

---

ENVIRON 718K

# Environmental Sciences

Spring 2018

---



**Dates / course meeting time:** 150 minutes of contact hours per week for 14 weeks

**Academic credit:** 3

**Course format:** Lecture & Separately Scheduled Discussion

---

## Instructor's Information

---

Dr. Binbin Li, Assistant Professor of Environmental Sciences

Office: CC 1084

Email: [binbin.li@dukekunshan.edu.cn](mailto:binbin.li@dukekunshan.edu.cn)

Phone: +86 512 3665 7258

## What is this course about?

---

This course introduces students to the core concepts and topics of environmental sciences. It will give an in-depth overview of main themes in the field of environmental studies: global environmental challenges, human population trends, global atmospheric changes, air, land and water resources and pollution, the ocean and fisheries, key ecosystems (forests, grasslands, wetlands, freshwater and marine environment), biodiversity and conservation, non-renewable and renewable energy, agriculture and sustainable production. Quantitative and qualitative research methods will be introduced with case studies. Students will explore the interventions, technology and management tools for these related issues.

## What background knowledge do I need before taking this course?

---

This is an iMEP core course. There are no prerequisites.

## What will I learn in this course?

---

At the end of the course, students should be able to

- Describe and define the concepts and processes in environmental studies
- Apply key concepts and methods to understand existing and novel environmental problems
- Understand interactions between human, environment and social systems
- Read, comprehend and use the primary literature in environmental studies
- Explain, summarize and critique articles related to environmental issues
- Synthesize scientific literature for decision making
- Demonstrate the capability of considering the environment as a whole system, identify related scientific topics with real world problems and identify potential interventions
- Communicate with both science community and the public
- Develop writing and presentation skills

## How will I know if I have met the objectives of this course?

---

The course will be constituted of three parts: lectures, student-led discussions and two projects. The instructor will provide key concepts in each lecture. Students are required to finish readings and prepare for discussion. For each discussion session, one student will be designated to lead the discussion of the required readings. For the midterm project, students need to identify one specific topic (e.g. PM 2.5, habitat fragmentation) related to the course, conduct and write a literature review about the current theories and research methods for dealing with the issues. Students will present the work to the class for feedback and further discussion. For the final project, students will form a team of three to on a group project. The team is going to focus on a specific geographic area. The final project aims to identify the most urgent environmental issues (3-5 issues) to a particular country or region, causes and consequences of these environmental issues, summarize and evaluate the research that have been done to address these issues, and identify questions that should be answered in the future. The instructor will help to identify topics and projects.

---

### **How can I prepare for the class sessions to be successful?**

---

The lecture is designed to provide an overview of the topic. Students should finish the required readings before the lecture and participate in the discussion during the class.

The students are expected to have well prepared discussion and active participation in class. The leader needs to decide the format (discussion, debate, presentation, film, etc. or combination), prepare questions and engage everyone in the session to discuss the assigned readings and relevant topics from that week. The instructor will facilitate the discussion if needed.

Project paper should be around 20-25 pages, font size 11 with double space and should be submitted before the deadline through Sakai. Mid-term and final presentation should follow the academic presentation format with a clear outline and references. The students are encouraged to use graphs, tables, illustration and photos for better communication during the presentation. Answers to questions and discussions after the presentation are also evaluated.

---

### **What required texts, materials, and equipment will I need?**

---

Raven, P.H., and L.R. Berg. 2006. Environment. 6th edition. John Wiley & Sons, Hoboken, N.J.

Vesilind, P. Aarne, J. Jeffrey Peirce, and Ruth F. Weiner. 2013. Environmental pollution and control.

The other required readings are listed in the course schedule and will be available in the course Sakai site.

---

### **How will my grade be determined?**

---

Leading discussion and participation in discussion:	20%
Midterm paper and presentation:	30%
Final group project and presentation:	40%
Attendance:	10%

---

### **What are the course policies?**

---

*[DKU Administrators: insert link to a pdf or website url for the full DKU course policies and guidelines.]*

1. Academic Integrity:

Each student is bound by the academic honesty standard of the Duke Kunshan University. Its Community Standard states: "Duke Kunshan University is a community composed of individuals of diverse cultures and backgrounds. We are dedicated to scholarship, leadership, and service and to the principles of honesty,

fairness, respect, and accountability. Members of this community commit to reflect upon and uphold these principles in all academic and non-academic endeavors, and to protect and promote a culture of integrity.”

2. Laptop Use Policy

You can use laptop for lectures to write note. However, browsing irrelevant contents or websites is not allowed.

3. Attendance

Students are required to attend the class and actively participate in the discussion and presentation. In the rare event of an illness or true emergency that prevents a student from accomplishing one of the reports, exercises or presentations, the student must contact the instructor by e-mail immediately to discuss possible alternate arrangements. If you have a legitimate scheduling conflict, you must contact the instructor ahead of time to make alternate arrangements.

4. Attention to assignment deadlines

The assignment is due 5pm on the due day. Late submission will have penalty of 5% off for each late hour.

### **What campus resources can help me during this course?**

---

***[DKU administrators: Insert link to a pdf or website url for the full list of resources, that includes the writing center, language labs, tutors, and any other relevant campus learning resources.]***

*In this section, highlight particularly relevant resources or other resources that are discipline specific that are useful for students, in addition to the general resources outlined in the link above.*

**What is the expected course schedule?**

WEEK	TOPIC and READINGS	Assignment
Week 1	<p><b>Global Trend (population, consumption, landcover changes)</b></p> <p>Vitousek et al., 2012. Human Domination of Earth's Ecosystems. <i>Science</i> 277(5325): 494-499</p> <p>Henrique M. Pereira, <i>et al.</i> 2010. Scenarios for Global Biodiversity in the 21st Century. <i>Science</i> 330, 1496 (2010)</p> <p>Barnosky et al., 2011. Has the Earth's sixth mass extinction already arrived? <i>Nature</i> 471:51-57</p> <p>Optional reading: Raven and Berg, CH1, 2, 8; Vesilind et al., CH1</p>	
Week 2	<p><b>Air and pollution</b></p> <p>Vesilind et al., CH18-21</p>	<p><b>Choose topic for individual project and submit one paragraph of description to the instructor</b></p>
Week 3	<p><b>Water, soil and pollution</b></p> <p>Vesilind et al., CH 3-5, CH12</p>	
Week 4	<p><b>Biodiversity and extinction</b></p> <p>Costanza, R., d'Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., ... &amp; Raskin, R. G. (1997). The value of the world's ecosystem services and natural capital. <i>nature</i>, 387(6630), 253-260.</p> <p>Costanza, R., de Groot, R., Sutton, P., van der Ploeg, S., Anderson, S. J., Kubiszewski, I., ... &amp; Turner, R. K. (2014). Changes in the global value of ecosystem services. <i>Global environmental change</i>, 26, 152-158.</p> <p>S. L. Pimm, C. N. Jenkins, R. Abell, T. M. Brooks, J. L. Gittleman, L. N. Joppa, P. H. Raven, C. M. Roberts, J. O.</p>	<p><b>Submit preference for the final project</b></p>

	<p>Sexton. 2014. The biodiversity of species and their rates of extinction, distribution, and protection. <i>Science</i>, 334. 1246752 (2014). DOI: 10.1126/</p> <p>Myers, Norman. "Environmental services of biodiversity." <i>Proceedings of the National Academy of Sciences</i> 93.7 (1996): 2764-2769.</p>	
Week 5	<p><b>Forests, related ecosystem services and environmental problems</b></p> <p>Raven and Berg, CH 4-6, 17</p>	<p><b>Draft of the individual project paper due on Friday</b></p>
Week 6	<p><b>Wetland and Grasslands, related ecosystem services and environmental problems</b></p> <p>HANSSON, L.A., Brönmark, C., Anders Nilsson, P. and Åbjörnsson, K., 2005. Conflicting demands on wetland ecosystem services: nutrient retention, biodiversity or both? <i>Freshwater Biology</i>, 50(4), pp.705-714.</p> <p>Cui, B., Yang, Q., Yang, Z. and Zhang, K., 2009. Evaluating the ecological performance of wetland restoration in the Yellow River Delta, China. <i>Ecological Engineering</i>, 35(7), pp.1090-1103.</p> <p>Zhao, B., Kreuter, U., Li, B., Ma, Z., Chen, J. and Nakagoshi, N., 2004. An ecosystem service value assessment of land-use change on Chongming Island, China. <i>Land Use Policy</i>, 21(2), pp.139-148.</p> <p>Bai, Y., Han, X., Wu, J., Chen, Z. and Li, L., 2004. Ecosystem stability and compensatory effects in the Inner Mongolia grassland. <i>Nature</i>, 431(7005), p.181.</p>	
Week 7	<p><b>Individual Presentation</b></p> <p>Students will write a literature review for their mid-term paper and present to the class. The topic should be related to the course and is oriented to a real-world environmental problem. The literature review should cover the following aspects: what is the problem? What are the causes? What are the consequences? Who are</p>	<p><b>Revision of the individual project paper due on Sunday</b></p>

	<p>involved? What are the potential solutions? During the lecture and discussion for this week, students will present their work to the class. Comments from students and the instructor will be collected at the end of the presentation session and should be incorporated into their mid-term paper.</p>	
Week 8	<p><b>Freshwater and marine ecosystem</b></p> <p>Christer Nilsson, Catherine A. Reidy, Mats Dynesius, Carmen Revenga. 2005. Fragmentation and Flow Regulation of the World's Large River Systems. <i>Science</i> 308, 405</p> <p>Ransom A. Myers &amp; Boris Worm. 2003. Rapid worldwide depletion of predatory fish communities. <i>Nature</i>, 423.</p> <p>Daniel Pauly, Villy Christensen, Johanne Dalsgaard, Rainer Froese, Francisco Torres Jr. 1998. Fishing down marine food webs. <i>Science</i> 279.</p> <p>Jonathan L. Payne, Andrew M. Bush, Noel A. Heim,<sup>1</sup> Matthew L. Knope, Douglas J. McCauley. 2016. Ecological selectivity of the emerging mass extinction in the oceans. <i>Science</i> 353.</p> <p>Callum M. Roberts, James A. Bohnsack, Fiona Gell, Julie P. Hawkins, Renata Goodridge. Effects of Marine Reserves on Adjacent Fisheries. 2001. <i>Science</i> 294: 1920-1923.</p>	<p><b>Meet with the instructor to discuss progress of the final project</b></p>
Week 9	<p><b>Urban environment</b></p> <p>Raven and Berg, CH 7&amp;9</p> <p>McIntyre, N.E., Knowles-Yáñez, K. and Hope, D., 2008. Urban ecology as an interdisciplinary field: differences in the use of "urban" between the social and natural sciences. <i>Urban Ecology</i>, pp.49-65.</p> <p>Shochat, E., Warren, P.S., Faeth, S.H., McIntyre, N.E. and Hope, D., 2006. From patterns to emerging processes in</p>	

	<p>mechanistic urban ecology. <i>Trends in ecology &amp; evolution</i>, 21(4), pp.186-191.</p>	
<p>Week 10</p>	<p><b>Food and agriculture</b></p> <p>Raven and Berg, CH 18</p> <p>Scoones, I., 1998. Sustainable rural livelihoods: a framework for analysis.</p> <p>Horrigan, L., Lawrence, R.S. and Walker, P., 2002. How sustainable agriculture can address the environmental and human health harms of industrial agriculture. <i>Environmental health perspectives</i>, 110(5), p.445.</p> <p>Scherr, S.J. and McNeely, J.A., 2008. Biodiversity conservation and agricultural sustainability: towards a new paradigm of 'ecoagriculture' landscapes. <i>Philosophical Transactions of the Royal Society of London B: Biological Sciences</i>, 363(1491), pp.477-494.</p>	
<p>Week 11</p>	<p><b>climate change</b></p> <p>Raven and Berg, CH 20</p> <p>Stuart L. Pimm. 2009 Climate Disruption and Biodiversity. <i>Current Biology</i> 19, R595–R601</p> <p>IPCC, 2014: Summary for policymakers. In: <i>Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change</i> [Field, C.B., V.R. Barros, D.J. Dokken, K.J. Mach, M.D. Mastrandrea, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, and L.L.White (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.</p> <p><a href="http://www.ipcc.ch/">http://www.ipcc.ch/</a></p>	

Week 12	<p><b>Energy and Innovative technology</b></p> <p>Raven and Berg, CH 10-12 , 24</p>	
Week 13	<p><b>Conservation planning and intervention</b></p> <p>Reed Noss. Context matters: considerations for large-scale conservation.  <a href="http://conservationmagazine.org/2008/07/context-matters-considerations-for-large-scale-conservation/">conservationmagazine.org/2008/07/context-matters-considerations-for-large-scale-conservation/</a></p> <p>James E. M. Watson, Nigel Dudley, Daniel B. Segan &amp; Marc Hockings. 2014. The performance and potential of protected areas. <i>Nature</i>, 515, doi:10.1038/nature13947</p> <p>A.J. Dickman. 2010. Complexities of conflict: the importance of considering social factors for effectively resolving human–wildlife conflict. <i>Animal Conservation</i>, 13:458-466. doi:10.1111/j.1469-1795.2010.00368.x</p> <p>Wendland, Kelly J., et al. "Targeting and implementing payments for ecosystem services: Opportunities for bundling biodiversity conservation with carbon and water services in Madagascar." <i>Ecological economics</i> 69.11 (2010): 2093-2107.</p>	
Week 14	<p><b>Group presentation</b></p> <p>The final project aims to identify the most urgent environmental issues (3-5 issues) to a particular country or region, causes and consequences of these environmental issues, summarize and evaluate the research that have been done to address these issues, and identify questions that should be answered in the future. The instructor will help to identify topics and projects. Project topics will be presented to the students at the beginning of the course. The instructor will assign 2-3 students to each project according to</p>	<b>Final project report due</b>

	their preference. Each group should finish one project report and present it to the class in week 14.	
--	---	--