Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship

Stockholm University

PhD course in the Resilience Research School

Ecosystem services and economic analysis: an introduction from an ecological economics perspective

3.0 hp/ECTS (additional 1.0 hp/ECTS for final assignment).
April 23-25 and 28-29

Course description

This course will give an overview of the ecosystem service concept and its links to biodiversity science, ecology and economics. An ecological economics approach will be emphasized for valuing ecosystem services to support land use and resource management decision-making. Various issues will be covered, including the links between biodiversity and ecosystem services, debates over monetary valuation, payments for ecosystem services schemes, and whether applying the ecosystem services lens fosters the commodification of nature. Case studies will be used to relate theory to practice and the acquisition of practical skills in valuation will be emphasized. The course will be taught seminar style and it includes guest lectures and a one-day field trip in the Stockholm region.

Course leader:	Tom L. Green (TG), PhD, ecological economist and postdoctoral researcher at the Stockholm Resilience Centre (SRC), Stockholm University.
Co-instructors:	Erik N. Gómez-Baggethun (EG), PhD, ecological economist; senior researcher at Universitat Autonòma de Barcelona and the University of Oxford
	Jakub Kronenberg (JK), PhD, ecological economist at Lodz University.
Guest lecturers:	Gretchen Daily (Stanford), Thomas Elmqvist (TE) (SRC), Erik Andersson (EA) (SRC), Maria Schultz, Director, Resilience and Development Programme (SRC), Thomas Hahn (SRC)

Course topics

- rationale behind the ecosystem services concept
- evolution of the ecosystem services concept
- relationship of ecosystem services to biodiversity and natural capital
- distinctions between ecological economics and mainstream environmental economics and implications for how these two fields engage with ecosystem services
- characterizing ecosystem services while taking account of scale, boundaries, interlinkages and uncertainty
- ecosystem services, thresholds and regime shifts
- theoretical issues involved in the monetary valuation of ecosystem services
- monetary valuation of ES: approaches / assumptions / methodologies and their limitations
- non-monetary valuation of ES: approaches / assumptions/ methodologies and their limitations
- how have ecosystem service assessments and valuation influenced decision-making?
- political economy of ecosystem services

Course format

lectures, seminars, team work and 1-day fieldtrip in the Stockholm region

Learning outcomes

By the end of the course, students will be able to:

1. offer a reasoned position, that takes into account the literature, on the appropriateness of assessing and valuing ES to support resource management decisions
2. describe main techniques for monetary valuation and their limitations
3. describe main techniques for non-monetary valuation and their limitations

4. participate in an informed matter in deliberations exploring the extent to which evaluating ecosystem services promotes the commodification of nature
5. develop a high-level framework for valuing ecosystem services in a landscape in support of competing management alternatives

(Note: this course will only give a brief overview of the theory or practice for the identification and measurement of ecosystem services. It begins from the assumption that most will have some experience evaluating or assessing ecosystem services).

Assessment and grading – Course

Component	Learning Outcomes	Weighting (%)
Participate in class discussions	1-5	Compulsory
Valuation technique description	2 & 3	20%
Team presentation on course reading	1-4	20%
Field trip	1,5	30%
Valuation framework presentation	5	20%
Mini-assignments	2-4	10%
Course evaluation		Compulsory
		100%

Attendance of lectures, participation in all seminars and the fieldtrip is compulsory. Participation does not only mean attendance, the participant must have prepared for and take an active role. The individual course evaluation at the end of the course is also compulsory.

Criteria for assessment:

The following grades are issued:

P Pass – student shows proficiency in stipulated learning objectives and has full attendance
F Fail – student does not meet learning objectives or does not attend given course components.

The final assignment is optional; those students who do not submit an assignment by the deadline will be considered to have opted out.

Assignments

1. In teams, prepare a ~8-10 minute, provocative presentation on a course reading (from one of the optional or enrichment readings) intended to foster deeper comprehension and scrutiny of a paper by fellow students.
2. In teams, describe for the class a valuation technique and the underlying assumptions it requires (techniques will be assigned by the instructors).
3. Course paper (due May 12th at noon; limit of 2500 words length, excluding bibliography and figures and tables; send electronically to Tom Green <tom.green@su.se>)

   Option I) Applied paper / case study

   - Select a case study where future provision of ecosystem services may be compromised due to unsustainable resource use or development (students are encouraged to draw from their own field work / thesis research if relevant).
   - Write a paper on the case study that incorporates the following elements:

     a) description of the conservation challenge represented by the case study

b) an evaluation of the role that assessment and valuation of ES could play in supporting decision-making, discussing the relevance and suitability of both monetary and non-monetary valuation

c) lessons from the case study for the theory and practise of ES valuation

Option II) Theoretical paper

- Write a paper, supported by relevant literature that addresses one of the following topics/tasks:

  a) provide a critical review of a peer-reviewed article on ES valuation

  b) defend a position with respect to the relative roles of monetary and non-monetary valuation in support of decision-making.

Assessment and grading – Final paper

Component	Learning Outcomes	Weighting (%)
Use of theory to support arguments and analysis	1-5	40%
Relevance of paper, engage and maintain readers' interest, paper focus	1-5	20%
Organization, flow, readability, grammar, spelling		20%
Insights offered on theory and application of ES valuation	1-5	20%
Meets assignment specifications (topic / length)		Compulsory
		100%

	Time	Who?	Topics / themes	Learning outcomes	Class Activities	Student preparation *(before class!)*
Day 1 – Wednesday Apr 23	9:00-9:30	TG/JK	Welcome, overview, logistics - Motivations for ES concept and applying economic analysis to ES - ecological economics and environmental economics – commonalities and differences	- diagram three foundational differences between ecological and environmental economics relevant to consideration of ES	Introductions and mini-lecture	Day 1 readings Elmqvist et al. (2010). Biodiversity, Ecosystems and Ecosystem Services. Chapter 2 of TEEB. Daily, G. et al. (2009). Ecosystem services in decision making: time to deliver. *Frontiers in Ecology and the Environment*, Vol. 7 No. 1, pp. 21–28. Spangenberg, J.H., Settele, J., (2010). Precisely incorrect? Monetising the value of ecosystem services. *Ecological Complexity* 7, 327–337. NB: Students should make sure they understand basic principles of monetary valuation from a mainstream economics perspective. See for instance: www.ecosystemvaluation.org or Chapter 3 (especially section 3.2, pp. 43-50) from: *TEEB for Local and Regional Policy Makers Report*, Chapter 3: Tools for Valuation and Appraisal of Ecosystem Services in Policy Making. www.teebweb.org/publication/teeb-for-local-and-regional-policy-makers-2/
	9:30-10:30	Gretchen Daily	- Origins of ES framework - Intro to Natural Capital project - ES valuation and conservation	- appraise motivations for ES frameworks - explore influence of ES valuation	Lecture and discussion	
	10:30-11:00		Coffee break & stretch			
	11:00-12:00	JK/TG/ Thomas Hahn	Economic foundations: monetary valuation – what is value, how does it relate to market prices? Value for whom? How do we know this value in the absence of markets? Environmental economics: monetary valuation techniques fundamentals.	- contrast value to market prices - relate consumer surplus to value - characterize goods that do not meet requirements to trade in markets - describe core principles and assumptions underlying estimation of monetary values	Lecture, mini exercises	
	12:00-13:00		Lunch			
	13:00-14:00	EA	Ecological foundations: biodiversity, ecosystems and ES.	- summarize ecological requirements for sustained flows of ES - complicating factors for ES valuation: resilience, discontinuities, irreversibilities and regime shifts	Lecture and discussion	
	14:00-15:00	Students	Monetary valuation methodologies (preparation)	- describe given methodology for generating values / calculating willingness-to-pay	Student teams: prepare 4 minute speed talk on an assigned monetary valuation technique, including an illustrative example.	
	15:00-15:30		Coffee break and stretch			
	15:30-16:30	Students	Monetary valuation methodologies (student speed talks)	- select valuation methodology for a given ES.		
	16:30-17:00	JK/TG	Welfare economics: pivotal issues from an ecological economics perspective	- review ecological economists' cautions around valuation and CBA - identify circumstances where issues of incommensurability may arise		

	Time	Who?	Topics / themes	Learning outcomes	Class Activities	Student preparation *(before class!)*
Day 2—Thursday Apr 24	9:00-10:30	EG	ES and valuation in perspective: from theory to policy and markets	- explain rationale behind ES valuation - situate ES valuation in conservation and environmental policy context - relate valuation to commodification	Lecture and discussion	Day 2 readings; prepare assignment 1 *(in teams, prepare 'provocation' for deeper discussion of a course reading)*. Gómez-Baggethun, E. et al. (2010). The history of ecosystem services in economic theory and practice: From early notions to markets and payment schemes. *Ecological Economics*. Kallis, G., Gómez-Baggethun, E. and Zografos, C. (2013). To value or not to value? That is not the question. *Ecological Economics*. Karjalainen, T et al. (2013). Integrating ecosystem services into environmental impact assessment… *Environmental Impact Assessment Review*.
	10:30-11:00		Coffee break and stretch			
	11:00-12:00	EG	Economic values and instruments in ES governance.	- diagram main economic instruments for biodiversity protection - describe the scope and limits of market instruments in ES governance		
	12:00-13:00		Lunch			
	13:00-15:00	Students	Meanings when monetary values are linked to ES. Does valuation lead to commodification/ neoliberalization of nature? Will decision-makers draw on results of non-monetary assessments of ES?	- appraise the meanings behind monetary values - relate ES valuation studies to decision-making contexts	Seminar: student teams prepare and then lead discussions of a paper	
	15:00-15:30	TG	Coffee break and stretch			
	15:30-16:30	EG/JK/ TG/TE	Urban ecosystem services	- appraise rationale for incorporating ES valuation in urban planning - describe challenges in valuation of ES in urban contexts - cultural keystone species concept		
	16:30-17:00	TG/EA	Field trip: relating theory to practice.			

D3	**Field Trip – Friday April 25.**
	Bring appropriate footwear (some sites may be muddy/rough terrain) and clothing (it may rain) for fieldtrip.

	Time	Who?	Topics / themes	Learning outcomes	Class Activities	Student preparation *(before class!)*
Day 4—Monday April 28	9:00-10:30	TG/JK	Valuation: some technical issues - double-counting - margin vs. index - reliance on individual preferences - WTP vs. WTA - protest bids or different value systems? - lexicographic preferences - (in)commensurability of values - strengths and weaknesses of different valuation techniques - selecting the appropriate valuation technique	- describe three key technical issues involved in valuation - match valuation technique to a given need for ES values	Lecture and discussion	Day 4 readings Pascual, U., et al. (2010). Chapter 5: The economics of valuing ecosystem services and biodiversity. In Kumar, P. (Ed.), *The Economics of Ecosystems and Biodiversity.* Christie, M et al. (2012). An evaluation of monetary and non-monetary techniques … in countries with developing economies. *Ecological Economics* Raymond, C. et al. (2013). Ecosystem services and beyond: Using multiple metaphors to understand human–environment relationships, *BioScience.* Sijtsma, F et al. (2013), Beyond monetary measurement…, *Environmental Science & Policy*.
	10:30-11:00		Coffee break and stretch			
	11:00-12:00	Students	Valuation frameworks	- identify and describe key elements of an effective valuation framework	Small group work: sketch out a valuation framework for selected case study (drawing from fieldtrip insights and plausible decision scenarios)	
	12:00-13:00		Lunch			
	13:00-14:00	Students	Valuation frameworks (cont'd)	- map out a valuation framework and substantiate choices made by reference to theory	Valuation framework proposals presentations and peer reviews	
	14:00-15:00	Maria Schultz	Two ES valuation case studies: Swedish Government Inquiry *Making the value of ecosystem services visible*; ES valuation and the Aichi Biodiversity Targets	- relate valuation theory to government policy at national and international scales	Lecture and discussion	
	15:00-15:30		Coffee break and stretch			
	15:30-17:00	JK/TG	Non-monetary valuation - methods, approaches - systems thinking and non-monetary valuation	- describe advantages and limitations of non-monetary valuation		

	Time	Who?	Topics / themes	Learning outcomes	Class Activities	Student preparation *(before class!)*
Day 5—Tuesday April 29	9:00-10:30	TG/JK	Limitations of monetary valuation and welfare economics: ecological economics perspectives	- evaluate how limitations of assigning monetary values should be reflected in decision-making processes	Lecture and discussion	Day 5 Readings Laurans, Y. et al., (2013). Use of ecosystem services economic valuation for decision making: Questioning a literature blindspot. *Journal of environmental management*. Norgaard, R.B. (2010). Ecosystem services: From eye-opening metaphor to complexity blinder. *Ecological Economics*. Spash, C.L. (2008). How much is that ecosystem in the window? The one with the bio-diverse trail. *Environmental Values*. Chan, K. et al., (2012). Where are cultural and social in ecosystem services? *BioScience*.
	10:30-11:00		Coffee break and stretch			
	11:00-12:00		Cultural ES Special topics in valuation *(per student interest)*	- TBD		
	12:00-13:00		Lunch			
	13:00-15:00	All	- Assessment: the promise and perils of ES valuation - How can ecological economics theory improve ES valuation?	- appraise ES valuation as a tool for conservation	Roundtable: what role valuation, what kind of valuation and how do decision-making processes use study outputs?	
	15:00-15:30		Coffee break and stretch			
	15:30-16:00	Students	Final assignment proposals		Individual presentation of final assignment proposals and peer feedback.	
	16:00-17:00	All	Wrap-up and evaluation		Course evaluation completed.	

Final assignment: Due May 12 @ noon. Detailed instructions see above.

Course readings and reference documents (preliminary)

All readings should be done before class!

NB: For students with little or no familiarity of monetary valuation, please familiarize yourself with basic concepts in economic valuation before the course. See the following resources:

www.ecosystemvaluation.org.

TEEB 2010. Chapter 3: Tools for Valuation and Appraisal of Ecosystem Services in Policy Making. In *TEEB for Local and Regional Policy Makers Report*, www.teebweb.org/publication/teeb-for-local-and-regional-policy-makers-2/ (Focus on section 3.2, pp. 43-50).

a) Day 1 readings (to be completed before 1st class)

Elmqvist, T., et al., 2010. Biodiversity, Ecosystems and Ecosystem Services. Chapter 2 In: Kumar, P (ed). *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations*, TEEB: The Economics of Ecosystems and Biodiversity, UNEP/Earthscan, London.

Daily, G.C., Polasky, S., Goldstein, J., Kareiva, P.M., Mooney, H.A., Pejchar, L., Ricketts, T.H., et al., 2009. Ecosystem services in decision making: time to deliver. *Frontiers in Ecology and the Environment* 7(1), 21–28.

Spangenberg, J.H., Settele, J., 2010. Precisely incorrect? Monetising the value of ecosystem services. *Ecological Complexity* 7, 327–337.

Optional and reference readings

Atkinson, G., Bateman, I. and Mourato, S., 2012. Recent advances in the valuation of ecosystem services and biodiversity. *Oxford Review of Economic Policy* 28 (1), 22–47.

Balmford, A., Bruner, A., Cooper, P., Costanza, R., Farber, S., Green, R.E., Jenkins, M., et al., 2002. Economic reasons for conserving wild nature. Science 297(5583) 950–953.

Costanza, R., d' Arge, R., De Groot, R., Farber, S., Grasso, M., Hannon, B., Limburg, K., et al., 1998. The value of ecosystem services: putting the issues in perspective. *Ecological Economics* 25(1), 67–72.

Parks, S. and Gowdy, J., 2012. What have economists learned about valuing nature? A review essay. *Ecosystem Services* 3, e1-e10.

b) Day 2 readings

Gómez-Baggethun, E., de Groot, R., Lomas, P.L. and Montes, C. 2010. The history of ecosystem services in economic theory and practice: From early notions to markets and payment schemes, *Ecological Economics* 69, 1209–1218.

Kallis, G., Gómez-Baggethun, E. and Zografos, C., 2013. To value or not to value? That is not the question. *Ecological Economics* 94, 97–105.

Karjalainen, T.P., Marttunen, M., Sarkki, S. and Rytkönen, A.-M., 2013. Integrating ecosystem services into environmental impact assessment: An analytic–deliberative approach. *Environmental Impact Assessment Review* 40, 14–25.

Muradian, R., Gómez-Baggethun, E., 2013. The Institutional Dimension of "Market-based Instruments" for Governing Ecosystem Services. Society & Natural Resources 26: 1113-1121.

Optional and reference readings

Kosoy, N., Corbera, E. 2010. Payments for ecosystem services as commodity fetishism. *Ecological Economics* 69, 1228–1236.

Robertson, M.M., 2004. The neoliberalization of ecosystem services: wetland mitigation banking and problems in environmental governance. *Geoforum* 35, 361–373.

c) **Day 3 readings**

Field trip handout (distributed on Day 2).

c) Day 4 readings

Pascual, U., Muradian, R., Brander, L., Gómez-Baggethun, E., Martin-López, B., Verma, M., Armsworth, P., et al. (2010). Chapter 5: The economics of valuing ecosystem services and biodiversity. In Kumar, P. (Ed.), *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations*, TEEB: The Economics of Ecosystems and Biodiversity, UNEP/Earthscan, London.

Christie, M., Fazey, I., Cooper, R., Hyde, T. and Kenter, J.O., 2012. An evaluation of monetary and non-monetary techniques for assessing the importance of biodiversity and ecosystem services to people in countries with developing economies. *Ecological Economics* 83, 67–78.

Sijtsma, F.J., van der Heide, C.M. and van Hinsberg, A. 2013. Beyond monetary measurement: How to evaluate projects and policies using the ecosystem services framework. *Environmental Science & Policy* 32, 14–25.

Raymond, C.M., Singh, G.G., Benessaiah, K., Bernhardt, J.R., Levine, J., Nelson, H., Turner, N.J., et al., 2013. Ecosystem services and beyond: Using multiple metaphors to understand human–environment relationships. *BioScience* 63(7), 536–546.

Optional and reference readings

Spash, C.L., 2007. Deliberative monetary valuation (DMV): Issues in combining economic and political processes to value environmental change. *Ecological Economics* 63, 690–699.

d) Day 5 readings

Laurans, Y., Rankovic, A., Billé, R., Pirard, R. and Mermet, L., 2013. Use of ecosystem services economic valuation for decision making: Questioning a literature blindspot. *Journal of environmental management* 119, 208–219.

Norgaard, R.B., 2010. Ecosystem services: From eye-opening metaphor to complexity blinder. *Ecological Economics* 69(6), 1219–1227.

Spash, C., 2008. How much is that ecosystem in the window? The one with the bio-diverse trail. *Environmental Values* 17(2), 259-284.

Chan, K.M., Guerry, A.D., Balvanera, P., Klain, S., Satterfield, T., Basurto, X., Bostrom, A., et al. 2012. Where are cultural and social in ecosystem services? A framework for constructive engagement. *BioScience* 62(8), 744–756.

Optional and reference readings

Daniel, T.C., Muhar, A., Arnberger, A., Aznar, O., Boyd, J.W., Chan, K.M., Costanza, R., et al., 2012. Contributions of cultural services to the ecosystem services agenda. *Proceedings of the National Academy of Sciences* 109(23), 8812–8819.

Garibaldi, A., Turner, N., 2004. Cultural keystone species: implications for ecological conservation and restoration. *Ecology and Society* 9, art. 1, 1-18.

Ernstson, H., Sörlin, S., 2013. Ecosystem services as technology of globalization: On articulating values in urban nature. *Ecological Economics* 86, 274–284.

e) Reference and enrichment readings—theoretical, philosophical and political considerations & valuation methods

Åkerman, M., 2003. What Does 'Natural Capital' Do? The Role of Metaphor in Economic Understanding of the Environment. *Environmental Values* 12, 431–448.

Farrell, K.N., 2007. Living with living systems: The co-evolution of values and valuation. *International Journal of Sustainable Development & World Ecology* 14, 14–26.

Illge, L. and Schwarze, R., 2009. A matter of opinion—How ecological and neoclassical environmental economists and think about sustainability and economics. *Ecological Economics* 68(3), 594–604.

Martínez-Alier, J., Munda, J., O'Neill, J., 1998. Weak comparability of values as a foundation for ecological economics. *Ecological Economics* 26, 277–286

Ring, I., Hansjürgens, B., Elmqvist, T., Wittmer, H. and Sukhdev, P., 2010. Challenges in framing the economics of ecosystems and biodiversity: the TEEB initiative. *Current Opinion in Environmental Sustainability* 2, 15-26.

Sagoff, M., 2011. The quantification and valuation of ecosystem services. *Ecological Economics* 70(3), 497–502.

Martín-López, B., Gómez-Baggethun, E., García-Llorente, M. and Montes, C., 2013. Trade-offs across value-domains in ecosystem services assessment. *Ecological Indicators*. 37 Part A, 220-228.