

International Summer School and Workshop on

# “Sustainable Perspectives on Energy Security, Renewable Energy and Climate Change”



**To be held at the University Of Azores**

**22<sup>nd</sup> -26<sup>th</sup> July 2013**

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## 1. Rationale of the international workshop

Tackling climate change and improving energy security are two of the twenty-first century's greatest challenges. Thus, it became relevant to assess the most advanced commercially available technologies for strengthening global energy security, mitigating the effects of climate change, and enhancing resilience through adaptation measures. It is also important to evaluate the barriers to the deployment of these technologies and critically review public policy options crucial to their adoption. In fact, nowadays society may have all the technologies necessary to face these challenges, while maintaining economic growth and preserving the natural environment without forcing trade-offs among them. This can be done through an array of different options, including reduction, reuse and recycling of waste, energy recovery from waste, high-efficiency transportation, renewable energy, carbon sequestration, demand-side management, among others. Several examples of successful approaches to reducing emissions of greenhouse gases and improving energy security have been reported in the past ten years but there is still a lot to improve in order to move towards a sustainable way of living, where traditional “business as usual” approaches highly dependent on fossil fuels will be no longer the preferential pathway to be pursued. Possible measures to abate greenhouse gas emissions and to adapt to climate change effects, while addressing the economic, social and political obstacles associated to these measures is also of high importance.

The Intergovernmental Panel on Climate Change (IPCC) has pointed out that vulnerability of a region depends to a great extent on the level of economic development and institutions since poverty limits adaptive capabilities. Therefore, it is necessary to promote adaptation activities that work to eliminate poverty and build climate-resilient regions. Solutions include investing in water supply, sanitation, irrigation, flood control, transport and energy infrastructure that build resilience to current and future climate variability. Investment in sectors such as health and education will also improve countries' capacity to adapt.

Effective government institutions and policies are also essential for energy planning in ensuring that energy supply and demand decisions made by all stakeholders – producers, consumers, investors, etc. – are compatible with overall goals for national sustainable development.

Apart from the global interest in reducing greenhouse gas emissions and harnessing renewable energy sources as a way to deal with the fossil fuel depletion, the threats to energy systems from climate change have also gained a major importance and have been recently highlighted by the International Energy Association (IEA). In fact, extreme weather events threaten electricity transmission, delivery of gasoline, as well as heat, transport and communication systems that rely on energy. Climate change may affect how energy is produced and consumed in the future. Warmer regions may be exposed to rising electricity demand for cooling in the summer. Warming can also affect electricity supply as plants that need water and air for cooling face new challenges. At the same time, sea level rise and flooding pose challenges for energy infrastructure and the transport of energy goods.

Some of the aspects of particular concern that are discussed by researchers include the relative small size of many small islands states respective geographic isolation; narrow economic base and dependence on larger countries; limited resources; relatively small populations with a narrow skills base; single centres with high population densities and hence high demands on resources; high ratio of coastline to land area; and ecosystems such as coastal lagoons, mangroves, and coral extremely vulnerable to others external ecological influences. Small islands are highly sensitive to environmental problems such as marine and coastal resource degradation, climate change effects such as rising sea level, water resource, waste disposal, land and soil resource usage, desertification and deforestation and industrial pollution. They furthermore face impacts from the demands of the tourism industry, including

capital development projects, hotelisation of coastal areas, road construction, airport and harbour extensions, dredging, and sand extraction and quarrying.

Climate change, energy security, and economic stability are inextricably linked. The impacts of climate change are expected to act as a “threat multiplier” in many of the world’s most unstable regions, exacerbating droughts and other natural disasters as well as leading to food, water, and other resource shortages that may spur mass migrations. Impacts of climate change, in combination with other drivers of global change, are compromising our ability to address global economic, security and social priorities. As floods, drought and other impacts of climate change on water become more frequent or intense, economies and livelihood security will weaken. Adapting to such impacts by building resilience is integral to addressing these global priorities. As water is at the centre of climate change impacts, this demands a focus on resilience to impacts on water. The environment has a critical role in building resilience to climate change and reducing vulnerabilities in communities and economies. Well-functioning watersheds and intact floodplains and coasts provide water storage, flood control and coastal defense. They are ‘natural infrastructure’ for adaptation.

Located in the middle of the Atlantic, the Azores region of Portugal is comprised of nine islands, each with a unique endowment of renewable resources, including: geothermal, wind, solar, hydro, biomass and marine energy resources. Meeting the aggressive renewable energy targets and greenhouse gas reduction goals of the regional government will require optimizing the use of all of these local energy resources, as well as seeking substantial reductions in overall energy consumption.

Studies postulated a slight temperature increase in the Azores due to projected increase in greenhouse emissions, with the postulated biggest impact being increase of precipitation in winter and decreases in other seasons. With climate variability and global climate change policies potentially exerting significant effects on the Azores, the Azores needs to strengthen its resilience through reducing its vulnerability to Climate Variability Impacts (CVI) such as sea-level change, landward seawater intrusion, and increases in coastal erosion (0.8 m/yr in some places), coastal storms, stream flooding and landslides. These potential coastal hazards as a result of CVI need to be better understood in order to establish appropriate adaptation strategies and mitigation measures.

It is important for the Azores to be prepared for future climate variability because it will stretch Azores's inherent vulnerable coasts beyond its resilience limit. Thus, more studies need to be carried out on CVI on the coasts, in order to strengthen its Coastal Zones Management Plans (CZMPs) for the future through integrating adaptation strategies and mitigation measures.

## 2. Objectives of the international workshop

The **International Summer School and Workshop on Sustainable Perspectives on Energy Security, Renewable Energy and Climate Change** will address how climate change and energy security issues have been affecting various communities worldwide, particularly the SIDS. It will investigate how local climate change effects are interrelated and the local contributing factors to their vulnerability. Further, it will explore possible mitigation and adaptation measures. Therefore, the vulnerability of even the most well-developed economies and energy systems to environmental impacts as well as possible means to strengthen the resilience of their energy systems will be addressed in the workshop.

Firstly, the workshop will provide participants a theoretical background on how climate change may affect various aspects of environment and the human society, including the energy systems. Technical and engineering solutions will be highlighted with supporting sound governance structures and policies based on successful cases perceived in different regions across the world. At the end of the workshop, a strategic framework facing climate change

and energy security will be developed for the Azores and will be published in a later date after the event. This strategic framework will consist in a stakeholder-oriented decision-making plan with climate change mitigation and adaptation measures that simultaneously will help enhancing the energy infrastructure and resilience in the Azores archipelago. Besides recommending governance structures and policies that can be locally implemented, the framework will also provide strategic objectives, strategy map, initiatives and key performance indicators (KPIs) that will be interlinked in harmonized way within a Sustainability Balanced Scorecard (SBSC). This strategic management framework goes beyond the conventional Balanced Scorecard that was mainly conceived for private organizations. Since it is built for public authorities facing climate change and energy security, it places on the top of the strategy map the welfare perspective instead of the financial perspective. In the welfare perspective, the increase of socio-economic value and the improvement of regional environmental quality are the main goals. The financial means to achieve these goals will be embedded in the framework within all perspectives that will be jointly developed by participants.

### **3. Key speakers**

#### **MSc. José Manuel Rosa Nunes**

Holding a degree in Finance and a Master in Economics and Politics of Energy and the Environment, Rosa Nunes is a full lecturer at the University of the Azores since 1977 and the current regional director for energy in Azores. He has been member of the Board of Directors of EDA (Electricity company operating in Azores), and Chairman of the Board of Directors at SOGEO, SA (geothermal energy company in Azores).

#### **MSc. Ticiano Costa Jordão, PhD candidate**

Eng. Ticiano Costa Jordão is a Brazilian senior civil and environmental engineer, full time Senior lecturer at the Faculty of Economics and Administration of the University of Pardubice (Czech Republic), director of the Sustainability Crusade Observatory (CRUSUS), vice-president of the Czech-Brazilian Chamber of Commerce, and a member of the editorial board of the international journal Sustainable Development and Corporate Social Responsibility Review. He is currently doing a PhD programme in Environmental Engineering at the Faculty of Chemical Technology of the University of Pardubice with expected degree to be achieved in the beginning of June 2013. In the past seven years he has been invited to teach courses and to present seminars on various topics related to climate change, renewable energy and sustainable development in several universities in Brazil, France, Portugal and Spain. In the past three years he co-organized workshops and summer schools on topics related to climate change and renewable energy within the context of sustainable development in Corsica, Azores and in Spain, always in cooperation with local universities and government authorities.

#### **Mr. José Hernández Brito**

Mr. José Hernández Brito holds a Ph. D. in Chemistry (1986) by the University of La Laguna, and he is professor at the Faculty of Marine Sciences of the University of Las Palmas de Gran Canaria since 1983.

He has been a marine science researcher, supervisor for several thesis, and responsible for over twenty national and international projects. He has held several R & D management positions at the University of Las Palmas de Gran Canaria, such as Dean of the Faculty of Marine Science, Director of the Research Results Transfer Office (TTO), Director of the Scientific

and Technological Park, and Research Vice-Rector. He has also held the positions of Director of the Canary Institute of Marine Science.

Since 2009, he is the manager of the ICTS (Science and Technological Singular Infrastructure) PLOCAN (Oceanic Platform of the Canary Islands) where he is in charge of developing infrastructures, services and projects. His main motivation is to bring out new knowledge, skills, marine and maritime resources, linking administration, training and business.

#### **MSc. Alexander Chlan**

Assoc. Prof. Alexander Chlan is a full lecturer and the Vice-Dean for External Relations at the Jan Perner Transport Faculty of the University of Pardubice.

#### **Assoc. Professor Philippe Poggi**

Dr. Philippe Poggi is an Associate Professor in the Faculty of Science and Technology of the University of Corsica Pasquale Paoli (UCCP), France. He is the coordinator of the Master course on Energy Systems and Renewable Energy Sources at the university. He is the Director of R&D Solar and Energy Storage Platform in Vignola-Ajaccio (MYRTE Platform), and the Coordinator of the convention between UCCP and the French Meteorological Network. He has been involved in teaching and research on Solar and Wind resource analysis and assessment, wind and photovoltaic electrical grid integration, multi-sources hybrid systems, hydrogen production and fuel cells, storage systems integration. He has published articles related to RES in 15 international publications (Physical Review E, Journal of Hydrogen Energy Power, Int. J. of Nuclear Governance, Economy and Ecology, Energy Conversion and Management, etc.).

#### **Assist. Professor Pedro Cabral**

Dr. Pedro Cabral is an Assistant Professor at the Higher Institute of Statistics and Information Management of the University Nova in Lisbon (ISEGI/UNL). Presently, he is on a research leave working as a Post-doc researcher at AMURE (<http://www.umr-amure.fr/>), a mixed research unit of the French Institute of Marine Research (IFREMER) and University of Western Brittany (UBO), in Brest (France). The projects he is currently working on are related with providing management information about ecosystem services to decision-makers in the context of climate change adaptation and marine and terrestrial spatial planning. He has published several papers in the areas of geographical information systems, land change models and remote sensing. He is a member of the editorial board of the Journal of Urban Planning and Development (ASCE).

#### **Assoc. Professor Roshan T Ramessur**

Dr. Roshan T Ramessur is currently Associate Professor in the Faculty of Science, University of Mauritius and also Board Member of the Mauritius Oceanography Institute since 2005. His research interests and publications are in the field of Integrated Coastal Zone Management (ICZM), biogeochemical cycling and submarine groundwater discharge and has carried out climate change/ICZM research projects under IAEA-UNESCO, MRC and University Funding. He has been ICZM lead trainer under RECOMAP- European Union Funding and has participated in a number of conferences and workshops in Africa, Europe, Asia, Australia and North and South America. He is also Founder President of UKCAC- Alumni Mauritius Chapter.

## **Dimitar Zvezdov**

Dr. Dimitar Zvezdov is a research and teaching assistant at the Centre for Sustainability Management at the Leuphana University. His research interest lies in investigating the corporate practice of sustainability accounting in general and on its contribution to improved decision-making and performance control in particular. Before obtaining his phd, Dimitar completed a degree in environmental management. He has also collected experience in the environmental consulting sector.

## **4. International workshop programme (MAIN TOPIC)**

The International workshop will be held at the **University of Azores during one week from 22<sup>th</sup> July to 26<sup>th</sup> July**. The programme of the workshop is presented as follows:

### **Part 1: Vulnerabilities of natural resources, human settlements and energy systems within the context of climate change**

#### **1.1 Natural resources and coastal zone management facing climate change**

As the Earth's climate warms, sea levels are rising, having a significant impact on coastal populations, economies, and natural resources, including inland water resources. Besides the possibility of actual drowning of some low-lying islands and atolls, the increasing reach of storm waves result in coastal erosion and saltwater intrusion of freshwater reservoirs. The session will address these vulnerabilities and how an appropriate management of these resources can help inland and coastal communities prepare for and adapt to a changing climate.

#### **1.2 Vulnerability of energy systems in the context of climate change**

Whether it is for oil and gas or renewable sources such as wind or wave power, a lot of energy exploration, production, and transport takes place along the coast. Therefore, it becomes important to ensure that energy facilities are constructed in places and ways that protect the national interest in energy production and coastal resources, while minimizing conflicts with other coastal uses such as fishing and navigation. With the continuing rise in energy prices and growing concerns about global climate change, renewable energy has drawn more and more attention in recent years. However, efforts to site renewable energy projects have provoked as much, if not more, opposition than conventional energy projects. The opportunities and barriers to developing renewable energy potential will also be addressed in this session.

#### **1.3 Vulnerability of human settlements and food security in the context of climate change**

Although global warming may bring some localized benefits, such as fewer winter deaths in temperate climates and increased food production in certain areas, the overall health effects of a changing climate are likely to be overwhelmingly negative. Climate change affects social determinants of health – clean air, safe drinking water, sufficient food and secure shelter. In this session the following impacts of climate change will be addressed: weather-related mortality, infectious diseases, air-quality respiratory illnesses, crop yields, irrigation demands.

## **Part 2: Sustainable management, policy and governance facing climate change and energy security**

### **2.1 Stakeholder-oriented decision-making tools facing climate change and energy security**

The use of problem tree analysis for identifying the main local climate change effects, their interrelations, and their main local contributing factors. The use of objective tree analysis and the stakeholder-oriented Mendelow Framework for proposing mitigation and adaptive measures facing climate change. Lecturer will also present how a Sustainability Balanced Scorecard can be implemented to foster sustainable deployment of renewable energy technologies in a region.

### **2.2 Mechanisms for climate change mitigation and adaptation**

The Kyoto Protocol to the UNFCCC has set legally binding greenhouse gas (GHG) emission limitation commitments to industrialized countries. It offered these countries some flexibility in meeting their obligations by three market-based mechanisms: Joint Implementation (JI), the Clean Development Mechanism (CDM) and International Emissions Trading (IET). CDM and JI are also called project-based mechanisms. These three mechanisms give industrialized countries an opportunity for cost-effective options to reach their Kyoto target, mainly the CDM in which projects can be undertaken in developing countries where the cost of GHG emission reductions is expected to be far less than in developed countries. At the 2012 Doha climate change talks, Parties to the Kyoto Protocol agreed to a second commitment period of emissions reductions from 1 January 2013 to 31 December 2020, which takes the form of an amendment to the Protocol. While generally, market-based instruments for mitigation can be seen as successful, several key lessons have been learned from previous experiences. Adaptation instruments to climate change have gained importance, especially as developing countries are likely to be impacted relatively strongly by even relatively small magnitude of climate change, especially if situated in the tropics. In that context, developing countries have consistently asked industrialized countries to provide financial resources for adaptation. This session will show how the Kyoto Protocol mechanisms work and will present updated statistics of projects undertaken under the umbrella of these mechanisms worldwide. Some specific examples of projects will be highlighted with their outcomes observed so far.

### **2.3 Energy policies, incentives and financing mechanisms for renewable energy sources**

There is a global interest for a sustainable growth of the renewable energy market due to increasing scarcity of fossil fuel resources and climate change mitigation efforts. For such a sustainable growth, important success factors are not only effectiveness of policy, but also security for investors, which is essential for building up a sector and developing the renewable energy market. Consistency of regulations and policies at different levels and between policy fields form a condition for security, as does the active involvement of market stakeholders. Further, the increasing role of trade within the energy and renewable energy sector leads to a priority for international coherence of policies and markets. To guarantee a sustainable growth of the renewable energy sector, a broad perspective of policy makers and planners is required to include a long timeframe, a comprehensive view of related policy fields and authorities involved, and an orientation that looks beyond national borders. This session will present some examples of energy policies and financing mechanisms implemented on national

and regional levels and how renewable energy projects have also been benefited by Kyoto protocol.

## **2.4 Instruments and financial mechanisms of energy efficiency measures**

Energy efficiency is one of the quickest and cheapest ways to increase the amount of energy available for use. In contrast, building new power plants is expensive and requires years of paperwork before ground-breaking can happen. Buildings are responsible for at least 40% of energy use in most countries, particularly in those where a construction boom has been observed such as China and India. The determinant factors of the energy demand evolution are economic and demographic. For this set of countries, the expected development of the building sector and higher standards of living (directly connected with the consumption of the residential sector) are the main reason for these consumption upsurges. Therefore, it becomes relevant to manage knowledge and technology to slash the energy buildings use, while at the same time improving levels of comfort. Behavioural, organizational and financial barriers stand in the way of immediate action. This session will present successful policies and measures that have been implemented in some countries. Lecturer will also address energy efficiency trends around the world and will show how the interaction between energy efficiency policies and energy efficiency performance of economies can contribute to define approaches that can help overcome these barriers.

## **Part 3: The potential and barriers of renewable energy sources**

### **3.1 Land surveying and geomatics engineering for mapping renewable energy technical potential**

Renewable energy technical potential represents the achievable energy generation of a particular technology given system performance, topographic limitations, environmental, and land-use constraints. The primary benefit of assessing technical potential is that it establishes an upper-boundary estimate of development potential. It is important to understand that there are multiple types of potential — resource, technical, economic, and market. Land surveying and geomatics have been widely used for this purpose. This session will present some examples of geomatic applications for harnessing offshore wind power, wave energy and solar energy.

### **3.2 Hydrogen and solar energy storage platform in Corsica**

In partnership with the University of Corsica and the French Nuclear and Alternative Energies Commission, the MYRTE platform was inaugurated on January 9<sup>th</sup> 2012 at the University of Corsica site in Vignola, close to Ajaccio. MYRTE platform aims to demonstrate the feasibility of a solar energy storage solution using hydrogen technologies to mitigate the fluctuations of solar power generation, and contribute to securing Corsica's power grid. A 560 kWc photovoltaic power plant is connected to an innovative energy storage system developed by AREVA, made of an electrolyzer, hydrogen and oxygen reserves, and a fuel cell. MYRTE has been running connected to the Corsican electrical grid since December 16, 2011: a first in Europe and worldwide in this power range. The director of the platform will comment on all phases of development of this project, on the operational characteristics and on the main constraints they had to overcome to implement it.

### **3.3 Financial and management control of renewable energy sources projects**

## **Part 4: Sustainability issues in the Transport Sector**

4.1 Main concepts in logistics and logistics management, economic theories applied in the transport sector, environmental aspects in the transport sector: air pollution, water pollution and greenhouse gas emissions, the current and future scenario of global transport sector in terms of energy use, energy efficiency and emissions

4.2 Cost-benefit analysis and policy-making for increasing energy efficiency and reducing emissions in the transport sector: some examples. Sustainability indicators for the transport sector

## **Part 5: Working group session for a strategic framework for sustainable governance facing climate change and energy security in the Azores Island.**

### **5.1 Energy Security and Renewable Energy Exploitation in the archipelago of Azores**

The Azores archipelago (Portugal) has 52% of its electricity demand supplied by geothermal energy. This session will present several good practice cases of Azores, mainly those supported by a protocol signed between the Regional Government of the Azores, the Foundation for Science and Technology, MIT Portugal and the University of the Azores, with a view to implementing the Green Islands Project. According to the project, several sources of renewable energy in the Azores will be explored, which includes solar power, wind power, water power, geothermal and biomass power, as well as the production of energy from waves and maritime currents. The objective is to increase electricity production based on Renewable Energies, whose weight will represent 52% of total production in the Azores until 2014. The investments include the construction of new geothermal power stations on the islands of São Miguel and Terceira, new Wind Power Stations in São Miguel and Faial and new Hydro Power Stations on the islands of Flores and São Jorge.

#### **Working group session 1**

**All participants, including invited lecturers will be encouraged to take part in this session**

#### **Preparation of first draft of the strategic framework for sustainable governance**

Development of the first draft of the strategic framework with the supervision of all lecturers involved. The current vision and strategic framework will be considered as a reference for comparison and further improvements. The vision essentially seeks to transform the environmental, economic and social landscape of the country and it embraces five development pillars, namely Education, Environment, Energy, Employment and Equity. Stakeholder mapping tools and a problem tree analysis will be adopted in this session.

Participants and lecturers will propose mitigation and adaptation measures in a harmonized way under an objective tree analysis. The harnessing and promotion of local renewable energy sources such as solar and wind power will be an important part of this strategic framework.

**Part 6: Working group session for a strategic framework for sustainable governance facing climate change and energy security in Azores Island.**

#### **Working group session 2**

**All participants, including invited lecturers will be encouraged to take part in this session**

#### **Development of strategy map within a Sustainability Balanced Scorecard**

The working group will develop a strategy map within a Sustainability Balanced Scorecard (SBSC) with proposed initiatives and Key Performance Indicators (KPIs). The contribution of students, academic and professionals of different backgrounds and different countries is very welcome in this working group session.

#### **Final conclusions related to the preliminary version of the strategic framework developed**

The commission of the working group session lead by lecturers involved in the workshop will provide details on the further steps towards the publication of the strategic framework in a final report. Certificates will be delivered to participants of the workshop.

### **5. Outcomes of the international workshop**

The **International Workshop on Sustainable Perspectives on Energy Security, Renewable Energy and Climate Change** that will be held at the University of Azores aims at delivering a final report with a strategic framework that can enhance the resilience of the energy sector and reduce vulnerability to climate change impacts. Possibilities of improving energy efficiency and opportunities to exploit renewable energy sources will be highlighted as well as a set of adaptive measures facing climate change. These recommendations will be provided within a strategy map based on a Sustainability Balanced Scorecard planning and management system. A review of current set of strategic objectives of Azores oriented to sustainable development concept will be undertaken particularly those that are related to climate change and energy security. The key pillars will be addressed (Energy, Environment, Education, Employment and Equity) and presented in a number of initiatives, key performance indicators and targets. Apart from identifying the stakeholder groups and their main issues of interest that can be associated to climate change and energy security, the strategic framework will identify the capacity and motivation of stakeholder groups to contribute to the achievement of proposed objectives. Specific initiatives in which each stakeholder group can be involved will also be reported.

All participants of the workshop will be invited to join a group on linkedin exclusively created for the purpose of final reviews in the publication of the strategic framework report. The partial results and the final report will be later shared by the organizers of the workshop and will also be available in the website of the University of Azores and in the website of CRUSUS. The report will be available free of charge for consulting and is expected to be used as a benchmarking for other small island developing states.

This research network, however, will continue active even after the publication of report for discussing topics, sharing best practices and news related to sustainable development in the regional and national levels.

### **6. Benefits the workshop will bring to Azores**

The workshop will provide valuable considerations of how the vulnerability to climate change in Azores can be reduced and energy security can be improved by a set of harmonized strategic objectives, initiatives and key performance indicators within a sound governance framework. Besides the contribution of local high-profile experts on climate change and energy issues, external experts will be leading some of the workshop sessions bringing their experience from other countries and different professional backgrounds. Participants of all over the world will be welcomed to attend the workshop sessions and share their perceptions among themselves and with the mentors of each workshop session. This rich diversity in

knowledge among participants is expected to bring an added value to the strategic framework developed that will contribute to the improvement of energy efficiency, the increase in exploitation of renewable energy sources and the enhancement of the resilience of energy systems and resilience to current and future climate variability. Thus, the participants of the workshop intend to develop a strategic management tool for sustainable development within the context of climate change and energy security that can be proudly replicated elsewhere with proper adaptation.