

Climate and Sustainable Development

Faculty of Geography and Earth Sciences

Jelgavas street 1, Room 223

Wednesdays, 14:30 – 16:00

Course title	<i>Climate and Sustainable Development</i>
Course code	VidZ1033
Credit points	2
ECTS creditpoints	3
Total Contact Hours	32
Number of hours for lectures	28
Number of hours for seminars and practical assignments	4
Number of hours for laboratory assignments	0
Independent study hours	48
Date of course confirmation	08.01.2016
Responsible Unit	Division of Environmental science

Course developers

Jānis Zaļoksnis

Prerequisite knowledge

Course abstract

The course aims are to provide knowledge about climate change and reducing its negative effects, as well as about adaptation process and its management, the use of modern management approaches, methods and tools.

The course will form students' ability to apply the acquired knowledge to engage in climate management implementation at different levels.

The acquired knowledge on the greenhouse gas emissions reduction and adaptation strategies will create preconditions for the feasibility of different program or plan preparation, implementation, monitoring and evaluation of climate change.

The theoretical aspects will be interacting with case studies from both the literature (national and local climate change strategies, programs and plans) and lecturers experience from practice. It will give for students the opportunity to become aware of the importance of climate change and search solutions needed. Student permanent employment will provide in-depth knowledge and the basis for their practical application.

Learning outcomes

In the course learning process, students work both individually and in groups, in close collaboration with the lecturer. Will be build academic knowledge and understanding as well as management skills on climate control options. After succesfull completion of the course students will gain an understanding of climate change, emission reduction and the necessary adaptation on climate change (sectoral restructuring) implementation, as well as various management planning and mutually agreed implementation.

Students will have the impression of climate change management strategies, programs and plans for a wide variety of areas and levels of governance, implementation monitoring and evaluation. Students will gain knowledge about the basic principles of sustainable development, the main problems and possible solutions to global, regional and local levels. Students will gain an idea of necessity for individuals and the community to work together for sustainable development in society.

Course plan

1. Within five blocks - " Earth's climate and its change" (3 lectures) , " Impacts of climate change " (2 lectures) , " Climate and economic sectors " (4 lectures) , "Climate policy Implementation " (3 lectures) and "Sustainable development "(2 lectures) 14 lectures will be presented.

1.1. " Earth's climate and its change" (3 lectures):

1.1.1. Earth's climate and its constituent elements L2,

1.1.2. Climate variability and change L2,

1.1.3. Climate change in Latvia L2 ;

1.2. " Climate change impacts " (2 lectures):

1.2.1. Impacts of climate change on human health L2,

1.2.2. Climatic factors on living organisms L2 ;

1.3. " The climate and economic sectors " (4 lectures):

1.3.1. Climate and Energy L2,

1.3.2. Climate, industry and transport L2,

1.3.3. Climate, agriculture and forestry L2,

1.3.4. Climate change and the economy L2 ;

1.4. "Climate Policy Implementation " (3 lectures):

1.4.1. Climate policy L2,

1.4.2. Adapting to climate change L2,

1.4.3. Climate change , lifestyle and consumption of L2 ;

1.5. "Sustainable Development " (2 lectures):

1.5.1. Sustainable development L2,

1.5.2. Implementation of Sustainable Development L2 .

2. Seminars (two classes) :

2.1. Earth's climate and its change impacts S2

2.2. Sustainable development S2 .

3. Preparation for seminars :

3.1. The film "Inconvenient Truth"

3.2. The film "The Age of Stupid ".

4. Students' independent work - 48 hours.

5. The final essay, "My contribution for the climate change negative effects mitigating" (3-5 pp.).

Course content

1. lecture

EARTH'S CLIMATE AND CONSTITUENT FACTORS

Climate and weather. Earth's atmosphere and its impact on the climate. Solar radiation and Earth climate. Greenhouse effect. More efficient technologies. Use of renewable resources. Bio-fuel. Hydrogen - the fuel of the future. The use of biogas. CO2 storage.

2. lecture

CLIMATE CHANGE

Earth's climate and the factors influencing its formation. Solar radiation and cosmic radiation impact on variability on Earth's climate. Natural changes of the Earth's orbital and rotational motion. Geological and cosmic disasters. Ocean water flow variability. Water intermediary interactions – seas, oceans atmosphere. Climate variability in the nature and by the human impact on it. Greenhouse gas sources.

3. lecture

CLIMATE CHANGE IN LATVIA

Sunshine duration and solar radiation. Air temperature and its variability in nature. Precipitation's amount and variability. Extreme events and their frequency. Mantle of snow in the nature and its variability. The vegetation period and its changes. Wind's characteristics change in long-term. The fluidity of atmospheric

circulation process. Impacts of climate change on river's hydrology. Possible climate changes in Latvia in the 21st century.

4. Lecture

CLIMATE CHANGE EFFECTS ON HUMAN HEALTH

Climate change effects on health - ways and intensity. Climate change sensitive groups. Impact on health by exceptional environmental conditions. Food and water availability under climate change. Climate change promoted diseases.

5. Lecture

CLIMATIC CHANGE INFLUENCE ON LIVING ORGANISMS

Impact of environmental factors on living organisms: Shelford law. Environmental factors interaction. Temperature effects on living organisms. Moisture effects on living organisms. Impact of climate change on global biodiversity. Climatic and anthropogenic factor interaction effects. Hypotheses and predictions. Threats to world agriculture and forestry. Climate change impact on Latvia's ecosystems and biodiversity. Changes in the marine ecosystems. Possible changes on freshwater ecosystems.

6. Lecture

CLIMATE AND ENERGY

Power industry impact on the climate. Energy users. Energy management and energy efficiency. Climate Technologies for energy consumers. Buildings and energy. Energy use in production processes. Renewable energy technologies. Bioenergy and processing technologies. Bioenergy power supplies. Solar energy. Electricity generation by wind. Hydropower use. Geothermal and other renewable energy technologies. Renewable power sources operating modes. CO₂ storage options.

7. lecture

CLIMATE, INDUSTRY, TRANSPORT

Energy use in industry and its impact on climate change. ISO 50001 requirements. Industrial productivity and efficiency. Cleaner and clean production. The life-cycle approach and its use to ensure climate action. Environmental labels and need for climate labeling.

Transport trends in the world and Latvia. Transport energy impact on the environment and climate. Transport and air pollution abatement techniques. Different modes of transport impact on the climate. Life-cycle analysis of the air pollution caused by transport. Public attitudes about the air pollution caused by transport.

Advanced transport technologies. Economic policy methods to reduce pollution from transport. Direct costs, fuel taxes, mileage fees, vehicle sales and annual fees, parking charges. Lifestyle changes in conjunction with transport policy shift. Sustainable commercial transport and its relationship to the production process. Sustainable transport policy possible complications.

8. lecture

CLIMATE, AGRICULTURE, FORESTRY

Land and growth on productivity - factors influencing the climate. Land-use effects in the development of industrial agriculture and forestry. Sustainable agriculture opportunities - ecological agriculture. The structure of agricultural production in the long term. Fertilizers and pesticides in agriculture and its impact on atmospheric processes. Biodiversity - the rural village and the climate. Energy dilemma in relation to bio-production.

Forest's photosynthesis and climate change. The essential requirements for sustainable forestry and forest ecosystem management. Forestry future development with maintaining biodiversity.

Quality and productivity of the Baltic Sea and impact on the climate. Eutrophication effects. Aquaculture climatic rating.

9. Lecture

CLIMATE CHANGE AND ECONOMY

Economic impact on climate change. Impacts of climate change on the economy. Adaptation measures in various business areas. Mitigation of economic instruments. Climate change mitigation measures in entrepreneurship.

10. Lecture

CLIMATE POLICY

Climate policy framework. Combating climate change. Adaptation to climate change. Climate policy

instruments. International climate policy. International negotiations on climate dynamics. Kyoto protocol's flexible mechanisms. Paris agreement. EU climate policy. EU towards a low-tech carbon development. EU emission trading scheme. EU climate change adaptation. Latvia's climate policy and goals of greenhouse gas emission reduction. Adaptation to climate change in the Latvia.

11. lecture

ADAPTING TO CLIMATE CHANGE

The concept of adaptation. Adaptation policies. Recommendations for adaptation solutions. Climate change adaptation solutions at national level. Education and science for the development of adaptation and implementation. Adapting to climate change in the urban and spatial planning. Adapting to climate change in agriculture and forestry. Adapting to climate change and water management.

12. lecture

CLIMATE CHANGE , LIFESTYLE AND CONSUMPTION

Awareness of the emissions - carbon footprint. Consumer calculation of the GHG emissions. Data and their quality. Carbon footprint in Latvia and other places in the World. Low carbon development determinants.

13. Lecture

SUSTAINABLE DEVELOPMENT

Need for sustainable development. Global changes. Social changes in the world. World economic development. Exponential economic growth. "Business as usual." Growth boundaries. Concept of sustainable development. The role of science and scientists for sustainable development problem identification and solving. Sustainable development, environment and climate policy. Determination of the problems and their causes. Latvian citizens' perspective on sustainability as a lifestyle and life rhythm element. Local government duties and responsibilities for implementation of sustainable development. Role of the schools for local community sustainability.

14. Lecture

SUSTAINABLE DEVELOPMENT IMPLEMENTATION UN Environment and sustainable development conferences - Stockholm (1972), Rio de Janeiro (1992), Johannesburg (2002), "Rio + 20" (2012.). UN Millennium goals. Sustainable development indicators. UN Decade "Education for sustainable development". Alternative development opportunities. The historical basis for economic growth. "New Economy". "Green Economy". "National happiness." "Non-growth". Latvia's Sustainable Development Strategy - "Latvia-2030". Municipalities and sustainable development. Future options.

Requirements for awarding credit points

The required rating course (mark) for a successful acquisition is 4-10. Course final grade is calculated as the average of the results of the seminar work (20 %), attendance at lectures during the semester (10 %), essay (20 %) and semester final exam results (50 %).

Compulsory reading

Laba pārvaldība. Red. Reinholde Iveta, Ozoliņa Žanete. Zinātne, Rīga, 2009.

Kļaviņš M., Zaļoksnis J. (red.), Vide un Ilgtspējīga attīstība. Rīga: LU Akadēmiskais apgāds, 2011. 334 lpp.

Zaļoksnis J., Kļaviņš M., Brikše I., Meijere S. Vides vadība. Rīga: Latvijas Universitāte, 2011. 205 lpp.

Sustainable Development in Europe: Concepts, Evaluation and Application, Schubert U., Stormer E. (eds), Edvard Elgar Publishing, 2007

Pūķis M. Pašu valdība. Latvijas pašvaldību pieredze, idejas un nākotnes redzējums. Rīga: Latvijas Pašvaldību savienība, 2010, 512 lpp.

IPCC (Intergovernmental Panel on Climate Change). „Climate Change 2014: Impacts, Adaptation and Vulnerability” (Fifth Assessment Report): Summary for Policy Makers”, 34 pp.

Lejup norādītie literatūras avoti ir pieejami LU DZAC bibliotēkā:

„Climate change in Latvia and adaptation to it” /editors Māris Kļaviņš and Agrita Briede ; [English language editor: Ervīns Lukševics]. Rīga : University of Latvia, 2012 (Latgales druka), 186 pages.

„Climate impacts on the Baltic Sea :from science to policy”/Marcus Reckermann ... [et al.], editors, New

York : Springer, 2012. 216 pages.

„Climate change and energy systems :impacts, risks and adaptation in the Nordic and Baltic countries” /edited by Thorsteinn Thorsteinsson and Halldór Björnsson/ Kopenhagen : Nordic Council of Ministers, 2011, 226 lpp

„Climate change :a multidisciplinary approach” /William James Burroughs/ Cambridge ; New York : Cambridge University Press, c2007, 378 pages.

„Climate change and biodiversity /edited by Thomas E. Lovejoy & Lee Hannah/ New Haven ; London : Yale University Press, c2005, 418 pages.

„Klimata pārmaiņas :izaicinājumi Latvijai starptautiskajā vidē” /Stratēģiskās analīzes komisija ; [zinātniskā redaktore Gunda Reire]. Rīga : Zinātne, 2008, 222 lappuses.

„Fenoloģiskās izmaiņas un to ietekmējošie klimatiskie faktori” /G.Kalvāne, promocijas darbs doktora zinātniskā grāda iegūšanai ģeogrāfijā, apakšnozare: dabas ģeogrāfija. LU Akadēmiskais apgāds, 2011, 165 lpp.

„Klimata mainība Latvijā :piemērošanās pasākumi” /Valsts pētījumu programma "Klimata maiņas ietekme uz Latvijas ūdeņu vidi” ; [autori: Juris Aigars ... [u.c.] ; zin. red.: Māris Kļaviņš, Agrita Briede]. Rīga : Kalme, 2009, 63 lpp.

„Klimata mainība un globālā sasilšana” /[Māris Kļaviņš ... [u.c.] ; Māra Kļaviņa un Andra Andrušaiša redakcijā. Rīga : LU Akadēmiskais apgāds, 2008, 173 lpp.

Further reading

IPCC (Intergovernmental Panel on Climate Change). „Climate Change 2014: Impacts, Adaptation and Vulnerability” (Fifth Assessment Report), pieejams vietnē <http://www.ipcc.ch/report/ar5/wg2/>

„Bioenerģijas tehnoloģijas” /D.Blumberga un citi, D.Blumbergas red./, RTU Vides aizsardzības un siltuma sistēmu institūts, Rīga, 2011, 272 lpp. Grāmata pieejama RTU bibliotēkā.

„Vides vadība un energopārvaldība” / S.Valtere, S.N.Kalniņš, D.Blumberga/, RTU izdevniecība, Rīga, 2014, 288.lpp. Grāmata pieejama (nozīmīgs eksemplāru skaits) RTU bibliotēkā. Grāmata pieejama LU AB Misiņa bibliotēkā un LNB.

„Vides tehnoloģijas” /Andra Blumberga ... [u.c.] ; Dagnijas Blumbergas redakcijā. Rīga : Latvijas Universitāte, 2010. 212 lpp.

Atjaunojamie energoresursi un to izmantošana Latvijā /Autoru kolektīvs/, Latvijas Atkritumu Saimniecības Asociācija LASA, Rīga, 2011, 94 lpp. Grāmata pieejama pēc vienošanās LASA.

Eberhards, G. Baltijas jūras Latvijas krasta procesi. Rīga : LU Akadēmiskais apgāds, c2008 (63 lpp.)

Blumberga A. (Red.), Sistēmiskās domāšanas integrēšana vides politikā. Rīga: Rīgas Tehniskās universitātes Vides aizsardzības un siltuma sistēmu institūts, 2010. 225 lpp.
Nozaru politikas vadlīnijas pašvaldībām (LR VARAM, 2014),
http://www.varam.gov.lv/lat/darbibas_veidi/reg_att/metodika/

Periodicals and other sources

Žurnāls „Enerģija un Pasaule”.

RTU Zinātniskie Raksti, 13.sērija Vides un klimata tehnoloģijas Latvijas Fizikas un tehnisko zinātņu žurnāls.

Journal „Climate Change” (ISSN 0165-0009 print, 1573-1480 online, Springer Link).

Wiley online library journal „Wiley Interdisciplinary Reviews: Climate Change” (online ISSN 1757-7799, John Wiley & sons A Wiley company).

International Journal on Climate Change Strategies and Management (ISSN 1756-8692, Emerald Group Publishing).

The International Journal of Climate Change: Impacts and Responses (ISSN 1835-7156, The Climate Change: Impacts & Responses knowledge community).

„Energy Policy” (The International Journal of the Political, Economic, Planning, Environmental and Social Aspects of Energy, ELSEVIER Science, ISSN 0301-4215).

Žurnāls „Technological Forecasting and Social Change” (ELSEVIER Science, ISSN 0040-1625).

Žurnāls „Renewable and Sustainable Energy Reviews (ELSEVIER Science, ISSN 1364-0321).

Žurnāls „Climate Risk Management” (ELSEVIER Science, ISSN 2212-0963).

Journal of coastal conservation : planning and management (ISSN 1400-0350).

Journal of environmental planning and management (ISSN 0964-0568).

Journal of environmental policy & planning (ISSN 1523-908X).

Latvijas Pašvaldību Savienības žurnāls „Logs”.

Citi žurnāli, pieejami LU bibliotēkas datu bāzes: SAGE Journals Online, EBSCO u.c.

1. <http://likumi.lv/> (Latvijas Republikas tiesību akti)

2. <http://polsis.mk.gov.lv/news.do> (Latvijas Republikas politikas plānošanas dokumentu datu bāze): Latvijas ilgtspējīgas attīstības stratēģija līdz 2030. gadam, Latvijas Nacionālais attīstības plāns 2014.-2020. gadam un Darbības programmas, Piekrastes telpiskās attīstības pamatnostādnes 2011.-2017. gadam, Piekrastes telpiskās attīstības pamatnostādņu 2011.-2017. gadam stratēģiskais ietekmes uz vidi novērtējums (http://www.varam.gov.lv/lat/pol/ppd/telp_plan/?doc=12701), Latvijas Lauku attīstības programma 2014.-2020.gadam, Vides politikas pamatnostādnes 2014-2020. gadam

3. http://varam.gov.lv/lat/darbibas_veidi/Klimata_parmainas/ (LR Vides aizsardzības un reģionālās attīstības ministrijas vietne. sadaļa; Klimata pārmaiņas)

4. <http://www.meteo.lv/lapas/vide/klimata-parmainas/klimata-parmainas?id=1148&nid=369> (Latvijas Vides, Ģeoloģijas un Meteoroloģijas Centra vietne, sadaļa: Klimata pārmaiņas)

5. <http://www.vvd.gov.lv/izsniegtas-atlajas-un-licences/seg-atlajas/> (LR Valsts Vides dienesta vietne, uzņēmumu, kuriem izsniegtas SEG emisiju atļaujas 2013.-2020.periodam dokumentācija)

6. Valsts reģionālās attīstības aģentūras vietne: <http://www.vraa.gov.lv>

7. Ekonomikas ministrijas vietne: <http://www.em.gov.lv>

8. Eiropas telpiskās plānošanas novērošanas tīkla (ESPON) mājas lapa: <http://espon.eu>

9. <http://www.eea.europa.eu/lv> ; <http://www.eea.europa.eu/lv/themes/climate> (Eiropas Vides aģentūras vietne)

10. <http://cdr.eionet.europa.eu/> (EIONET (European Environment Information and Observation Network) vietne, sadaļa: Central Data Repository)

Notes

Independent work during use:

- University of Agder (Norway) course " Climate and Sustainable Development" modules "Climate Change "; "Sustainable development"; "Green Economy" . - Movies ("Environmental facts" - Latvia; Uppsala University materials) .