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# CDS 490

**Decisionmaking in Environmental Policy Modeling**

**2021 Summer**

**Synchronous Online Sessions**[[1]](#footnote-1)

**Monday, Wednesday, Friday**

**June 2 – July 23: 10:30am–12:30pm**

# Syllabus

**Instructor**

## Prof. Dale S. Rothman

## Computational Social Science PhD Program

## Department of Computational and Data Sciences

## College of Science

## Research Hall, Room 374

## drothma@gmu.edu

# Office Hours

By appointment

I plan to be in my physical office on Wednesdays, but will also provide a Zoom link on Blackboard so that we can meet online. If you wish to contact me at other times, please feel free to use the Email feature in Blackboard or write me directly. If you do write me directly, please include CDS490 in the subject line; it will make it much more likely that I will respond in a timely manner.

* I will only respond to emails sent from a Mason account.
* All e-mails should have “CDS490” at the beginning of the Subject Line so I may easily identify it as a class email.
* Please allow up to 24 hours for a response during normal hours (M-F 9am-5pm; longer on weekends and holidays.
* If your questions are involved enough, I will ask you to schedule an appointment with me.
* Questions related to assignments should be asked before the due date and definitely not within the last few hours before the deadline.[[2]](#footnote-2)
* All emails are subject to FOIA requests.

# Course Overview

This course is an undergraduate-level introduction to environmental modeling for decision making, specifically policy making. This, necessarily, requires treatment of not only environmental models themselves, but also the policy process, and their interactions. Thus, in this course, we will interweave explorations of environmental models with discussions of the opportunities and pitfalls of using models in the policy process. We will focus on the use of models by the US and the EU, but will also explore additional models and discuss the development of our own models.

Topics:

* Policy Making
  + What is Policy?
  + What is Environmental Policy?
* Modeling
  + Model Development
  + Model Evaluation
    - Verification and Validation
    - Sensitivity and Uncertainty Analysis
  + Model Application
* Modeling for Policy Making
  + Special Features of Modeling for Policy Making
  + Wicked Problems and the Limits of Evidence Based Policy
  + Communicating Models and Model Results
  + Participation in Modeling for Policy Making
  + Modeling the Policy Process

# Course Website

The class website on Blackboard is the hub for this course. It contains, *inter alia*, a copy of this syllabus, Zoom links to the synchronous sessions and office hours, weekly outlines, links to readings (other than from the required text) and other preparatory material, links to the software to be used in the course, course assignments, and your grades.

Material for each session is provided in the weekly overview sections. Please note that course handouts (i.e. lecture slides) will not be available until after classes.

Any important changes to the website during the semester will be announced

**Format and Course Recordings**

The course will be taught as synchronous online lectures supported with additional material disseminated through the course website. All of our synchronous meetings in this class will be recorded automatically for offline access. Recordings will be stored on Blackboard and will only be accessible to students taking this course during this semester.

**Student Privacy**

All course materials posted to Blackboard or other course site are private; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.

* Video recordings of class meetings that include audio or visual information from other students are private and must not be shared
* Live Video Conference Meetings that include audio or visual information from other students must be viewed privately and not shared with others in your household

# Grading

# Your grade for the course will be comprised of the following elements:

* *Attendance and In-class Participation 10%*

# *Participation in Online Discussions 10%*

# *Project Proposal Submission 5%*

# *Model Notebooks (4 x 7.5%) 30%*

# *Final Presentation 10%*

# *Final Paper 25%*

# *TRACE document and model files 10%*

*Attendance and In-class Participation*

Although this class is being taught on-line, it is being taught synchronously, not asynchronously. While I am recording the sessions, I do expect you to attend the sessions live, and be on time, unless you have given me prior notice that you will be absent and/or late. Of course, emergencies can arise that cause you to miss/be late for sessions at the last minute, but please do inform me afterwards. It is up to my discretion as to whether absences are considered excused.

*Participation in Online Discussions (various dates)*

For a number of the class sessions, I will be posting discussion questions online (see Discussion Board in the course menu). These are intended to make sure you are engaging with the assigned readings and to set the stage for in class discussion. You need to respond to these questions even (especially) if you will not be attending the class session live.

*Project Proposal Submission (submit Tuesday June 22 by 5:00PM)*

You will need to provide a brief description of the environmental policy you will explore and the model you will either develop yourself or build upon. If you will be building on an existing model, please include a link to the model.

*Model Notebooks (submit Fridays June 25, July 2, July 9, and July 16 by 5:00PM)*

As part of your project, you will be required to keep a modeling notebook. This notebook is meant to be a log of dated entries reporting what was done on the project and why, what was accomplished, and a “to-do” list of both critical issues to be addressed as soon as the task is resumed and non-critical issues to be addressed when one has time. (see Ayllón et al 2021 for more details). The information in this notebook should be a key resource for your final presentation, paper, and TRACE document. Beginning with week 4 (June 21-25), you will need to submit your model notebook by 5:00PM each Friday with all entries up to that time.

*Final Presentation (submit slides Friday July 23 by 10:30AM)*

Your presentation on July 23rd should be no longer than 15 minutes. It should take the form of a formal conference/work presentation. The use of Powerpoint or a similar presentation software is not necessary, but if you will be using a slide deck, please provide a copy to the instructor prior to the class in case of technical difficulties and as part of your final project. You should also be prepared to answer questions of clarification during your presentation and other questions at the end of your presentation (approximately 5 minutes will be allocated for questions after the presentation).

*Final Paper (submit Sunday July 25 by 11:59PM)*

The main text of the final paper (i.e., not including, title page, table of contents, tables, or figures; you can count the abstract) should be approximately 2000 words (this is around 4 pages single spaced or 8 pages double spaced). The paper is expected to be of similar style to that of a research paper or short report (including the appropriate referencing style and good use of English). It should include the following, or similar sections:

**Abstract**

Summarize the paper.

**Introduction**

Discuss the purpose of the overall project. Identify the policy area you will be exploring. Introduce, briefly, the model you will be using in your analysis – does it build on an existing model or is it a new model; what is the model “for”; not what the model is “of”

**Methodology**

Describe the model and the policy experiments you will be exploring. Since, you will also be including a separate TRACE document, you will not need to provide excessive details on the model here, but you should indicate the input parameters and output variables that are central to your policy experiments.

**Results**

Using appropriate figures and tables, summarize the specific input parameter settings and results (outputs) from your policy experiments.

**Analysis & Discussion**

Discuss the model results in the context of the overall policy area you are exploring. Identify any possible recommendations you might make based on your analysis, including some indication of your confidence in these. Indicate key areas of uncertainty and the need for possible further model development and/or exploration.

**Summary & Conclusions**

Summarize your main findings and key conclusions from the project process and outcomes.

**References**

All papers, models[[3]](#footnote-3), web links, etc. cited in the main text, using a consistent reference style. (Could be a good time to learn Zotero or another reference manager)

*TRACE document and model files (submit Sunday July 25 by 11:59PM)*

TRACE – TRAnsparent and Comprehensive model Evaludation documents are a tool for planning, documenting, and assessing model evaludation, which includes understanding the rationale behind a model and its envisaged use. Please use the template provided on the Blackboard site for preparing your TRACE document.

Along with the TRACE document, please include the actual model file(s) and any additional files required to run the model and replicate the policy experiments, i.e., input data sets.

***In all cases, assignments are to be submitted on Blackboard and late submissions will not be accepted without prior approval by the instructor.***

Based on the final total score, your final grade will be determined as follows: A+ [97-100], A [93-96.99], A- [90-92.99], B+ [87-89.99], B [83-86.99], B- [80-82.99], C+ [77-79.99], C [73-76.99], C- [70-72.99], D [65-69.99], F [<65].

# Readings and other Preparatory Material

All readings and preparatory material are listed in the sections on the class website. These will consist of, *inter alia*, required readings, optional readings, links to websites, and videos. The optional readings may or may not be discussed in class, depending on the time available, but is nonetheless included in the interest of depth and completeness.

Other readings are available online or will be made available on the course website.

# Software

I will introduce you to one software platforms during this course.

* NetLogo version 6.2.0 (<http://ccl.northwestern.edu/netlogo/>): This is a very commonly used platform for teaching and doing basic cellular automata and agent-based modelling. It does have the ability to do very simple system dynamics and network modeling, as well as incorporate GIS, but those features are somewhat limited. We will only be using NetLogo 6.2.0 and BehaviorSearch 6.2.0; you can ignore NetLogo 3D and HubNet Client, which are also installed with the software. There is no commercial version of NetLogo.

There are a number of other platforms available for the types of modeling we will be exploring, but I am less familiar with them. Also, for more advanced modeling, many modelers eventually move to specialized C++, Java, or Python libraries, such as MASON, which was developed here at GMU (<https://cs.gmu.edu/~eclab/projects/mason/>). We will not be exploring those in this class, but you may come across them in some of the readings and demos. You will almost certainly come across them in more advanced courses in this department.

# Course Resources

**Journals**

* Environmental Modelling & Software (<https://www.sciencedirect.com/journal/environmental-modelling-and-software>)
* Environmental Policy and Governance (<https://onlinelibrary.wiley.com/journal/17569338>)
* Environmental Politics (<https://www.tandfonline.com/toc/fenp20/current>)
* International Journal of Environmental Policy and Decision Making (<https://www.inderscience.com/jhome.php?jcode=ijepdm>)
* Journal of Artificial Societies and Social Simulation (<http://jasss.soc.surrey.ac.uk/JASSS.html>)
* Journal of Environmental Policy & Planning (<https://www.tandfonline.com/toc/cjoe20/current>)
* Journal of Policy & Complex Systems (<http://www.ipsonet.org/publications/open-access/policy-and-complex-systems>)
* Journal of Policy Modeling (<https://www.journals.elsevier.com/journal-of-policy-modeling/>)
* Socio-Environmental Systems Modelling (<https://sesmo.org/index>)

**US Resources**

* US Laws and Regulations related to the Environment (<https://www.epa.gov/laws-regulations>)
* National Environmental Policy Act (<https://ceq.doe.gov/>)
* EPA Center for Environmental Measurement and Modeling (<https://www.epa.gov/aboutepa/about-center-environmental-measurement-and-modeling-cemm>)
* EPA Environmental Modeling (<https://www.epa.gov/measurements-modeling/environmental-modeling>)
* EPA Science Models and Research Tools (SMaRT) Search (<https://www.epa.gov/research/epa-science-models-and-research-tools-smart-search>)
* EPA Registry of EPA Applications, Models and Data Warehouses (READ) (<https://sor.epa.gov/sor_internet/registry/systmreg/searchandretrieve/basic/search.do>)
* EPA Environmental Modeling Training Modules (<https://archive.epa.gov/epa/measurements-modeling/environmental-modeling-training-modules.html>)
  + Module 1 - Environmental Modeling 101 (<https://archive.epa.gov/epa/measurements-modeling/environmental-modeling-101-training-module.html>)
  + Module 2 The Modeling Life-cycle (<https://archive.epa.gov/epa/measurements-modeling/model-life-cycle-training-module.html>)
  + Module 3 Best Modeling Practices- Model Development (<https://archive.epa.gov/epa/measurements-modeling/training-module-development-best-modeling-practices.html>)
  + Module 4 Best Modeling Practices- Model Evaluation (<https://archive.epa.gov/epa/measurements-modeling/training-module-evaluation-best-modeling-practices.html>)
  + Module 5 Best Modeling Practices-Model Application (<https://archive.epa.gov/epa/measurements-modeling/training-module-application-best-modeling-practices.html>)
  + Module 6 Integrated Modeling 101 (<https://archive.epa.gov/epa/measurements-modeling/integrated-modeling-101-training-module.html>)
  + Module 7 Legal Aspects of Environmental Modeling (<https://archive.epa.gov/epa/measurements-modeling/legal-aspects-modeling-training-module.html>)
  + Module 8 Sensitivity and Uncertainty Analysis (<https://archive.epa.gov/epa/measurements-modeling/sensitivity-and-uncertainty-analyses-training-module.html>)

**European Union Resources**

* Fact Sheets on the European Union – Environmental Policy (<https://www.europarl.europa.eu/factsheets/en/section/193/environment-policy>)
* European Commission Environment (<https://ec.europa.eu/environment/index_en>)
* EU Environment Action Plan to 2030 (<https://ec.europa.eu/environment/strategy/environment-action-programme-2030_en>)
* EU Environment Action Programme to 2020 (<https://ec.europa.eu/environment/action-programme/>)
* Modelling Inventory and Knowledge Management System of the European Commission (MIDAS) (<https://web.jrc.ec.europa.eu/policy-model-inventory/>)
* Modelling Tools for EU Analysis (Climate) (<https://ec.europa.eu/clima/policies/strategies/analysis/models_en>)
* European Commission Competence Centre on Modelling (<https://knowledge4policy.ec.europa.eu/modelling_en>)

**Model Repositories**

* CoMSES Network (<https://www.comses.net/>)
* NetLogo User Community Models (<https://ccl.northwestern.edu/netlogo/models/community/index.cgi>)
* NetLogo Modeling Commons (<http://modelingcommons.org/account/login>)

**Other Resources**

* RAND Robust Decision Making (<https://www.rand.org/topics/robust-decision-making.html>)

# Academic Honesty and Collaboration

The integrity of the University community is affected by the individual choices made by each of us. GMU has an Honor Code with clear guidelines regarding academic integrity. Three fundamental and rather simple principles to follow at all times are: (1) all work submitted should be your own or that of your assigned group; (2) when using the work or ideas of others, including fellow students, give full credit through accurate citations; and (3) if you are uncertain about the ground rules on a particular assignment, ask for clarification. No grade is important enough to justify academic misconduct.

Plagiarism means using the exact words, opinions, or factual information from another person without giving the person credit. Writers give credit through accepted documentation styles, such as parenthetical citation, footnotes, or endnotes. Paraphrased material must also be cited, using MLA or APA format. A simple listing of books or articles is not sufficient. Plagiarism is the equivalent of intellectual robbery and cannot be tolerated in the academic setting. If you have any doubts about what constitutes plagiarism, please see me.

As in many classes, a number of projects in this class are designed to be completed in groups. With collaborative work, names of all the participants should appear on the work. Collaborative projects may be divided up so that individual group members complete portions of the whole, provided that group members take sufficient steps to ensure that the pieces conceptually fit together in the end product.

Other projects are designed to be undertaken independently. In the latter case, you may discuss your ideas with others and conference with peers on drafts of the work; however, it is not appropriate to give your paper to someone else to revise. You are responsible for making certain that there is no question that the work you hand in is your own. If only your name appears on an assignment, your professor has the right to expect that you have done the work yourself, fully and independently.

Furthermore, it is unacceptable to use a model or a paper developed for another class in this class.

The re-use of computer models is also not acceptable. If one does use code from another model, please ensure the code that is used is accredited to the original model (just as you would do to a reference in a paper).

# Disability Statement

If you have a documented learning disability or other condition that may affect academic performance you should: 1) make sure this documentation is on file with Disability Services (SUB I, Rm. 4205; 993-2474; http://ds.gmu.edu) to determine the accommodations you need; and 2) talk with me to discuss your accommodation needs.

# Sexual Harassment, Sexual Misconduct, and Interpersonal Violence

As a faculty member and designated “Responsible Employee,” I am required to report all disclosures of sexual assault, interpersonal violence, and stalking to Mason’s Title IX Coordinator per university policy 1412. If you wish to speak with someone confidentially, please contact the Student Support and Advocacy Center (703-380-1434), Counseling and Psychological Services (703-993-2380), Student Health Services, or Mason’s Title IX Coordinator (703-993-8730; [cde@gmu.edu](mailto:cde@gmu.edu)).

# Privacy

Students must use their MasonLive email account to receive important University information, including communications related to this class.

# Student Support Resources

George Mason University has a number of academic support and other resources to facilitate student success (e.g., Counseling and Psychological Services, Learning Services, University Career Services, the Writing Center, etc.). See <http://www.gmu.edu> for more details.

# Military activation

In accordance with the “Virginia Tuition Relief, Refund, and Reinstatement Guidelines,” Mason students in the uniformed services under call or order to active duty, after the beginning of a semester or summer session have two options they may consider with the dean's office of their school of enrollment and Office of the University Registrar in determining their enrollment status with the University: 1. Students may withdraw from courses in which they are enrolled as of the effective date of the call or order to report to active duty and 2. Students may take a grade of incomplete in all courses. For more details see <https://catalog.gmu.edu/student-services/military-services/>.

# Course Sessions

*Wed June 2: Introduction to Course*

Readings

* Rittel, Horst W. J., and Melvin M. Webber. 1973. “Dilemmas in a General Theory of Planning.” Policy Sciences 4 (2): 155–69.

*Fri June 4: Introduction to Policy*

Readings

* Morgan, Granger. 2017. Theory and Practice in Policy Analysis: Including Applications in Science and Technology. Cambridge, United Kingdom ; New York, NY: Cambridge University Press. Ch.1.
* Vedung, Evert. 1998. “Policy Instruments: Typologies and Theories.” In Carrots, Sticks & Sermons: Policy Instruments and Their Evaluation, edited by Marie-Louise Bemelmans-Videc, Ray C. Rist, and Evert Vedung, 21–58. Comparative Policy Analysis Series. New Brunswick, NJ: Transaction Publishers.

*Mon June 7: Introduction to Environmental Policy*

Readings

* Graff-Zivin, Josh, and Sam Krumholz. 2018. “Environmental Policy-Making- Theory and Practice.” Oxford, UK: Rockefeller Foundation Economic Council on Planetary Health at the Oxford Martin School.
* Cocklin, Chris, and Katie Moon. 2020. “Environmental Policy.” In *International Encyclopedia of Human Geography (Second Edition)*, edited by Audrey Kobayashi, 227–33. Oxford: Elsevier.

*Wed June 9: Environmental Policy in the US and EU*

Readings

* CEQ. 2021. “A Citizen’s Guide to NEPA: Having Your Voice Heard.” Washington,  DC: Council on Environmental Quality, Executive Office of the President. (focus on pp.1-17 and 28-34)
* US Laws and Regulations related to the Environment (<https://www.epa.gov/laws-regulations>) (look at summary of key laws)
* Fact Sheets on the European Union – Environmental Policy (<https://www.europarl.europa.eu/factsheets/en/section/193/environment-policy>)
* Proposal for EU Environment Action Plan to 2030 (<https://ec.europa.eu/environment/strategy/environment-action-programme-2030_en>)

*Fri June 11: Use of Models for Environmental Policy in the US and EU*

Readings

* Köhler, J, S Glöser, M Pfaff, M Corbin, D Hogg, Michael Munk Sørensen, A Maratou, et al. 2016. Scoping Study on Modelling of EU Environment Policy: Final Report. Luxembourg: Publications Office.
* National Research Council (U.S.), ed. 2007. *Models in Environmental Regulatory Decision Making*. Washington, D.C: National Academies Press.
* US EPA. 2009. “Guidance on the Development, Evaluation, and Application of Environmental Models.” EPA/100/K-09/003. Washington, DC: US EPA Council for Regulatory Environmental Modeling.

*Mon June 14: Initial Choice of Models/Issues*

* Please come to class ready to discuss, in pairs, the initial model/issue you have chosen to explore.

Readings

* Module 1 - Environmental Modeling 101 (<https://archive.epa.gov/epa/measurements-modeling/environmental-modeling-101-training-module.html>)
* Module 2 The Modeling Life-cycle (<https://archive.epa.gov/epa/measurements-modeling/model-life-cycle-training-module.html>)

*Wed June 16: One-on-One Project Meetings with Students*

*Fri June 18: Discussion of Projects and Documentation*

Readings

* Ayllón, Daniel, Steven F. Railsback, Cara Gallagher, Jacqueline Augusiak, Hans Baveco, Uta Berger, Sandrine Charles, et al. 2021. “Keeping Modelling Notebooks with Trace: Good for You and Good for Environmental Research and Management Support.” Environmental Modelling & Software : With Environment Data News 136: 104932-. <https://doi.org/10.1016/j.envsoft.2020.104932>.
* Schmolke, Amelie, Pernille Thorbek, Donald L. DeAngelis, and Volker Grimm. 2010. “Ecological Models Supporting Environmental Decision Making: A Strategy for the Future.” Trends in Ecology & Evolution (Amsterdam) 25 (8): 479–86. <https://doi.org/10.1016/j.tree.2010.05.001>.
* Augusiak, Jacqueline, Paul J. Van den Brink, and Volker Grimm. 2014. “Merging Validation and Evaluation of Ecological Models to ‘Evaludation’: A Review of Terminology and a Practical Approach.” Ecological Modelling, Population Models for Ecological Risk Assessment of Chemicals, 280 (May): 117–28. <https://doi.org/10.1016/j.ecolmodel.2013.11.009>.
* Grimm, Volker, Jacqueline Augusiak, Andreas Focks, Béatrice M. Frank, Faten Gabsi, Alice SA Johnston, Chun Liu, et al. 2014. “Towards Better Modelling and Decision Support: Documenting Model Development, Testing, and Analysis Using TRACE.” Ecological Modelling 280: 129–39. <https://doi.org/10.1016/j.ecolmodel.2014.01.018>.
* Grimm, Volker, Steven F. Railsback, Christian E. Vincenot, Uta Berger, Cara Gallagher, Donald L. DeAngelis, Bruce Edmonds, et al. 2020. “The ODD Protocol for Describing Agent-Based and Other Simulation Models: A Second Update to Improve Clarity, Replication, and Structural Realism.” Journal of Artificial Societies and Social Simulation 23 (2): 7. <https://doi.org/10.18564/jasss.4259>.

*Mon June 21: Course Review and Update*

* Also watch Kendall lecture <https://www.youtube.com/watch?v=qzpSu-4JXiY>

*Wed June 23: One-on-One Project Meetings with Students*

*Fri June 25: Implications of Complexity for Decisionmaking*

Readings

* Funtowicz, Silvio O., Joan Martinez-Alier, Guissepe Munda, and Jerome R. Ravetz. 1999. Information Tools for Environmental Policy Under Conditions of Complexity. Environmental Issue Series, No. 9. Copenhagen, Denmark: European Environment Agency. <https://www.eea.europa.eu/publications/ISSUE09/file>.
* Funtowicz, Silvio O., and Jerome R. Ravetz. 1985. “Three Types of Risk Assessment: A Methodological Analysis.” In Risk Analysis in the Private Sector, edited by Chris Whipple and Vincent T. Covello, 217–31. Advances in Risk Analysis. Boston, MA: Springer US. <https://doi.org/10.1007/978-1-4613-2465-2_18>.
* Lane, David A., and Martin Down. 2010. “The Art of Managing for the Future: Leadership of Turbulence.” Edited by David Lamond. Management Decision 48 (4): 512–27. <https://doi.org/10.1108/00251741011041328>.

*Mon June 28: En-ROADS - A Model for Energy and Climate Policy*

* Presentation of work by Climate Interactive (<https://www.climateinteractive.org/>), with a focus on the En-ROADS model.

Readings

* En-ROADS User Guide (attached) up through section 1.5
* En-ROADS One Page Guide to Control Panel (attached)

*Wed June 30: One-on-One Project Meetings with Students*

*Fri July 2: Review of Sensitivity, Scenario, and Policy Analysis*

Reading

* BehaviorSpace guide in NetLogo

*Mon July 5: No Class – 4th of July observed*

*Wed July 7: One-on-One Project Meetings with Students*

*Fri July 9: Course Review and General Discussion on Projects*

*Mon July 12: Modeling Small-Scale Fisheries*

* The SES-LINK group at Stockholm Resilience Centre, Stockholm University (<https://www.seslink.org/>) has produced a series of models related to small-scale fisheries. The first of these is named SMILI - Small-scale fisheries: Institutions and Local Interactions. Please find attached the NetLogo model (downloaded from ComSES) and a published artlicle based upon this model. The supplemental material to the latter includes and ODD and other descriptive material related to this model. I will present and discuss this model. If time permits, I will also discuss some of their other models related to issues surrounding small-scale fisheries.

*Wed July 14: One-on-One Project Meetings with Students*

*Fri July 16: Enhancing the Use of Modeling for Environmental Policy*

Readings

* Grimm, Volker, Alice S. A. Johnston, H.-H. Thulke, V. E. Forbes, and P. Thorbek. 2020. “Three Questions to Ask Before Using Model Outputs for Decision Support.” Nature Communications 11 (1): 4959–4959. <https://doi.org/10.1038/s41467-020-17785-2>.
* Saltelli, Andrea, Gabriele Bammer, Isabelle Bruno, Erica Charters, Monica Di Fiore, Emmanuel Didier, Wendy Nelson Espeland, et al. 2020. “Five Ways to Ensure That Models Serve Society: A Manifesto.” Nature 582 (7813): 482–84. <https://doi.org/10.1038/d41586-020-01812-9>.
* Voorn, G. A. K. van, R. W. Verburg, E. -M. Kunseler, J. Vader, and P. H. M. Janssen. 2016. “A Checklist for Model Credibility, Salience, and Legitimacy to Improve Information Transfer in Environmental Policy Assessments.” Environmental Modelling & Software 83 (September): 224–36. <https://doi.org/10.1016/j.envsoft.2016.06.003>.

*Mon July 19: One-on-One Project Meetings with Students*

*Wed July 21: Project Presentations*

*Fri July 23: Project Presentations*

1. Zoom links for, and recordings of, these sessions will be made available on Blackboard. [↑](#footnote-ref-1)
2. Exceptions to this rule are determined on a case-by-case basis. For example, I do plan to respond when there are unexpected technical glitches. [↑](#footnote-ref-2)
3. If code is used that is not your own please cite it accordingly and provide a link to the code. [↑](#footnote-ref-3)