



## Comparative Sustainable Bioeconomy and Energy Resources

ENVI-EURO 3000 (3 credits / 45 hours)

SIT Study Abroad Program:  
Portugal: Sustainability and Environmental Justice

PLEASE NOTE: This syllabus represents a recent semester. Because courses develop and change over time to take advantage of unique learning opportunities, actual course content varies from semester to semester.

### Description

This seminar takes Portugal, southern Spain, and the Azores islands as case studies for a critical reflection on the impact of sustainable bioeconomy and energy resources on economic growth and sustainability of environmental resources. The European Commission defines bioeconomy as "the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy." Portugal's sustainability approach challenges the core principles of economic orthodoxy that is inherently unstable and crisis prone and maps directions for alternative designs in green policies, sustainable environmental tourism and use of natural resources, and access to a sustainable urban environment. Portugal generates almost 100% of the country's needs in electricity consumption from renewable energy, its approach to sustainable and accessible tourism has been hailed as a model for economic development, and Lisbon has been awarded the title of the European Green Capital for 2020. Spain is the second most visited country in the world today (more than 75 million tourists), the world's largest producer of olive oil, and is expected to achieve 100% renewable energy in electricity generation by 2030. The Azores islands have been designated as one of the world's most sustainable destinations and as exemplary in terms of best practices for managing a sustainable tourist economy while avoiding over-tourism. Through field excursions, students compare different sustainability and issues in bioeconomics including conservation projects, sustainable agriculture production, resource management and environmental good practice, and innovative use of renewable energy and impact on sustainable economic growth.

### Learning Outcomes

The *Comparative Sustainable Bioeconomy and Energy Resources* course comprises 45 hours of instruction (3 credits). Upon completion of the course, students will be able to:

- List key sustainability and bioeconomy models and their achievements and the challenges of their implementation in Portugal;
- Compare different approaches to mass tourism and sustainable agriculture;
- Explain defining features of sustainability paradigms that have shaped the development of bio-based economy in Portugal;

- Develop a theoretical and empirical viewpoint of the economic, environmental, and socio-cultural sustainability impact of bioenergy, biotechnology, and use of renewable resources on the economies of Portugal, southern Spain, and the Azores;
- Synthesize key components of the sustainability and bioeconomy paradigms and their impact on economic development.

### Language of Instruction

This seminar is conducted in English, but students will be exposed to vocabulary related to seminar content through in-country expert lectures and field visits in a wide range of venues.

### Course Schedule

\*Please be aware that topics and excursions may vary to take advantage of any emerging events, to accommodate changes in our lecturers' availability, and to respect any changes that would affect student safety. Students will be notified if this occurs.

### Course Methods:

This course is delivered in five modules as described below. The methodological approach will be integrative, participatory, and experiential, and will aim to help the student develop a theoretical, empirical, and comparative understanding of sustainability approaches in Portugal, southern Spain, and the Azores and impacts of bio-based economy on industry, agriculture, and tourism. The modules include field visits and meetings with academics, policy makers, and environmentalists.

### Module 1: Comparative Approaches to Sustainability and Bioeconomy

This module surveys main sustainability models and examines the state of Portugal, southern Spain, and the Azores considering the UN sustainability goals. The module also addresses sample conceptualizations of bioeconomy and discusses the potential gain and cost of the implementation of a bio-based economy. Through an examination of the cases of Portugal, southern Spain, and the Azores, students develop a comparative perspective of sustainability and bioeconomic models, especially in the areas of renewable energies, tourism, agriculture, and waste management.

Sessions and class discussions in this module explore:

- Emerging sustainability models;
- Conceptualizing bioeconomy: green, circular, bio economy;
- Sustainability, bioeconomy, and economic growth;
- Bioeconomy in Europe: the case of Portugal;
- Sustainability in Lisbon and the Azores: a comparative approach.

#### Required Readings:

Lewandowski, I. (Ed.) (2018). *Bioeconomy: Shaping the Transition to a Sustainable, Biobased Economy*. Springer. (selected chapters)

Portney, K. (2015). *Sustainability*. Cambridge, Massachusetts: The MIT Press. (selected chapters).

D'Amato, D., Droste, N., Allen, B. et al. (2017). Green, circular, bio economy: A comparative analysis of sustainability avenues. *Journal of Cleaner production*, 168, pp. 716-734.

#### Recommended Readings:

Sustainable development in the European Union: A Statistical Glance from the Viewpoint of the UN Sustainable Development Goals. Luxembourg: Publications Office of the European Union, 2016.

Slaev, A. and Arch, M. (2004). Sustainability in different urban development contexts: The Southeastern European experience. Conference paper. Retrieved: [https://www.researchgate.net/publication/257654175\\_Sustainability\\_in\\_different\\_urban\\_development\\_contexts\\_The\\_Southeastern\\_European\\_experience](https://www.researchgate.net/publication/257654175_Sustainability_in_different_urban_development_contexts_The_Southeastern_European_experience)

### **Module 2: Blue Bioeconomy in Portugal and the Azores**

This module analyzes blue bioeconomy approach as outlined in Portugal's "The National Ocean Strategy" (2013–2020) and in the Azores islands. Aquatic-based services and products can potentially generate economic growth based on the sustainable and smart use of renewable aquatic natural resources. Portugal aims to develop into a world leading maritime nation and the Azores are designated as one of the most sustainable regions in the Atlantic. The module would also address EU's vision of a sustainable use of maritime resources including aquaculture and energy production based on maritime resources. Some sessions are delivered in the Azores during program excursion.

Sessions and class discussions in this module explore:

- Offshore farming of marine and freshwater resources;
- Aquaculture production on land;
- Offshore energy production (wind and wave energy);
- Marine biomass and freshwater biomasses;
- Water technology: recycling and the re-use of water in industrial processes;

#### *Required Readings:*

Calado, R. and CESAM. (2018). The role of sustainable aquaculture and blue biotechnology in a blue bioeconomy. Retrieved:

[http://www.encontrociencia.pt/files/2018/1530\\_159\\_SC\\_2\\_Ricardo\\_Calado.pdf](http://www.encontrociencia.pt/files/2018/1530_159_SC_2_Ricardo_Calado.pdf)

Ronzon, T. and M'Barek, R. (2018). Socioeconomic Indicators to Monitor the EU's Bioeconomy in Transition. *Sustainability*, 10: 1745. Accessed: doi:10.3390/su10061745

Bio-based industries consortium. (n.a.) Mapping the potential of Portugal for the bio-based industry. Retrieved:

[https://biconsortium.eu/sites/biconsortium.eu/files/downloads/Country\\_Report\\_Portugal.pdf](https://biconsortium.eu/sites/biconsortium.eu/files/downloads/Country_Report_Portugal.pdf)

### **Module 3: Extremadura, Spain: Sustainability and Renewable Energies**

This module takes place in the Extremadura region in Spain. It examines alternative energy technologies and competence in critical analysis of sustainability systems in southern Spain. The module addresses approaches of the mechanics of a variety of renewable energy technologies, the types and scales of energy utilization technologies, and the relationship between energy production, consumption, and resource management. Students learn how Spain uses renewable energy production to drive future economic growth and create jobs.

Sessions and class discussions in this module explore:

- Spain's integration of renewable energy technology into existing infrastructure;
- Smart technologies for power generation and distribution;
- Operating and enhancing sustainable energy systems;
- Green combustion and biofuels in a local context;
- Fundamentals of solar utilization;

- Renewable energy investments and markets.

*Required Readings:*

Montoya, F., Aguilera, M., and Manzano-Agugliaro, F. (2014). Renewable energy production in Spain: a review. *Renewable and Sustainable Energy Reviews*, 33, pp. 509–531.

Scarlat, N., Dallemand, J., Monforti-Ferrario, F. and N., Viorel. (2015). The role of biomass and bioenergy in a future bioeconomy: Policies and facts. [\*Environmental Development\*](#), pp. 3-34.

Emmanuel Koukios, E. and Monteleone, M., et al. (2018). Targeting sustainable bioeconomy: A new development strategy for Southern European countries. The Manifesto of the European Mezzogiorno. [\*Journal of Cleaner Production\*](#), 172, pp. 3931-3941.

*Recommended Reading:*

Lago, C., Caldés, N., Lechón, Y. (Eds). (2018). *The Role of Bioenergy in the Emerging Bioeconomy: Resources, Technologies, Sustainability and Policy*. Academic Press.

#### **Module 4: Sustainability and Forest Fire Management**

This module addresses Portugal’s experience in managing forest fires and long-term fire damages. Students meet with wildfire prevention professionals to learn about Portugal’s Fire Plan (Plano Nacional de Defesa da Floresta Contra Incêndios). Students also analyze impacts of climate change on forest fire occurrence and severity, assess fire risks for the next decades, and hear from experts how Portugal is pursuing a balanced and sustainable strategy to preempt fire threats, improve firefighters’ performance, and develop forest intervention areas.

Sessions and class discussions in this module explore:

- Impacts of climate change on wildfire management;
- Portugal’s Fire Plan (Plano Nacional de Defesa da Floresta Contra Incêndios)
- Rural Civil Protection and Rural;
- Sustainability and Portugal’s balanced approach to fire prevention and management
- EU leadership in environmental governance.

*Required readings:*

Beighley, Mark & Hyde, A. C. (2018). Portugal Wildfire Management in a New Era: Assessing Fire Risks, Resources and Reforms. Accessed: [https://www.isa.ulisboa.pt/files/cef/pub/articles/2018-04/2018\\_Portugal\\_Wildfire\\_Management\\_in\\_a\\_New\\_Era\\_English.pdf](https://www.isa.ulisboa.pt/files/cef/pub/articles/2018-04/2018_Portugal_Wildfire_Management_in_a_New_Era_English.pdf)

Collins, Ross D. et al. (2013). Forest fire management to avoid unintended consequences: A case study of Portugal using system dynamics. *Journal of Environmental Management*, 130 (pp. 1-9). Accessed: <http://www.cienciaviva.pt/img/upload/Forestfiremanagement.pdf>

*Recommended Reading:*

Mustalahti, I. (2018). The responsive bioeconomy: The need for inclusion of citizens and environmental capability in the forest based bioeconomy. *Journal of Cleaner Production*, 172, pp. 3781-3790.

#### **Module 5: The Azores: Sustainable Tourism and Agribusiness**

This module takes place in the Azores. It examines integrated sustainable management of tourism in the Azores Islands. Students learn about the management and sustainability

principles in the tourism industry and conduct field-based assignments to assess the Azores approach to sustainable tourism and impact on economy and local communities. Students also learn about the principles of sustainable agribusiness and analyze the use and challenges of sustainable energy resources in farming. Students compare impact of sustainable tourism in Lisbon and the Azores.

Sessions and class discussions in this module explore:

- The Azores approach to sustainability and ecology;
- Sustainable tourism and economic growth;
- Food production and sustainability;
- Ecological farming and sustainability;
- Biodiversity and its impact on development;

*Required Readings:*

Epler Wood, M. (2017). *Sustainable Tourism on a Finite Planet: Environmental, Business and Policy Solutions*. New York: Routledge (selected chapters).

Guerreiro, S. and Seguro, P. (2018). Sustainable Tourism: Indicators Monitoring sustainability performance in the Portuguese tourism industry. Available: [http://www.15th-tourism-forum.com/pdf/Papers/S2/2\\_2\\_Sustainable\\_tourism\\_indicators\\_monitoring\\_of\\_sustainability\\_performance\\_in\\_the\\_tourism\\_industry\\_in\\_Portugal.pdf](http://www.15th-tourism-forum.com/pdf/Papers/S2/2_2_Sustainable_tourism_indicators_monitoring_of_sustainability_performance_in_the_tourism_industry_in_Portugal.pdf)

Biggs, R., Schluter, M., and Schoon, M. (2015) *Principles for Building Resilience: Sustaining Ecosystem Services in Social-Ecological Systems*. Cambridge: Cambridge University Press (selected chapters).

*Recommended Readings:*

Lorencowicz, E., Baptista, F., Silva, L., and Marquez da Silva, J. (Eds.). (2014). *Sustainable Agriculture: Poland and Portugal*. Lublin-Évora: Reprographic Centre, University of Life Science. Available:

<https://www.eurageng.eu/kcfinder/upload/files/Sustainable%20Agriculture%20-Portugal%20and%20Poland%202014.pdf>

Kousis, M. (2004). Economic opportunities and threats in contentious environmental politics: A view from the European South. *Theory & Society*. 33:3/4, pp. 393-415.

### **Evaluation and Grading Criteria**

Timely completion of all assignments is expected. Late hand-ins will be penalized. All assignments are evaluated according to organization, analytical quality, depth of understanding, argumentation, and presentation of evidence.

### Description of Assignments:

#### Comparative Paper (40%)

Students submit a comparative paper on an aspect of sustainability and bioeconomy addressing at least two regional case studies in which they engage with innovative approaches and challenges in the areas of environmental governance, impacts of bioeconomy on sustainability or sustainable tourism or agribusiness. The paper should demonstrate solid conceptual framework and data collected in the course of lectures, field visits or educational excursions. The paper should be 8-10 pages long.

### Oral Presentation (20%)

Students are required to present orally and creatively at the end of the thematic seminar highlighting the most relevant and important issues discussed in class and on the different excursions. Students choose one sustainability or bioeconomy issue and elaborate on how course lectures, readings, and field visits have helped (or not) map viable approaches to the issue at hand. Students are also encouraged to provide their own insights and recommendations for how the issue could better be resolved.

### Final Essay (30%)

The comprehensive essay exam will consist of a 5 to 7 - page essay which should demonstrate the student's capacity to synthesize and engage critically with main sustainability and bioeconomy arguments addressed through lectures, readings, or field visits throughout the course. Students will be provided with two essay questions to choose from.

### Attendance and Participation (10%)

All students are expected to prepare for classes, attend and participate in all lectures, class discussions, field activities, and carry out all assignments and other activities prepared in the context of the Comparative Sustainability in Bioeconomy in Southern Europe course.

#### Assessment

|                              |     |
|------------------------------|-----|
| Comparative Paper            | 40% |
| Oral Presentation            | 20% |
| Final Essay                  | 30% |
| Attendance and Participation | 10% |

### Grading Scale:

The grading scale for all classes is as follows:

|           |    |
|-----------|----|
| 94-100%   | A  |
| 90-93%    | A- |
| 87-89%    | B+ |
| 84-86%    | B  |
| 80-83%    | B- |
| 77-79%    | C+ |
| 74-76%    | C  |
| 70-73%    | C- |
| 67-69%    | D+ |
| 64-66%    | D  |
| below 64% | F  |

### Grading Criteria

An "A" grade for an assignment entails superior (not just "very good") performance in terms of structure and organization of assignments, analysis, logical argumentation and consistency, and the provision of factual, numerical, and/or historical evidence.

### **Expectations and Policies**

- Show up prepared. Be on time. Have your reading completed and points in mind for discussion or clarification. Complying with these elements raises the level of class discussion for everyone.

- Have assignments completed on schedule, printed, and done according to the specified requirements. This will help ensure that your assignments are returned in a timely manner.
- Ask questions in class. Engage the lecturer. These are often very busy professionals who are doing us an honor by coming to speak.
- Comply with academic integrity policies (no plagiarism or cheating, nothing unethical).
- Respect differences of opinion (those of classmates, lecturers, local constituents engaged with on the visits, etc.). You are not expected to agree with everything you hear, but you are expected to listen across difference and consider other perspectives with respect.

**Please refer to the SIT Study Abroad Handbook** for policies on academic integrity, ethics, warning and probation, diversity and disability, sexual harassment, and the academic appeals process.

**Disability Services:** Students with disabilities are encouraged to contact Disability Services at [disabilityservices@sit.edu](mailto:disabilityservices@sit.edu) for information and support in facilitating an accessible educational experience. Additional information regarding SIT Disability Services, including a link to the online request form, can be found on the Disability Services website at <http://studyabroad.sit.edu/disabilityservices>.