The Food-Energy-Water Nexus (GEO/NRSM 540) Fall 2019

Course Information
Class meetings: TR 12:30-1:50 pm, CHCB 333
3.0 credits
Website: Moodle umonline.umt.edu

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<tr>
<th>Instructors:</th>
<th>Andrew Wilcox</th>
<th>Laurie Yung</th>
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<tr>
<td>Office:</td>
<td>CHCB 357</td>
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<tr>
<td>Office Hours:</td>
<td>M 3-4 pm, or by appt (please email)</td>
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Overview
The Food-Energy-Water Nexus examines core nexus concepts and tools with an emphasis on bridging local and global scales, sectors and disciplines, and problems and analytic tools. The course integrates physical and biological sciences, social and behavioral sciences, economics, and engineering, and covers broad frameworks such as interdisciplinarity, systems thinking, vulnerability, governance, and connecting science and practice. These frameworks are applied to specific food-energy-water problems and cases to build analytic skills and illuminate system drivers, leverage points, and cross-scale linkages. Readings draw from Montana, national, and international examples. The course is structured to highlight both disciplinary and interdisciplinary perspectives on the nexus. Active learning, collaboration, and student engagement and participation are essential components of the course.

Learning Outcomes
Students in this course will:

- conceptualize and articulate cross-sector linkages and processes within the Food-Energy-Water Systems (FEWS) nexus;
- understand the FEWS nexus across local to global scales and identify cross-scalar connections;
- understand systems approaches to the FEWS nexus;
- understand “wicked problems” at the FEWS nexus and approaches to addressing them;
- develop the capacity for interdisciplinary and collaborative analysis of nexus issues and topics.

Topics and Schedule

Week 1 (8/27, 8/29): Introduction to the Food-Energy-Water Systems (FEWS) nexus
Weeks 2 – 4: Core Concepts at the Nexus
  9/3-9/12 Case Study: The FEWS nexus in the Mekong River Basin
  9/17  Interdisciplinary research fishbowl

Weeks 4 – 8: Energy Systems at the Nexus
  9/19  Global energy systems and sources
  9/24  Renewable energy policy (Diana Maneta)
  9/26  Energy politics
  10/1, 10/3  Nuclear energy & water systems (Payton Gardner)
  10/8  Student presentations: science-policy/practice briefs
  10/10, 10/15  Water & energy / hydro / global to local scale
  10/17  Carbon cycle, climate, & energy fluxes (Ashley Ballantyne)

Weeks 9 – 11: Food Systems at the Nexus
  10/22, 10/24 The industrial food system (Neva Hassanein)
  10/29  Hydrology and agriculture; modeling approaches (Marco Maneta)
  10/31, 11/5  Drought, agriculture, farmer decision-making
  11/7  Food systems; biophysical perspectives

Weeks 12 – 16: Emerging Topics and Wicked Problems at the FEWS Nexus
  11/12-11/21: Interdisciplinary FEW Case Studies (Student Group Presentations)
  11/26  Emerging INFEWS topics; Future directions in FEWS
  11/28  Thanksgiving (no class)
  12/3  Individual project short presentations
  12/5  Uncertainty at the FEWS nexus / Looking to the future
  12/9  Course wrap up / Evaluations (10:10-12:10; this is the final exam slot for our class)

Readings
Because there is far more to this topic than we can possibly cover in lecture, and because this is a graduate class, an important element of your learning in this course will be from readings. Typically, each week there will be one or more readings targeted at fundamental knowledge related to that week’s topic (e.g., review papers, book chapters). Some weeks we will also read 1-2 journal papers and spend all or a portion of class discussing them. These discussions will be designed to encourage critical thinking about primary literature and broad participation (also see Participation section below). A partial list of readings is provided below; we will develop a more specific reading list and discussion schedule as the semester progresses. Readings will be posted on Moodle.
Assessment

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<th>Percent of Course Grade</th>
<th>Due Date</th>
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<tr>
<td>Participation</td>
<td>20%</td>
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<tr>
<td></td>
<td>Ongoing</td>
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<tr>
<td>Science-Policy/Practice Brief and Presentation</td>
<td>25%</td>
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<td>Case Study Presentation</td>
<td>25%</td>
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<tr>
<td>FEWS Data Analysis Paper and Presentation</td>
<td>30%</td>
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<tr>
<td>Total</td>
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Participation

Participation grades will be based on regular attendance and engaged participation, including but not limited to classes devoted to paper discussions. This is a graduate seminar, which means that students are responsible for contributing to the content of the course through regular attendance, engaged participation, discussion, and presentations. Students are expected to carefully and thoroughly read ALL assigned readings prior to class and come to class prepared to discuss, examine, analyze, and critique each reading. “Engaged participation” does not refer to the number of comments you make during class or your level of expertise, but rather describes the sort of thoughtful, meaningful, prepared (meaning you actively read the assignments) questions and comments that further your own intellectual development and that of the group; quality of contributions is more important than quantity! A willingness to work on the material at hand, and consider its application to the field is critical. Civility and respect for different views and ideas are also expected. Providing space for others to contribute and knowing when to hold back are critical. Participation may also entail completing in-class quantitative problem solving and back-of-the-envelope calculations.

Science-Policy/Practice Brief

Students will be asked to write a briefing paper that outlines the potential policy or management implications of a specific FEW nexus scientific finding. This paper will be written in lay language for a target audience of a specific client or stakeholder relevant to your topic; these could include policy-makers, resource managers, non-profit personnel, or other decision-makers. The brief will need to connect a specific nexus finding to a proposed or existing policy or management action. Students will need to identify a topic for this paper, based on the assigned readings for this class or resources identified outside of class. A broad objective of this assignment is to develop your ability to connect science and practice (i.e., policy, management, solutions). Each student is also required to make a short class presentation on the topic chosen for your science-policy brief. More specific guidelines for this assignment will be provided.

Case Study Presentation

Students will be organized in small, interdisciplinary groups to research and prepare a class session related to a specific FEW nexus case study. Each group will be responsible for one day of instruction during weeks 10–13. Instructors will provide topics and a set of readings to get
each group started. Each group will be meet outside of class to find additional readings and
resources, discuss the key elements of the case and how to focus the class period, select
specific readings for the rest of the class, and plan their case study presentation. Each group
will have an assigned instructor (Yung, Wilcox, or other faculty) who will work with them to
understand the case and plan the presentation.

Presentations can include lecture, guided discussion, and other class activities. Presentations
need to: (1) focus on the nexus (e.g. interactions between two or more of food, energy, and
water), (2) be integrated and interdisciplinary (e.g. highlight interactions across social, physical,
and biological elements of the case), (3) highlight interactions across scales, and (4) present or
generate some specific ideas regarding interdisciplinary research related to the case (e.g.
research questions and possible methods for an interdisciplinary study of the topic).

**FEWS Data Analysis Paper and Presentation**

Each student will individually research and prepare a ~8 page paper that incorporates data
analysis and interdisciplinary treatment of a FEWS problem and proposes a solution. Students
will be expected to incorporate conceptual frameworks introduced in readings and class, and
prepare a paper with intellectual rigor and depth suitable to a graduate course. More specific
guidelines for this assignment will be provided.

Each student is required to make a short class presentation on the topic chosen for your
research paper. These presentations will be “lightning talks”: 3-4 minutes long, including time
for a question or two. These lightning talks will offer students the opportunity to hone concise
communication skills and to engage the class in their topic prior to finalizing their paper, as well
as providing the class as a whole with exposure to a broad range of interdisciplinary research at
the food-energy-water nexus. Presentations will be evaluated based on your ability to
effectively convey key aspects of the topic and concepts involved, original analysis, and clarity
of material.

**Course website**

Please check the course website (Moodle) regularly, especially before class, for
announcements, notes, readings, assignments, and schedule updates. Some of the class lecture
notes will be posted.

**Student Conduct Code**

The [Student Conduct Code](http://www.umt.edu/student-affairs/dean-of-students/default.php) at the University of Montana embodies and promotes honesty, integrity, accountability, rights, and responsibilities associated with constructive citizenship in our academic community. This Code describes expected standards of behavior for all students, including academic conduct and general conduct, and it outlines students' rights, responsibilities, and the campus processes for adjudicating alleged violations.
Course Withdrawal
Students may use Cyberbear to drop courses through the first 15 instructional days of the semester. Beginning the 16th instructional day of the semester through the 45th instructional day, students use paper forms to drop the course, with advisor & instructor signatures. This class may not be taken as credit/no-credit.

Disability Modifications
The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and Disability Services for Students (https://www.umt.edu/dss/default.php). If you think you may have a disability affecting your academic performance, and you have not already registered with Disability Services, please contact Disability Services in Lommasson Center 154 or call 406.243.2243. We will work with you and Disability Services to provide an appropriate modification.

Journal papers for background readings and discussion

- This list includes most of the papers we’ll read, and also some that we won’t but that are relevant to our topic.
- We will also likely assign other FEWS-relevant media (e.g., podcasts). Please check Moodle for all readings / media assignments.

Mekong Case Study:

6. The Economist (2016), Requiem for a river: Can one of the world’s great waterways survive its development?.
7. NPR (2019). (7:53)

Other readings:


Other readings:


40. Wichelns, D. 2017. The water-energy-food nexus: Is the increasing attention warranted, from either a research or policy perspective? Environmental Science & Policy 69: 113-123.