon Emissions and why it matters
- Urbanization in Northern Virginia, its impacts on water quality, and how local government programs are constructed to mitigate those impacts
- What is Atrazine, how is it used, how does it impact humans, and why is it so controversial?
- The Science behind establishment of the Serengeti
- Protecting biodiversity in Costa Rica

Develop a proposed topic you are interested in learning a lot about and bring that enthusiasm to your presentation to share with your colleagues. Where possible, students are encouraged to research topics that directly or indirectly benefit their thesis, dissertation, or other research, provided they can connect it to the central concepts of the course. Presentations will be approximately 20-30 minutes, with additional time for questions or discussion following the presentation. Proposed presentation topics must be submitted by February 21 with a short abstract and preliminary list of resources. Students should plan on electronically distributing copies of presentations and bibliographies on the day they give their presentations.

Term Paper:

Students will complete a term paper, elaborating and expanding on the topics presented as part of their presentation. General guidelines are as follows:

Your term paper should be no more than 20 pages with tables, figures, and citations. The final product should utilize an appropriate font (use your judgment, but not one that is hard to read) and font size (10 to 12), be double spaced, and have one-inch margins. Be sure your paper is concise and to the point: do not include extra length to fill pages. The paper is due Tuesday May 2nd (last day of class).

Resources:

The course does not have an assigned textbook, and instead relies on journal articles and instructor lectures. The instructor lectures will present environmental science overview

information that is not in the assigned readings to provide general overview of broad topics. In class, we will also discuss the scientific papers/readings for targeted areas of specificity. For students who have less of a science or environmental science/ecology background, supplemental readings from an introductory environmental science textbook are available to fill in knowledge gaps as needed. A copy of this textbook is available to borrow for the short term, or it can be purchased in hard copy or electronic forms from major book suppliers.

Additional optional short readings may be suggested or distributed. These readings will either be suggested by speakers, other students in the course, or may be in response or to support discussion among participants in the course. A reduced load of readings have been suggested for the four weeks of the course to allow for this flexibility and to allow participants to focus on the readings needed for their presentations and paper.

Week 1 (January 24): Introduction, the conservation ethos, and sustainability

Reading:

Goodland, R. (1995). The concept of environmental sustainability. Annual review of ecology and systematics, 1-24. Available at: https://are.berkeley.edu/courses/ARE298/Readings/goodland.pdf

Supplemental Background (these are for students who want more of an introductory, broad overview of a given topic):

Chapter 1 – Environmental Interrelationships in Enger, E. D., Smith, B. F., & Barker, B. W. (One of the more recent editions). Environmental science: A study of interrelationships. McGraw Hill.

Week 2 (January 31): Water (Basic limnology, the Clean Water Act, and the Safe Drinking Water Act)

Reading:

Jones, R. C. (2020). Recovery of a tidal freshwater embayment from eutrophication: A multidecadal study. Estuaries and Coasts, 43(6), 1318-1334. Available at: https://link.springer.com/article/10.1007/s12237-020-00730-3

Kemp, W. M., Boynton, W. R., Adolf, J. E., Boesch, D. F., Boicourt, W. C., Brush, G., ... & Stevenson, J. C. (2005). Eutrophication of Chesapeake Bay: historical trends and ecological interactions. Marine ecology progress series, 303, 1-29. Available at: https://www.int-res.com/articles/feature/m303p001.pdf

Tracy Mehan III, G. (2022). The Clean Water Act Turns 50: A Critical Partner to the Safe Drinking Water Act. Journal-American Water Works Association, 114(6), 56-63. Available at: https://aquadoc.typepad.com/files/clean-water-act-turns-50-mehan-jawwa-2022.pdf

Supplemental background:

Chapter 16 in Enger, E. D., Smith, B. F., & Barker, B. W. (One of the more recent editions). Environmental science: A study of interrelationships. McGraw Hill.

Week 3 (Feb 7): Biodiversity, Natural Resources, and Invasive Species

Reading:

Wilson, E. O. (1988). The current state of biological diversity. Biodiversity, 521(1), 3-18. Available here

Havel, J. E., Kovalenko, K. E., Thomaz, S. M., Amalfitano, S., & Kats, L. B. (2015). Aquatic invasive species: challenges for the future. Hydrobiologia, 750(1), 147-170. https://link.springer.com/article/10.1007/s10750-014-2166-0

Kimmins, J. P. (2004). Forest ecology. Fishes and forestry: Worldwide watershed interactions and management, 17-43. Available at: http://www.eolss.net/sample-chapters/C10/E5-03-01-06.pdf

Supplemental Background:

Chapter 5 in Enger, E. D., Smith, B. F., & Barker, B. W. (One of the more recent editions). Environmental science: A study of interrelationships. McGraw Hill.

Week 4 (Feb 14): Conservation and Resource Management

Watch:

"The Last Refuge", the second episode in "The National Parks: America's Best Idea" by Ken Burns (2009) Available at https://www.pbs.org/kenburns/the-national-parks/ for free (if you are a member) or from Amazon for ~ $3.

Read

Chapters 10 and 12 in Nadkarni, N. M., & Wheelwright, N. T. (2014). Monteverde: Ecology and Conservation of a Tropical Cloud Forest-2014 Updated Chapters. Available at: https://digitalcommons.bowdoin.edu/cgi/viewcontent.cgi?article=1004&context=scholars-bookshelf

Supplemental Background:

Chapters 5 and 6 in Enger, E. D., Smith, B. F., & Barker, B. W. (One of the more recent editions). Environmental science: A study of interrelationships. McGraw Hill.

Week 5 (Feb 21): Chemicals and Pesticides (FIFRA, CICRA, RCRA)

Readings

Ögmundarson, Ó., Herrgård, M. J., Forster, J., Hauschild, M. Z., & Fantke, P. (2020). Addressing environmental sustainability of biochemicals. Nature Sustainability, 3(3), 167-174. Available at: https://backend.orbit.dtu.dk/ws/portalfiles/portal/203872345/proof.pdf

Rayasam, S. D., Koman, P. D., Axelrad, D. A., Woodruff, T. J., & Chartres, N. (2022). Toxic substances control act (TSCA) implementation: How the amended law has failed to protect vulnerable populations from toxic chemicals in the United States. Environmental science & technology, 56(17), 11969-11982. Available at: https://pubs.acs.org/doi/full/10.1021/acs.est.2c02079

Kumar, V., & Kumar, P. (2019). Pesticides in agriculture and environment: Impacts on human health. Contaminants in agriculture and environment: health risks and remediation, 1, 76-95. Available at: https://www.aesacademy.org/books/cae-vol-1/07.pdf

van der Werf, H. M. (1996). Assessing the impact of pesticides on the environment. Agriculture, Ecosystems & Environment, 60(2-3), 81-96. Available here

Chapter 9 (Pollution) in Newman, E. I. (2008). Applied ecology and environmental management. John Wiley & Sons.

Supplemental background:

Chapters 18 and 19 in Enger, E. D., Smith, B. F., & Barker, B. W. (One of the more recent editions). Environmental science: A study of interrelationships. McGraw Hill.

Week 6 (Feb 28): Air and Climate Change

Reading:

Dedoussi, I. C., Eastham, S. D., Monier, E., & Barrett, S. R. (2020). Premature mortality related to United States cross-state air pollution. Nature, 578(7794), 261-265. Available at: https://www.nature.com/articles/s41586-020-1983-8

Hansen, J., Sato, M., Ruedy, R., Lo, K., Lea, D. W., & Medina-Elizade, M. (2006). Global temperature change. Proceedings of the National Academy of Sciences, 103(39), 14288-14293. Available at: https://www.pnas.org/doi/abs/10.1073/pnas.0606291103

Zepernick, B. N., Wilhelm, S. W., Bullerjahn, G. S., & Paerl, H. W. (2022). Climate change and the aquatic continuum: A cyanobacterial comeback story.

Environmental Microbiology Reports. Available at: https://www.hindawi.com/journals/tswj/2001/139109/

Supplemental background:

Chapter 17 in Enger, E. D., Smith, B. F., & Barker, B. W. (One of the more recent editions). Environmental science: A study of interrelationships. McGraw Hill.

Week 7 (March 7) - At home Midterm, no in-person class, no reading

March 14 – Spring Break

Week 8 (March 21) – Energy Production and Impacts

Readings:

Congressional Research Service. (2021). Energy in the 21st Century: Issues and Trends. R46723. https://crsreports.congress.gov/product/pdf/R/R46723

Martins, F., Felgueiras, C., Smitkova, M., & Caetano, N. (2019). Analysis of fossil fuel energy consumption and environmental impacts in European countries. Energies, 12(6), 964. Available at: https://www.mdpi.com/1996-1073/12/6/964

Tiwary, R. K. (2001). Environmental impact of coal mining on water regime and its management. Water, Air, and Soil Pollution, 132(1), 185-199.

Supplemental background:

Chapter 10 in Enger, E. D., Smith, B. F., & Barker, B. W. (One of the more recent editions). Environmental science: A study of interrelationships. McGraw Hill.

Week 9 (March 28) US Environmental Policy Paradigms & Federalism

Readings:

Finn, D., & **Roberson, A.** (2022). New Federal Funding Provides Historic Opportunity. Journal-American Water Works Association, 114(3), 6-8. https://aquadoc.typepad.com/files/jawwa202204_finn.pdf

Kriebel, D., Tickner, J., Epstein, P., Lemons, J., Levins, R., Loechler, E. L., ... & Stoto, M. (2001). The precautionary principle in environmental science. Environmental health perspectives, 109(9), 871-876. https://ehp.niehs.nih.gov/doi/pdf/10.1289/ehp.01109871

Supplemental background:

Chapter 20 in Enger, E. D., Smith, B. F., & Barker, B. W. (One of the more recent editions). Environmental science: A study of interrelationships. McGraw Hill.

Week 10 (April 4) - Developing Effective Applied Environmental Science for use in Public Policy and Mitigation approaches and technologies

Readings:

Evich, M.G., Davis, M.J., McCord, J.P., Acrey, B., Awkerman, J.A., Knappe, D.R., Lindstrom, A.B., **Speth, T.F.,** Tebes-Stevens, C., Strynar, M.J. and Wang, Z., 2022. Per-and polyfluoroalkyl substances in the environment. Science, 375(6580), p.eabg9065. Available at: https://www.science.org/doi/full/10.1126/science.abg9065?casa_token=NwEOu81bthMAAAAA%3A7tRbbV3C6WO462VTdfmI6NdYItGSGSh3v9giFtntAShlRl_54GtuPyN4ch0XvVSvZhuXgRBhOZJZTA

Benedict, M. A., & McMahon, E. T. (2002). Green infrastructure: smart conservation for the 21st century. Renewable resources journal, 20(3), 12-17. Available at: https://www.merseyforest.org.uk/files/documents/1365/2002+Green+Infrastructure+Smart+Conservation+for+the+21st+Century..pdf

Week 11 (April 4) – Our Connected World and Ecosystem Services

Readings:

Balcombe, P., Brierley, J., Lewis, C., Skatvedt, L., Speirs, J., Hawkes, A., & Staffell, I. (2019). How to decarbonise international shipping: Options for fuels, technologies and policies. Energy conversion and management, 182, 72-88. Available at: https://www.sciencedirect.com/science/article/pii/S0196890418314250?casa_token=q3Kqmp_KSrQAAAAA:VRHtOKXsfUZCDySXh2ToiSQuPba3BKRYrXl81VPRNyP4ZZJEZsrijKDr4WwTxkCk7H8cRBqV

Kumar, P., Brondizio, E., Gatzweiler, F., Gowdy, J., de Groot, D., Pascual, U., Reyers, B. and Sukhdev, P., 2013. The economics of ecosystem services: from local analysis to national policies. Current Opinion in Environmental Sustainability, 5(1), pp.78-86. Available at: https://www.sciencedirect.com/science/article/pii/S1877343513000079?casa_token=FT_Al0a1EiYAAAAA:nTWWGG2z7HZzeEtFzfI1usLYd8TXTQdyUTL1IKv4LU9lYXvjHFQlYfkvSqdp681nnrNDWFcg

Week 13 (April 25) – Cost Benefit Analyses

Readings:

Atkinson, G., & Mourato, S. (2008). Environmental cost-benefit analysis. Annual review of environment and resources, 33(1), 317-344. Available at: http://bioecon-network.org/pages/16th_2014/UNEP/Mourato_reading.pdf