***Sustainable Management of Marine Resources 2011-2012***
***Seminar 2: Oceans as a Source of Renewable Energy | Hawaii, USA | March 26-28, 2012***

Major economic, environmental and social challenges arise when it comes to the management of oceans and coastal areas. An integrated and sustainable management approach are crucial to allow for better protection and usage of marine resources as well as for the development of recreational and economic activities in and around the oceans. Our economic activities are mostly located on coastal areas. Today, 40% of the world population lives in coastal areas or within a 70km range from seashore. This is particularly the case in the emerging economies of the Asia-Pacific region. In recognition of the importance of collective action and regional cooperation in terms of managing marine resources, PECC is implementing the international project led by the France Pacific Territories National Committee for Pacific Economic Cooperation (FPTPEC) in the form of three seminars.

The first seminar was held in November 2011 in Noumea, New Caledonia, focusing on the **Protection of Oceans' Resources** including fisheries, ocean and coastal area protection regulations, and management of challenges from global climate change.

The second seminar of the PECC international project on marine resources, "**Oceans as a Source of Renewable Energy**," held in Hawaii in March 2012, covered four key areas:

1) Development of new technologies for the efficient use of marine energy;
2) New energy sources of the sea including: the operation of ocean thermal energy conversion (mainly in the Pacific), wave energy, tidal energy, the hydraulic energy;
3) Means to increase the use of marine energy through technical and financial support from the public and private sectors;
4) Role of marine energy in future cities and adaptation requirements of urban infrastructures.

Experts highlighted the various benefits and constraints to new forms of ocean energy. For example, the use of ocean thermal technology is useful for dense urban centers, with proximity to deep seas to benefit from differences in temperature between warm surface water and cold water at significant depth. Seawater air conditioning technology is simple and reliable for cooling buildings, an example of which was given from French Polynesia (Bora Bora), and operational in many other cities around the world. Wind turbines are more efficient on the sea than onshore as wind is more regular and consistent offshore. Current energy is deemed more predictable and consistent than wave energy. In general, however, environmental conditions at sea are harsher and more aggressive than on land due to faster corrosion, problems of anchoring, and accelerated aging. Technologies are available but the biggest challenge is the commercialization of these innovations in the marketplace, and developing the economies of scale to make them viable requires sizable companies to buy into, and invest in the new technologies.

The expected benefits of marine energy are significant:

- less dependence on oil;
- lower power consumption;
- reducing greenhouse gas emissions (and even zero emissions as seen in the case of Brando's atoll in Polynesia);

- minimal or no refuse; and
- reduced industrial usage of water

The development of these new sources of energy requires a change in interconnections as existing networks are not compatible with renewable energy. It is therefore necessary to revisit the entire chain of production and distribution if we wish to develop renewable energy. The challenge facing public policy makers is how to connect and plug the many production centers offshore at low cost, into the overall production network at high capacity. To harness the benefits of marine energy requires a rethink of how different aspects of urban services are integrated with each other. This would involve consultation and agreement with stakeholders and the development of public-private partnerships. However, this requires rethinking the integration of urban services in developing better governance, by seeking the agreement of stakeholders and developing public-private partnerships.

While experts see enormous potential for marine energies, they also believe that the market by itself will not be enough to facilitate their further development; it would require all stakeholders to undertake concerted efforts. At this stage there is little likelihood of adoption without cooperation and without public financial support. The development of these new sources of energy require support from the political centers of decision that unfortunately are not always near coastal areas, as noted by an American expert who explained that from Washington DC, one feels little or no concern with marine energy. The development of marine energy calls for strong political will that also needs to be approved by the taxpayers.

The development of "clusters" (example of “Synergie” in New Caledonia) receiving state support as a form of “startup” in financial, technical, and legal aspects, was perceived desirable, as well as the backing of SMEs by major corporations as seen by an Australian firm specializing in wave energy that has signed partnerships with EDF (Electricity of France) and DCNS (French shipbuilding and energy company). Many examples of efforts led by France (e.g. EMACOP, AMI-ADEME, and IEED projects) and the European Union were presented during the seminar.

- EMACOP refers to a French national research project set up this year to study the potential and feasibility for generating renewable energies from marine, coastal, and port areas.
- AMI-ADEME refers to ‘Invitation for Expression of Interest by the French Agency for Environment and Energy Management,’ in which several joint projects involving marine current turbines (e.g. ORCA,SABELLA), floating wind turbines (e.g. WINFLO, VERTIWIND), and wave energy (e.g. S3) are receiving government funding.
- IEED stands for ‘Institute of Excellence in Carbon-free Energy’ which offers scientific and technological facilities to promote industrial development of marine resource energies, particularly through public-private partnerships.

The example of NELHA (National Energy Laboratory of Hawaii Authority), which helped establish a business incubator dedicated to marine energy, was notably interesting. A field visit of the 870-acre facility of NELHA was organized by the East West Center including presentation by the following companies and start-ups associated with the project: OTEC heat exchanger test facility of Makai Ocean Engineering, microalgae farm of Cellana, aquaculture facility Big Island Abalone Corporation, and Keahole solar power facility run by Sopogy.

NELHA is an industrial park that offers research support facilities for development of marine renewable energy and aquaculture by providing continuous supply of cold deep seawater at 4 degrees Celsius as well as warm surface water which allows for various tests to take place with views to reap economic potentials from the dual temperature seawater delivery system. Tenants of NELHA work at the pre-commercial, commercial, research and educational levels.

Another issue highlighted by the experts was the unpredictability of when energy from marine sources can be made available. For example, with tidal power, offshore wind or wave energy, their contributions to the total electricity capacity will vary with the weather in terms of timing and amount.

There are currently hundreds of patents that exist on marine energy technology but there is a relative lack of transparency. It is important to ensure that the technologies that are adopted by the market also address issues of environmental protection of the oceans.

According to a speaker from China, marine technologies are not yet mature enough and should be considered to be in the incipient stages of their development. They are perceived as technologies of luxury that developing economies cannot yet fully afford to grasp. As most marine renewable energies are yet in pre-industrial stages, the question is who will set the norms and standards to be recognized globally. The market is far from being structured, and its structuring will depend on forces that will facilitate its organization, the constraints as well as limits to its development.

Lessons should be learned from tests in situ in order to improve performance, quality of materials, design, reliability, and to lower the maintenance costs. A thorough and well-thought out policy framework is required to develop a solid industry. In addition, various socio-economic as well as technical barriers should not be neglected: the need to collect more reliable data for sound decision making, development of new digital tools, addressing problems connecting to the sector, risks related to operations at sea, evolution and compatibility of norms must also be tackled. This is a multidisciplinary field where technologies are not yet stabilized. Some experts urge caution, they said it would be cheaper and more appropriate to encourage lower energy consumption than developing new technologies, and similarly, terrestrial technologies (e.g. solar and wind) are less difficult to implement than marine technologies.

A key issue related to smart grids that are expected to efficiently manage the delivery of energy between peak and off-peak hours, consists of finding the optimal balance between collective systems and area-specific solutions. It requires finding the most efficient ways of integrating the energy generated from many different sources into the power grid without destabilizing the latter. New business models are expected to make networks more intelligent by connecting offices, stores, hotels, treatment stations for marine renewable energy where available. This process would be assisted by economic models which are based not on more production but on energy savings.

New research and new investments will be required as we push the boundaries of innovation in the ways we produce, consume, and manage energy and their sources. Some sources of marine energy are more likely than others to develop and become viable; the transition from experimentation to exploitation will then define internationally recognized standards.

Network reconfigurations will become necessary for public service providers and require finance to develop the sector through public-private partnership. This raises the question of energy security in small islands which are vulnerable to difficulties with remote distance and high costs of service equipment.

The presentations made at the seminar in Hawaii are available on PECC website:
http://www.pecc.org/component/eventlist/details/231-pecc-marine-resources-seminar-2-oceans-as-a-source-of-renewable-energy

The concluding seminar, "Management of Marine Resources and Oceans as a Means of Communication" will be held on December 4 and 5, 2012 in Auckland, New Zealand, and four main topics will be discussed:

1) **Identification and exploitation of deep sea mineral and energy resources**:
   **Identification of the existing resources, search for new resources** (nodules, rare earth metals), the development of clusters and international alliances, **technology transfer and innovation through PPPs**, **the legal framework,** and **the prevention of environmental risks**
2) **Surveillance of oceans**:
   **Protecting fishing zones** from non authorized users, monitoring and **fight against marine and coastal pollution**, the development of an international **early warning system to prevent potential environmental disasters**
3) **Oceans as a means of communications**:
   **Developing the competitiveness of small island countries** by developing sea transportation; working towards a "hub and spoke," or a "point to point" model to link the economies
4) **The development of high speed communication by optical fiber** in the Pacific Rim to enhance economic and financial relations

At the end of the series of three seminars, contents will be published in the form of a PECC project publication.