



# SUMMER COURSE ON CLIMATE CHANGE AND RENEWABLE ENERGY WITHIN THE CONTEXT OF SUSTAINABLE DEVELOPMENT

**18<sup>th</sup> - 28<sup>th</sup> July 2011**

**Ponta Delgada, São Miguel Island, Azores, Portugal**



**Language:** English

## **Lecturers:**

José Rosa Nunes (Department of Economics and Management, University of Azores, Portugal)

Ticiano Costa Jordão (co-founder of CRUSUS, Faculty of Economics and Administration, University of Pardubice, Czech Republic)

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Johann Orlygsson (Faculty of Natural Resource Sciences, University of Akureyri, Iceland).

**Duration:** 40 hours.

## **Overview**

Global warming and fossil fuel depletion are two of the most important issues confronting mankind in the 21<sup>st</sup> century. It has been well-recognized that an effective solution to these issues is to develop non-carbon-dioxide-emitting and inexhaustible renewable energy resources, such as photovoltaic, wind energy, bio-energy, geothermal, and solar thermal, and others.



Global warming is related with the concerns about the environmental consequences of greenhouse gas emissions. Although certain recent controversy has been observed in the minority of scientific community and popular media around the fact if the humankind has been contributing significantly to it or not, a major consensus has supported the idea that the anthropogenic activities have been contributing to climate change phenomena.

On the other hand, the depletion of non-renewable energy sources, particularly fossil fuels, has faced less controversy and so has shown to be even more convincing for stimulating investments in renewable energy sources, since according to currently known reserves and rate of consumption, oil and natural gas reserves are expected to be exhausted by around 2047 and 2068, respectively (European Energy Portal, 2010).

Despite of the fact that the world energy consumption fell in 2009 by 1.1 per cent in comparison with the previous year, the first decline registered since 1982, the world energy consumption is again on the rise from 2010 as a signal of the recovery from the global recession. However, this decline was only observed among the OECD member countries and particularly, among the global consumption of oil, natural gas and nuclear power, while the coal consumption has remained almost constant. On the other hand, the hydroelectric output and other renewable forms of energy increased in 2009 even among the OECD member countries (BP, 2010).

The foreseen exhaustion of fossil fuels is visible in the rapid increase in world energy prices observed in the past few years, mainly during the period from 2003 to mid-July 2008, when prices collapsed as a result of concerns about the deepening recession. In 2009, oil prices showed again an upward trend throughout the year, varying from about \$42 per barrel in January to \$74 per barrel in December.

Based on the wide extension of the effects to the whole society and environment caused by climate change and fossil fuel depletion, governmental authorities and representatives of large corporations have proposed several policies and mechanisms (command and control and market-based ones) for adaptation and mitigation. The carbon market is noteworthy.

A progress on dealing with both global problems which are interlinked has been observed but in a slow rate. There is still a lot to do on the road to 2020 and beyond, including in the restructuration of energy grids worldwide supported by a strong and well balanced governmental policies.

## **Programme**

### **Subject 1 – Introduction to Sustainable Development**

- 1.1 The concept of sustainability and an overview of its economic, social and environmental dimensions
- 1.2 Environmental Ethics
- 1.3 Trends and policies in environmental and social issues governing sustainable development
- 1.4 International financial institutions promoting the sustainable development

1.5 The basics of the economics of sustainable development: ecological footprint, carrying capacity, public goods, common property and private goods, externalities and valuation

## **Subject 2 – Climate Change and its Policies and Mechanisms for Adaptation or Mitigation**

- 2.1 The climate change within the context of sustainable development
- 2.2 The controversy around the causes of climate change and its effects
- 2.3 Policies and mechanisms for adaptation and mitigation of climate change
- 2.4 The functionality and the economics of carbon markets

## **Subject 3 – The World Energy Resources and Consumption**

- 3.1 The current known availability and depletion rate of non-renewable energy sources
- 3.2 The future trends of world energy consumption within the context of Climate Change and World Population Growth
- 3.3 Policies and initiatives worldwide for a global transition to a low-carbon economy

## **Subject 4 – The Energy Crops Within the Context of Fossil Fuel Scarcity**

- 4.1 The food and the non-food energy crops and the growth of biofuels
- 4.2 The advances in technology and production of biofuels
- 4.3 The threats behind the biofuels production and consumption

## **Subject 5 – Non-bio Renewable Energy Sources**

- 5.1 The overview of the generation, consumption and investment in non-bio renewable energy sources worldwide
- 5.2 An overview of the functionality of non-bio renewable (geothermal, solar PV/thermal, wind, hydropower, wave)
- 5.3 The advantages and disadvantages of non-bio renewable energy sources within the context of sustainability

## **Subject 6 – Strategic Management of Energy Resources**

- 6.1 Energy Policies and Types of Energy Supply Systems
- 6.2 Incentives and subsidies for the generation and use of renewable energy sources
- 6.3 Alternatives of restructuration of energy supply systems (hybrid renewable energy systems)



#### 6.4 Strategic management tools applied for energy supply in the regional and national level

### **Subject 7 – Sustainable Development Indicators within the Context of Climate Change and Energy Crisis**

- 7.1 An overview of sustainability indicators adopted worldwide in the public sector
- 7.2 The increasing importance of sustainability indicators within the context of climate change and energy crisis
- 7.3 The involvement of the private sector in sustainable development and the growth of socially responsible investors through the sustainability indexes

**Workshop** – impacts derived from the non-sustainable development (Business As Usual – BAU) in the world economy and the proposed mitigation and adaptation measures on a road map.

Case studies involving the application of sustainability principles, management practices, indicators and reporting in several sectors, particularly in the oil&gas, electric utility, agriculture, forestry, transport, chemical, mining and others.

#### **Learning Outcomes**

The course intends to give an updated, integrated, and systemic view of the most relevant aspects of policies and mechanisms facing climate change and energy security. The conceptual and technological evolution of these issues will be provided. Students will also understand the relationship between sustainable economic development and social and environmental pressures arising through the examination of the most widely adopted sustainability indicators, measurement and reporting as well as the most renowned sustainability indexes, such as DJSI and FTSE4Good. A special focus will be given to adaptation and mitigating measures to environmental impacts (particularly in reducing the emission of greenhouse gases and reducing the vulnerability to energy crisis), and their relations with sustainability policies implemented in enterprises. The main aim of the course is to remove the current fragmentation of teaching these topics, while allowing students to develop their individual perception and critical analysis of this issue, providing them with a valuable background of technical information for future use.

At the end of the course students will have an overview of the current adaptation and mitigation measures facing climate change and fossil fuel depletion through a "road map". They will also learn how to apply sustainability management practices and indicators and report on them in enterprises of several sectors, particularly in the oil & gas, electric utility, agriculture, forestry, transport, chemical, mining and others.

#### **Bibliography and Pedagogical Material**

Lessons are presented in Power Point and all slides are delivered on printed format to students at the beginning of each session. All lessons in Power Point with supporting



materials (case studies, additional literature) in electronic format will be available to students in a CD or in a virtual platform.

The students will receive:

- a. Summary in printed text with the main contents of course and bibliographical references
- b. CD containing all slides of the Power Point presentations presented in the lessons.
- c. Index of secondary bibliographical references for optional and complementary individual studies for the students after the course, organized by keywords (all references in English)
- d. Index of web pages consulting available videos on internet related to the topics of the course (references in English)

**Optional acquisition of a e-book** prepared by the lecturers containing valuable and updated information on sustainable development, climate change, renewable energy sources and the social responsibility and sustainability of enterprises.

### Target Audience

This course is recommended for students and professionals in engineering, economics, administration and management, agronomy, communications, journalism, and environmental sciences, who are working in the energy, transport, oil & gas, industry, agriculture and forestry sectors.

### For more information about the local costs, course programme and outcomes, contact:

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