

Addressing Coastal Community Vulnerabilities with Alternative Marine Energy Projects

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Abstract : Coastal communities experience a variety of distinct socioeconomic, technical, and environmental vulnerabilities, all of which accrue heightened risk with increasingly frequent and severe climate change impacts. Marine renewable energy (MRE) offers a potential solution for mitigating coastal community vulnerabilities, especially water-energy dependencies while delivering promising co-benefits such as increased resilience and more sustainable energy outcomes. This paper explores coastal community vulnerabilities and service dependencies based on the local drivers that create them, with attention to climate change impacts and how they catalyze water-energy unmet needs in these communities. We examine the vulnerabilities through the lens of coastal Tribal communities (i.e., the Makah Tribe, the Kenaitze Tribe, Quinault Nation), as indigenous communities often face compounded impacts of technical, economic, and environmental vulnerabilities due to their underlying socio-demographic inequalities. We offer an environmental and energy justice indicators framework to understand how these vulnerabilities disproportionately manifest and impact the most vulnerable community members, and we subsequently utilize the framework to inform a weighted decision matrix tool that compares the viability of MRE-based alternative energy futures in addressing these vulnerabilities. The framework and complementary tool highlight opportunities for future MRE research and pilot demonstrations that directly respond to the vulnerabilities of coastal communities.

Keywords : coastal communities, decision matrix, energy equity, energy vulnerability, marine energy, service dependency

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