Project Summary

Framework	German-Indonesian Cooperation in Marine Sciences, SPICE III
Joint Project	Potentials of Ocean Renewable Energy in the Indonesian Seas, Topic 6
Project Title	Development of a Decision Support System for Site Selection and Power Yield from Ocean Renewable Energy Facilities in Indonesia (Subproject 6.1 of the joint project)
Coordination	Dr. Wahyu W. Pandoe, The Agency for the Assessment and Application of Technology (BPPT, on the Indonesian side), Prof. Dr. Roberto Mayerle, Research and Technology Centre of Kiel University (FTZ, on the German side)
Project Duration	February 2012 to February 2015

Objectives: The proposed cooperative project aims at the advancement of the development of strategies for improving the reliability of estimations of the potential power from ocean energy facilities in Indonesia. Emphasis shall be placed primarily on sites suited for the development of tidal stream and wave energy facilities. It is intended to verify the effectiveness of state of the art techniques for improving resource characterization and advancing the development of rationale for the selection of suitable sites taking into account environmental aspects. The improved strategies shall be embedded into a decision support system (DSS) for supporting the managers in the decision making process. The developed DSS shall enable extensions to handle reliable estimates of power potential in sites all over the world.

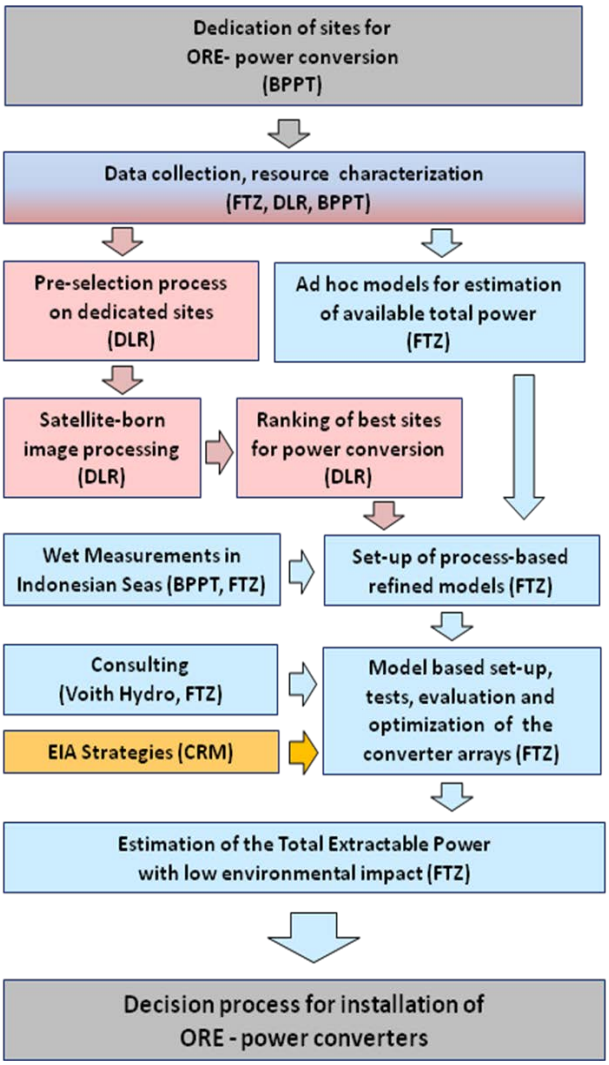
The Agency for the Assessment and Application of Technology (BPPT) and Ministry of Marine Affairs and Fisheries are actively involved in research activities on wave and tidal stream systems. This institution and some other related research agencies have preselected potential locations for the implementation of tidal current and wave energy systems. However due to the lack of measurement data on the spatial and temporal variation of current velocities, little is known about the overall yearly power that can effectively be extracted in those sites. It is intended to advance the development of strategies for characterization of the resources, site selection, assessment of the impacts and estimation of the effective power. State of the art technologies integrating data from observational stations, field investigations, space-borne remote sensing and process based models will be applied. The developed strategies shall be embedded into DSS to help decision makers in the energy sector to enhance the management of such resources.

Locations: Joint field investigation will be conducted in areas of the Indonesian Seas preselected for implementation of tidal current and wave energy converters. This will be done in the southern coast of West/Central Java and in the Larantuka Strait of Flores in 2013 and in the West coast of Bengkulu and in the Sunda Strait in 2014 in cooperation with BPPT.

The estimation of the power that can effectively be yielded from a given site requires first the identification of sites suited for such installations. The suitability of sites for tidal stream power depends on the characterization of the resources in terms of tidal speeds that can be achieved over a typical two weeks period covering neap and spring tidal conditions. To verify the suitability of sites in which physical and environmental key data is not readily available or difficult to obtain, in this study the effectiveness of advanced remote sensing techniques for

mapping tidal currents shall be investigated. These results would provide a cost effective means of characterization of the existing raw resources and a very rough estimate of the suitability of a site. In the pre-selected sites, more detailed investigation shall be undertaken. For that the spatial and temporal variation of current velocities will be obtained through the application of high resolution three dimensional hydrodynamic models. Specially designed field measurements and monitoring programs needed for the development and application of the models shall be carried out. Studies of the cumulative impacts of the technological deployments on the environment on the basis of field observations and numerical model simulations will also be conducted. Risk assessments due to extreme events shall also be conducted.

Results of model simulations covering typical tidal conditions will in turn enable the identification of the extent of the area suited for such installations and the proper selection of type and size of the structures. As a result the overall power potential that can effectively be yielded from the screened sites can be estimated for a longer period. This research is expected also to propose alternative engineering designs and techniques for such a proposed structure anchoring, subsea cable installation, turbine foil design, electric and mechanical control for the use of low RPM permanent magnetic generator as well as turbine model test in the existing BPPT's facility. The DSS will be used to run several scenarios combining sizes and types of structures as well as their spacing to maximize power generation in a suitable way. This will improve the understanding about the suitability of the site for feasible power generation.



Deliverables: A list of the main deliverables of the proposed project follows:

a) improved strategies for characterization of resources and for the selection of sites suited for installation of renewable ocean energy facilities;

b) Effectiveness of remote sensing techniques for pre-selection of suitable sites; c) Decision Support Systems for site selection and estimation of the effective power;

c) Process based models for simulation of hydrodynamics, sediment dynamics and morphodynamics;

d) Recommendations concerning the investigations and monitoring programs for dealing with the impacts of installations on the environment;

e) Effectiveness of multi-purpose use installations;

f) Estimation of the reduction in the emitted CO2 as a result of the implementation of ocean renewable energy installations in Indonesia;

g) Inventory of sites suited with the corresponding power yield in Indonesia.