RES 500E  Exploring the food-energy-water nexus  2019W T1

Course Syllabus

Instructor:  Dr. Mark S. Johnson <mark.johnson@ubc.ca>
Class time:  Tuesdays 2:00 to 5:00  (2202 Main Mall, AERL building, Room 107)

DESCRIPTION
Feeding one billion people requires the annual provision of one quadrillion (10^15) calories (kcal). Because plants use an average of 1 L of water during crop growth for each calorie of food energy produced, the projected growth in the global population from today’s 7.5 billion to 9.5 billion in 2050 will increase agriculture’s portion of the water footprint of humanity by two quadrillion L – or more, since meat has a water footprint 20X greater than cereal grains. These changes will greatly increase agriculture’s impacts on the water cycle, deepening its effects on surface water flows, water pollution and groundwater levels. Global food security is thus intimately tied to freshwater availability, with increasing challenges due to declining water tables and issues related to water quality and changing precipitation patterns. Coupled to that are energy considerations – energy required to produce fertilizers, operate farm equipment, process and distribute food, as well as food used as energy (i.e. biofuels). In this graduate seminar course, students will explore these and other dimensions of the food-energy-water nexus.

FORMAT
The course follows a seminar format, and meets once a week for 3 hours. Each class meeting will consist of an informal lecture and a student-led discussion session. Assigned readings will be discussed and further explored through in-class exercises and assignments that reinforce the topic.

EVALUATION
25%  Facilitation
15%  Case study / method / model / tool summary
30%  Project paper
15%  Project presentation
15%  Participation

FACILITATION
Student facilitation is a key component of this course as it allows students to take greater ownership over the course, provides opportunities to enhance learning and hopefully pushes everyone a bit outside of their comfort zones. For this course, facilitation involves conducting a focused review of the topic, providing a synthesis of the range of approaches that have been (or could be) brought to bear. You should explore the literature on the topic from several disciplinary perspectives, indicating advances, uncertainties, and future research directions on the topic, and suggest any key references that we should add to a supplemental course reading list (no more than 3-5 suggestions please). This information will be conveyed to the class as a facilitated discussion, and should include audio-visual materials presented in an engaging manner. Clips from archived conference presentations and/or webinars are also appropriate.

The facilitator will also provide a summary of key findings from the week’s readings, which can include a look forward and back at citations (e.g. check out which papers cite the readings, and which papers the readings cite). Other students will provide 2-3 discussion questions each, which the facilitator can...
incorporate in the discussion of the readings. Discussion questions should be emailed to the facilitator (with a copy to the course instructor) well in advance of class (e.g. by noon on Mondays).

Facilitation Guide

- Identify 2-3 key papers for topic
  - Confirm suggestions with professor one week prior to facilitated session
- Collect discussion questions from classmates
  - Class to email questions to facilitator no later than Mondays at noon
  - Review and select a few (3-5) questions for in class discussion
- Prepare brief presentation materials summarizing topic:
  - context, state-of-the-art, methodologies used, and key applications
- Prepare paper summaries
  - Why is this paper significant?
    - What is its primary contribution?
    - What has it influenced?
  - Include notes on paper’s authors to inform context
- Guide discussion using submitted questions as points of entry
  - Identify key points/take-aways

Exploring the FEW Nexus: Case study / method / model / tool summary
Each student will present a summary that helps to explore the food-energy-water nexus via a case study or summary of a method, model, or tool that can be used to analyze or evaluate the nexus. For case study summaries, in-class presentations (10 – 12 minutes) will provide the background context of the case, and explore drivers and linkages between the system or case of interest. A list of potential cases is available at the end of the syllabus. Methodological presentations (also 10 – 12 minutes) will discuss the assumptions and objectives of the technique, examples where it has been used, and any known limitations. A list papers reviewing methodological approaches is available at the end of the syllabus. Students can choose to present on either a case study or a methodological approach. Regardless, students should discuss their choice of method with the instructor during the week prior to their presentation.

TERM PROJECT
Term projects provide an opportunity to explore a topic/case/theme of the course in more depth. Students may wish to (i) apply a model or other analysis to a specific case, (ii) design a survey to evaluate decision making process related to food-energy-water nexus, (iii) prepare a policy brief on a topic germane to the FEW nexus. Feel free to get creative, and students are welcome to suggest projects from different modalities to those listed above. All projects will have a written component (approximately 10-12 double spaced pages not including tables or figures, 12 point font, 1 inch margins), and will be presented to the class during the last class session(s). For example, if you wish to prepare a policy brief (which would only span a couple of pages), additional background information can be provided as extended footnotes and an annotated bibliography to the project.

Key dates for the term project: (see next page)
Key dates for the term project:
Sept 24: Discuss ideas with instructor
  • Email project proposal brief to professor
Oct 8: “Pitch” your idea to class
  • Discuss objectives, scope, approach, and related details
Nov 19 and 26: Present findings
  • 10-12 minute presentation followed by Q&A
Dec 3: Submit write up
  • Email project paper to instructor. Paper length described above.

PARTICIPATION
As a graduate seminar, being physically and intellectually present during class is expected of all course members. We are hoping to create a participatory environment where we can both gain knowledge and question assumptions, which requires engagement from all. Hands-on participation is guaranteed through the facilitation roles each will play, as well as through preparation of discussion questions based on the week’s readings.

READINGS
[NOTE – readings will be revised based on discussions between instructor and student facilitator]
September 10
  • Papers for discussion on Exploring FEW Nexus concept
    o Interview at https://eos.org/editors-vox/the-challenges-of-meeting-future-food-energy-and-water-needs
      Read through end of pg 21 – we will revisit the rest of this paper in later weeks
    o Critiques of the concept:
      ▪ http://dx.doi.org.ezproxy.library.ubc.ca/10.1038/538140b

September 17
  • Papers for discussion on Water use in agriculture

**September 24**

• Papers for discussion on Virtual water trade network

**October 1**

• Papers for discussion on Virtual water trade network
  o Optional paper for those interested:

**October 8**

• Papers for discussion on Water in energy generation

**October 15**

• Papers for discussion on Energy use in agriculture
October 22
- Papers for discussion on **Bioenergy**
  - Optional paper of interest:

October 29
- Papers for discussion on **Urban metabolism**

November 5
- Papers for discussion on **SDGs and the FEW Nexus**

November 12
- Papers for discussion on **Sustainability of FEW Nexus**
November 19 and 26: Term project presentations

Case Studies (possible selections for the case study presentations)

- Seven cases are in Flammini, A., M. Puri, L. Pluschke, and O. Dubois (2014), Walking the nexus talk: assessing the water-energy-food nexus in the context of the sustainable energy for all initiative, FAO. Available online at [http://www.fao.org/3/a-i3959e.pdf](http://www.fao.org/3/a-i3959e.pdf)
- Numerous case studies outlined by CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS). Available online at [https://csa.guide/#chapter-case-studies](https://csa.guide/#chapter-case-studies)

Web-based models/tools for evaluating the FEW nexus (not a complete list)

- Water Analysis Tool for Energy Resources (WATER) [http://water.es.anl.gov/](http://water.es.anl.gov/)
- WESTWeb Water Energy Sustainability Tool [http://west.berkeley.edu/model.php](http://west.berkeley.edu/model.php)
- WEFNexusTool [http://wefnexusool.org/](http://wefnexusool.org/) (seems limited to Qatar at present)

Papers focusing on methods/models/tools for evaluating the FEW nexus


