The Role of Data Science and Artificial Intelligence in Accelerating Sustainable Energy Transitions

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OceanPixel
Enabling Sustainability through Data Intelligence

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OceanPixel is a Singapore start-up that was incorporated in 2014, having spun-off from the Energy Research Institute at NTU.

The core team has combined expertise in sustainable energy research, development, demonstration, project development and experience in the relevant industry ecosystem, business, finance, policy and education.

OceanPixel believes in the development of Sustainable Ecosystems, and supports these efforts by offering Data Management technologies and services coupled with Suitability Analytics, data catalogues, report products and technical services. OceanPixel has various global involvements, but is currently focused in South East Asia, handling projects in Singapore, Philippines and Indonesia.
Digital Ecosystems (e.g. Data, Artificial Intelligence, Digital Tools): Enabling & Accelerating Sustainable Development
RE Options for Islands in South East Asia: Appropriate Technologies

Case Study: Hybrid System for an Island Micro-Grids

<table>
<thead>
<tr>
<th>Power System Config.</th>
<th>RE Fraction</th>
<th>Excess Electricity</th>
<th>LCOE (USD/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel GenSets (910, 100 kVA) + Batt (576kWh) + Solar (90kWp)</td>
<td>6%</td>
<td>12.6%</td>
<td>0.368</td>
</tr>
<tr>
<td>Diesel GenSets (900kVA, 100 kVA) + Batt (720kW) + Solar (600kWp)</td>
<td>38.6%</td>
<td>20.1%</td>
<td>0.386</td>
</tr>
<tr>
<td>Diesel GenSets (900kVA, 100 kVA) + Batt (1440kWp)</td>
<td>0.0%</td>
<td>2.47%</td>
<td>0.456</td>
</tr>
<tr>
<td>Diesel GenSets (2x 910, 500, 100 kVA)</td>
<td>0.0%</td>
<td>14.5%</td>
<td>0.50</td>
</tr>
</tbody>
</table>

Floating tidal turbine deployment at Bintuni, Papua New Guinea, first in S.E.A. (Oct 2016)

Floating tidal turbine demonstration off Sentosa, Singapore, Feb 2017
Blue Economy Risk Registry

An Interactive dashboard summarizing hazards identified across a broad set of domains cross-linked to Australia’s emerging Blue Economy.

Project Goals:

• Cross-linking domains and hazard to have an overview of shared hazards.
• Hazard Impact ranking to help authorities in making impact assessment and mitigation strategies.
• Help Government organizations in Policy-making for a sustainable blue economy.
• New entrants in Blue economy industry can identify their relevant hazards and plan accordingly.
Fish-i is a technology that uses artificial intelligence in automating fish visual census. It is a quicker, safer, and more accurate way to monitor fishes. With this technology, even divers with minimal knowledge and expertise in the marine sciences can acquire highly accurate information.

- Safer, faster, cheaper
- High scalability
- More frequent census

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Data Science and AI + Digital Tools for Renewable Energy Pools, with Grid Considerations – Bohol, Philippines

Renewable Energy Pool (REP) suitability (a) without and (b) with grid extension

Legend:
- Bohol Province
- Existing Grid
- Grid Extension
- 5 km Grid Buffer

Overall Suitability Scores
- Class A REPs
  - 0.3 - 0.5
  - 0.5 - 0.6
  - 0.6 - 0.8
- Class B REPs
  - 0.3 - 0.5
  - 0.5 - 0.6
  - 0.6 - 0.8
- Class C REPs

Suitability of REPs along the province’s Competitive Renewable Energy Zone (CREZ) Project increases upon grid extension.

Wind Renewable Energy Project Site Assessment and Planning Considerations

1. Resource Assessment
   - Wind Speed

2. Scenarios modeling
   - Wind turbine characteristics
   - Total capacity
   - Noise Analysis
   - Shadow Flicker Analysis

3. Environmental Impacts Mapping

4. Project Recommendations
Data Science & AI + Digital Tools for Site Assessments: Multi-Criteria Decision Analysis + Geographic Information Systems

Offshore Wind Project Pre-Dev’t
Digital Tools: Enabling Sustainable Integrated Development for Islands & Coasts

Digital Ecosystems with various tools:
- Data Science
- Artificial Intelligence / Machine Learning
- Dashboarding
- Geographic Information System (GIS)
- Marine Spatial Planning
- Techno-Economics
- Computer Vision
- Augmented Reality, VR, Mixed Reality
- Internet-of-Things (IoT)
- And more!

Aquaculture & Fisheries

Green Transport – Sea and Land

Green Maritime Ecosystem – Ports, Vessels, Aquaculture, Desalination, Water, Ice/Cooling ++

Renewable Energy + Green Transport + Aquaculture + Water Production + Freezing/Cooling + Local Content + Other Sustainable Initiatives

OceanPixel
Thank You! 😊

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