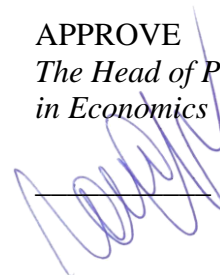


Ministry of Education and Science of Russian Federation  
Federal State Autonomous Educational Institution of  
Higher Professional Education  
“SIBERIAN FEDERAL UNIVERSITY”

APPROVE  
*The Head of Postgraduate School  
in Economics*



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E.V. Zander

**DISCIPLINE PROGRAM**

Discipline 2.1.3 Environmental Economics

Group of Branches of Science 5.2 Economics

Branch of Science 5.2.3 Regional and Sectoral Economy (Environmental Economics)

Krasnoyarsk 2024

## **DISCIPLINE PROGRAM**

is compiled in accordance with the federal state requirements

Group of branches of science / branch of science

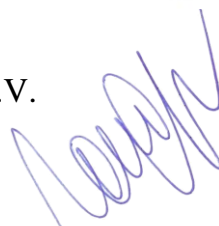
5.2 Economics / 5.2.3 Regional and Sectoral Economy (Environmental Economics)

The program was compiled by Pyzev A.I.



Head of department (developer) Zander E.V.

25.03.2024

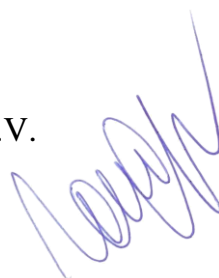


The discipline program was discussed at a meeting of the department (graduating)  
of

social and economic planning

25.03.2024 Protocol No. 7

Head of department (graduating) Zander E.V.



## **1. Course Description**

### 1.1 Course overview

Course gives an insight into economics of the environment. The subject of course is the mutual interaction between the environment and economy. The key concepts to be studied are the methodology of welfare economics and theory of sustainability in broad sense.

### 1.2 Special features of the course

Besides the theoretical concepts and models, multiple practical examples will be discussed during seminars. Students are assumed to study a lot of additional readers in private.

### 1.3 Course aim

To provide students with the opportunity to apply the methodology of environmental economics to analysis of practical problems.

### 1.4 Course objectives

1. To give a comprehensive overview of environmental economics, the theory of sustainability.
2. To analyze the consequences of environmental pollution using the most appropriate instruments and theoretical framework.
3. To train skills of practical application of mathematical modeling to the solution of economic problems.

### 1.5 Learning outcomes of the course

After completing the course, PhD student will be able to:

- solve vast class of theoretical problems of environmental economics with a special focus on problems of sustainability;
- determine the conditions needed to achieve the optimal distribution of environmental resources;
- analyze the consequences of environmental pollution using the most appropriate instruments and theoretical framework;
- design the suggestions for policy-makers in environmental problems regulation at regional, national and global scale.

## 2. The Volume of the Discipline (Module)

Type of Learning Activity	Total, credits (Academic hours)	Semester
		3
<b>Total complexity of the discipline</b>	<b>3 (108)</b>	<b>3 (108)</b>
<b>Contact activities with the professor:</b>	<b>1 (36)</b>	<b>1 (36)</b>
Lectures	0,5 (18)	0,5 (18)
Seminars	0,5 (18)	0,5 (18)
including: seminars	-	-
workshops	0,5 (18)	0,5 (18)
Other types of contact activities	-	-
<b>Independent study of postgraduate students:</b>	<b>2 (72)</b>	<b>2 (72)</b>
Study of the theoretical course	1 (36)	1 (36)
Preparation of an essay, report etc.	0,5(18)	0,5(18)
Preparation for current control	0,33(12)	0,33(12)
Preparation for intermediate control	0,17(6)	0,17(6)
<b>Type of intermediate certification (credit/exam)</b>	Credit	Credit

## 3. The Content of the Discipline (Module)

### 3.1 Sections of the discipline and types of classes (thematic lesson plan).

Item No.	Topic	week no.	Learning Activities (lecture, lab, assessments and other)	Hours	Homework and Reading
1	Introduction to environmental economics	1	Lecture "Introduction to theoretical econometrics. The value of econometrics for economic analysis"	2	Lecture 1 Verbeek, Ch. 1, 2
2	The origins of the sustainability problem. Conception of sustainable development	2	Lecture "The origins of the sustainability problem. Conception of sustainable development"	2	Lecture 2 Verbeek, Ch. 2
		3	Seminar "The drivers of environmental impact. Limits to growth"	2	Lecture 2 (Task)
3	Ethics, economics and the environment. Intertemporal distribution	4	Lecture "Ethics, economics and the environment. Intertemporal distribution"	2	Lecture 3 Verbeek, Ch. 3
		5	Seminar "Naturalist moral philosophies. Libertarian moral philosophy. Utilitarianism. Criticism of utilitarianism"	2	Lecture 3 (Task)
4	Concepts of sustainability.	6	Lecture "Concepts of sustainability.	2	Lecture 4 Verbeek, Ch. 5

	Sustainability and policy		Sustainability and policy”		
		7	Seminar “Economists on sustainability. Ecologists on sustainability”	2	Lecture 4 (Task)
5	Welfare economics and the environment	8-9	Lecture “Welfare economics and the environment”	4	Lecture 5 Verbeek, Ch. 6
		10-11	Seminar “Efficiency and optimality. Allocation in a market economy. Market failure, public policy and the environment. Externalities. The second-best problem. Imperfect information. Government failure”	4	Lecture 5 (Task)
6	Pollution control: targets. Pollution flows, pollution stocks, and pollution damage	12	Lecture “Pollution control: targets. Pollution flows, pollution stocks, and pollution damage”	4	Lecture 6 Verbeek, Ch. 8, 9
		13	Seminar “Modeling pollution mechanisms. The efficient levels of pollution. Convexity and non-convexity in damage and abatement cost function”	4	Lecture 6 (Task)
7	Pollution control: instruments. Criteria for choice of pollution control instruments	14	Lecture “Pollution control: instruments. Criteria for choice of pollution control instruments”	4	Lecture 7 Verbeek, Ch. 10
		15	Seminar “A comparison of the relative advantages of command and control, emissions tax, emission abatement subsidy and marketable permit instruments”	4	Lecture 7 (Task)
8	International environmental problems. International trade and the environment. The greenhouse effect	16	Lecture “International environmental problems. International trade and the environment. The greenhouse effect”	2	
		17	Seminar “Applied game theory analysis. Factors contributing to enhancing probability of international agreements or achieving a higher degree of cooperation”	2	

9		18	Final Exam	4	<a href="#">Final Exam</a>
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### 3.2 Lecture-type classes

#### **Lecture 1. Introduction to environmental economics**

Learning objectives

Introduction

Three themes

The emergence of resource and environmental economics

Classical economics: the contributions of Smith, Malthus, Ricardo and Mill to the development of natural resource economics

Neoclassical economics: marginal theory and value

Welfare economics

Ecological economics

Fundamental issues in the economic approach to resource and environmental issues

Property rights, efficiency and government intervention

The role, and the limits, of valuation, in achieving efficiency

The time dimension of economic decisions

Substitutability and irreversibility

#### **Lecture 2. The origins of the sustainability problem. Conception of sustainable development**

Economy-environment interdependence

The services that the environment provides

Substituting for environmental services

Some environmental science

The drivers of environmental impact

The IPAT identity

Population

Affluence

Technology

Behavioural relationships

Poverty and inequality

The current state of human development

Recent trends

Growth as the solution

Limits to growth?

Environmental limits

Economists on environmental limits

Social limits to growth

The pursuit of sustainable development

The World Commission on Environment and Development  
UNCED: Rio de Janeiro 1992  
World Summit on Sustainable Development: Johannesburg 2002

### **Lecture 3. Ethics, economics and the environment. Intertemporal distribution**

Naturalist moral philosophies  
Libertarian moral philosophy  
Utilitarianism  
Anthropocentric utilitarianism  
Preference-satisfaction utilitarianism  
From utilities to welfare  
Criticisms of utilitarianism  
Rawls: a theory of justice  
Criticisms of preference-based utilitarianism  
Intertemporal distribution  
The utilitarian intertemporal social welfare function  
Optimal growth  
Sustainability

### **Lecture 4. Concepts of sustainability. Sustainability and policy**

Concepts and constraints  
Consumption time paths  
Comparing consumption time paths  
Concepts of sustainability  
Economists on sustainability  
Economic concepts of sustainability  
Is sustainability feasible? Substitution possibilities  
The Hartwick rule  
Weak and strong sustainability  
Ecologists on sustainability  
Sustainable yields  
Resilience  
The steady-state economy  
A cautious approach  
The institutional conception  
Sustainability and policy  
Economic models and policy prescription  
Incentives  
Information  
Irreversibility

### **Lecture 5. Welfare economics and the environment**

## Part 1. Efficiency and Optimality

Economic efficiency

Efficiency in consumption

Efficiency in production

Product-mix efficiency

An efficient allocation of resources is not unique

The social welfare function and optimality

Compensation tests

## Part 2. Allocation in a market economy

Efficiency given ideal conditions

Partial equilibrium analysis of market efficiency

Market allocations are not necessarily equitable

## Part 3. Market Failure, Public Policy and the Environment

The existence of markets for environmental services

Public goods

What are public goods?

Public goods and economic efficiency

Preference revelation and the free-rider problem

Externalities

Classification of externalities

Externalities and economic efficiency

Consumption–consumption externality

The Coase theorem

Production–production externality

Production–consumption externality

The second-best problem

Imperfect information

Government failure

## **Lecture 6. Pollution control: targets. Pollution flows, pollution stocks, and pollution damage**

Modelling pollution mechanisms

Pollution flows, pollution stocks and pollution damage

The efficient level of pollution

A static model of efficient flow pollution

Efficient levels of emission of stock pollutants

Pollution control where damages depend on location of the emissions

Ambient pollution standards

Intertemporal analysis of stock pollution

Variable decay

Convexity and non-convexity in damage and abatement cost functions

Non-convexity of the damage function and its implications



Estimating the costs of abating pollution  
Engineering models  
Economic models  
Linked or integrated engineering–economic models  
Choosing pollution targets on grounds other than economic efficiency

## **Lecture 7. Pollution control: instruments. Criteria for choice of pollution control instruments**

Criteria for choice of pollution control instruments  
Cost efficiency and cost-effective pollution abatement instruments  
Instruments for achieving pollution abatement targets  
Institutional approaches which facilitate internalisation of externalities  
Command and control instruments  
Economic incentive (quasi-market) instruments  
Emissions taxes and pollution abatement subsidies  
Marketable emissions permits  
Pollution control where damages depend on location of the emissions  
Using non-transferable emissions licences  
Using emissions taxes or emissions abatement subsidies  
Using marketable emissions permits  
A comparison of the relative advantages of command and control, emissions tax, emission abatement subsidy and marketable permit instruments  
Cost-efficiency  
Monitoring, administering and enforcing compliance costs  
Long-run effects  
Double dividend  
Equity/distribution

## **Lecture 8. International environmental problems. International trade and the environment. The greenhouse effect**

International environmental cooperation  
Game theory analysis  
Two-player binary-choice games  
Games with multiple players  
Continuous choices about the extent of abatement  
Factors contributing to enhancing probability of international agreements or achieving a  
higher degree of cooperation  
Role of commitment  
Transfers and side-payments  
Linkage benefits and costs and reciprocity  
Repeated games

International treaties: conclusions  
Acid rain pollution  
Causes of acid rain pollution  
Consequences of acid rain pollution  
Pollution control techniques and instruments  
Stratospheric ozone depletion  
Summary of problem  
Action to date on abating emissions of ozone-depleting substances  
The greenhouse effect  
Greenhouse gas emissions  
Stocks and flows: the relationship between emissions and concentrations  
Climate change models  
The impacts of climate change and the monetary value of potential damages  
Routes towards stabilisation of greenhouse-gas atmospheric concentrations  
The costs of greenhouse gas reductions  
International cooperation in climate change policy  
An appraisal of the provisions of the Kyoto Protocol  
International trade and the environment

### **3.3 Seminar-type classes**

#### Prerequisites

Good level of advanced mathematics for economists is of a great importance while studying Environmental Economics.

Core knowledge of Econometrics at Master's level is required to study the "Environmental Economics" course.

#### Course materials

During the self-studying according to practical lessons students should read, make notes of the publications proposed by the teacher, and be ready to discuss given topics, write essays.

#### Required feedbacks

Student should provide his contact data to the lecturer in order to get the necessary instructions for learning the course

#### Assessment

At each seminar students make personal class assignments (67% of score). The final examination will be given at the end of the course (33% of score).

#### Attendance Policy and Required Course Participation

Students are expected to attend every lecture and seminar taking careful notes, complete all assigned readings and class assignments.

### **3.4 List of educational and methodological support for independent work of graduate students in the discipline (module)**

Independent work on the discipline is organized in the following forms:

1. Independent study of theoretical material on topics and sections of the discipline. When preparing for seminars, it is necessary to use lecture notes, demonstration materials, recommended literature of the main and additional lists, which includes scientific works by leading specialists, scientists and practitioners (monographs, textbooks, textbooks). The forms of the SibFU Scientific Library are used for the selection of literature (<https://bik.sfu-kras.ru/>), Krasnoyarsk Regional Scientific Library (<https://www.kraslib.ru/>), EBS of university partners, Internet resources.

## **4. List of Basic and Additional Educational References Necessary for Mastering the Discipline (Module)**

### **4.1 Main references**

1. Perman R., Ma Y., McGilvray J., Common M. Natural Resource and Environmental Economics / 3rd ed. Pearson Addison Wesley. 2006. ISBN 0273655590

2. Verbeek, Marno A guide to modern econometrics / Publisher Chichester, England ; Hoboken, NJ : John Wiley & Sons, 2008 / ISBN 978-0-470-51769-7

3. Mendelsohn R. The Economics of Adaptation to Climate Change in Developing Countries // Climate Change Economics. 2012. Vol. 3, no. 2. Pp. 1250006-1–1250006-21. DOI: 10.1142/S2010007812500066.

4. Mendelsohn R., Prentice I. C., Schmitz O., Stocker B., Buchkowski R., Dawson B. The Ecosystem Impacts of Severe Warming // American Economic Review. 2016. Vol. 106, no. 5. Pp. 612–614. DOI: 10.1257/aer.p20161104.

### **4.2 Additional references**

1. Porfiriev B. Climate change as a major slow-onset hazard to development: an integrated approach to bridge the policy gap // Environmental Hazards (special issue). 2015. Vol. 14, iss. 2. Pp. 187–191. DOI: 10.1080/17477891.2015.1019823.

2. Porfiriev B. Climate change: A hazard or an opportunity? // Environmental Hazards (special issue). 2009. Vol. 8, iss. 3. Pp. 167–170. DOI: 10.3763/ehaz.2009.0026.

3. Bobylev S. N., Kudryavtseva O. V., Yakovleva E. Yu. Green economy regional priorities // Economy of region. 2015. No. 2. Pp. 148—159. DOI: 10.17059/2015-2-12

## 5. List of Internet Resources Required for Mastering the Discipline (Module)

Postgraduate students are provided with free access to educational and methodological documents and Internet resources. All students have open access to the database of the Electronic Catalog and the full-text database of intra-university publications (<http://lib.sfu-kras.ru/>); to resources of the Virtual Reading Rooms (<http://lib.sfu-kras.ru/eresources/virtual.php>); to educational-methodical complex of the discipline (<http://lib.sfu-kras.ru/ecollections/umkd.php>); to video lectures and educational films of the university (<http://tube.sfu-kras.ru/>); to educational and methodical materials of institutes.

Internet resources necessary for mastering the discipline:

1. EastView: <http://www.ebiblioteka.ru>;
2. eLIBRARY.RU: <http://elibrary.ru>;
3. «ibooks.ru»: <http://ibooks.ru>;
4. Elsevier: (<https://www.elsevier.com/>);
5. POLPRED.COM Обзор СМИ: <http://www.polpred.com>;
6. Cambridge University Press: <http://www.journals.cambridge.org>;
7. DOAJ: <http://www.doaj.org>;
8. EBSCO Publishing: <http://search.ebscohost.com>;
9. Henry Stewart Talks: [www.hstalks.com](http://www.hstalks.com);
10. IEEE/IEL Database: <http://ieeexplore.ieee.org>;
11. Oxford Russia Fund eContent library: <http://lib.myilibrary.com>;
12. ProQuest: <http://search.proquest.com/>;
13. Sage: <http://online.sagepub.com>;
14. Scopus: <http://www.scopus.com>;
15. Springer: <http://www.springerlink.com>;
16. Web of Science: <http://isiknowledge.com>.

## 6. Methodological guidelines for graduate students on the development of the discipline (module)

№ п/п	Discipline section	Scope of work, credits (hours)	Characteristics of the types of independent work implemented in the discipline
1	Environmental economics	1,5 (54)	1. Independent study of theoretical material, including: educational literature (according to the list of references), journals (according to the list)/ 24 hours

			2. Training on issues from the list of topics / 12 hours 3. Search for statistical information / 18 hours
2	Economics of natural resources	1,5 (54)	1. Independent study of theoretical material, including: educational literature (in accordance with the list of references), journals (in accordance with the list)/24 hours 2. Training on issues from the list of topics / 12 hours 3. Search for statistical information / 18 hours

The verification of independent work on the study of theoretical material is carried out by the teacher in the form of an oral survey in the classroom.

Collectively, according to the results of training, a graduate student can score a maximum of 100 points, which are provided by performing the following types of work:

1. The current work in the seminars is 80 points (answers to the control questions on mastering the topic, the answer to each question is counted as 10 points).
2. Written independent work (two theoretical questions of 5 points each, ten test tasks of 1 point each) – 20 points.

The final assessment is carried out as follows:

51-100 points - «passed»;

0-50 points – «failed».

## **7. List of information technologies used in the implementation of the educational process on the discipline (module) (if necessary)**

### 7.1. List of required software.

Microsoft® Windows XP (Microsoft® Vista Business Russian Upgrade Academic OPEN No Level) License certificate - 43158512 from 07.12.2007, unlimited;

– ESET NOD32 - Software license, serial number EAV-0220436634, valid from 04/19/2018 to 04/26/2019;

– Acrobat 8.0 Pro Russian Version Win Full Educ - License certificate CE0712341 from 06.12.2007, unlimited.

### 7.2. List of necessary information reference systems.

The e-library system (the scientific library of SibFU: <http://bik.sfu-kras.ru/>) provides the possibility of individual access for each student from any point where there is access to the Internet.

1. E-library system "Lan": <http://e.lanbook.com>
2. E-library system "INFRA-M": <http://www.znanium.com>
3. Scientific e-library CyberLeninka: <https://cyberleninka.ru/>
4. E-library of dissertations RSL: <http://dvs.rsl.ru> (access to full text), <http://diss.rsl.ru> (directory access)
5. Scientific e-library (eLIBRARY.RU): <http://elibrary.ru>

6. E-library LitRes: Library:
7. E-library of Grebennikov Publishing House <http://grebennikon.ru>
8. E-library of the Russian State University of Oil and Gas. I. M. Gubkina: <http://elib.gubkin.ru>

Information reference systems:

1. Federal State Statistics Service: <https://rosstat.gov.ru/>
2. IAS "Statistics": <http://www.ias-stat.ru>
3. Unified Interdepartmental Statistical Information System (UniSIS): <https://www.fedstat.ru/>
4. State Archive of Krasnoyarsk Krai: <http://красноярские-архивы.рф>
5. Open budget project»: <http://openbudget.karelia.ru/>
6. "SBIS": <https://sbis.ru/>
7. «SPARK»: <https://www.spark-interfax.ru/>
8. *Transparent Business - A Project of the Federal Tax Service of Russia* <https://pb.nalog.ru/>
9. Unified portal of the budget system of the Russian Federation: <http://budget.gov.ru/>
10. Krasnoyarsk Krai. Official web-site: <http://www.krskstate.ru/>
11. Information reference system "Kodeks".
12. Information reference system "Kodeks-Server".
13. Legal reference system "Garant".
14. Legal reference system "Consultant Plus"

Postgraduate students are provided with the conditions and opportunities to work online with foreign and domestic licensed information databases on the profile of SibFU educational programs.

- Cambridge University Press: <http://www.journals.cambridge.org> ;
- EBSCO Publishing: <http://search.ebscohost.com> ;
- Oxford Journals: <http://www.oxfordjournals.org> ;
- Oxford Russia Fund eContent library: <http://lib.mylibrary.com> ;
- Science/AAAS: <http://www.sciencemag.org> ;
- Scopus: <http://www.scopus.com> ;
- Springer: <http://www.springerlink.com>;
- Web of Science: <http://isiknowledge.com>

## **8. Material and technical base necessary for the implementation of the educational process on the discipline (module)**

- 6 classrooms with software and hardware complex with SANACO LAB 300 software for 16 seats: PANASONIC PT-F200NT projector; interactive whiteboard Interwrite; interactive plasma panel Smartboard - Svobodny pr., 79, building № 3 3rd floor and Maerchaka st. 3; 6, 7 floor
- 3 seminar rooms with rear projection smart boards - Svobodny pr., 79, building № 3, 3rd floor and Maerchaka st. 3; 6, 7 floor

- 4 computer labs equipped with Kraftway computers with direct projection boards. Projector EPSON EMP-X5 - Svobodny pr., 79, building № 3, 3rd floor and Maerchaka st. 3; 6, 7 floor
- 6 mobile carts (class AquaCartMC116, special software for teamwork, Windows XP, optical mouse, cart safe, project)
- 6 lecture classroom complexes equipped with: Epson EMP-X5 multimedia projector, remote control, Audio-Technica ATW-702/701P dual radio system; Management console #1 HP TFT7600 RKM with LCD monitor and keyboard; Installation power amplifier Electro-Voice PA2250T; Acoustic system for background sounding Electro-Voice EVID 4.2T. Speaker; Computer Kraftway Credo model KS35 - in / counter. Intel CRAPHICS Media Accelerator 950. Up to 224 MB c/control. 10/100/100) - Svobodny pr., 79, building № 3, 3rd floor and Maerchaka st. 3; 6, 7 floor