

Emergy analysis of coastal systems influenced by upwelling in northern Chile: Estimation of ecological-economic sustainability at multiple scales

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Numerous studies carried out in a variety of environments have suggested that coastal marine systems generate a variety of goods and services for humanity. However, in recent decades there has been a marked degradation of these ecosystems, as well as over-exploitation of natural resources. Within the coastal systems of Chile, problems related to the sustainability of fisheries, aquaculture and industrial activities, so far have only generated solutions that seek to manage and protect certain species without considering the ecosystems of which they form a part. In general, management measures related to the protection of the coastal zone have not considered sustainability that emerges from the integration of ecosystem, environmental and economic components within a systemic framework. This is one of the main reasons used to explain the poor results obtained after the implementation of La Rinconada Marine Reserve in Antofagasta Bay. Northern Chile is characterized by the presence of coastal upwelling that supports marine ecosystems of importance for fisheries and industrial activities, as well as for the conservation and preservation of biodiversity. This coastal area supports important artisanal benthic fisheries and numerous industrial complexes featuring thermoelectric plants, mineral shipping ports, acid and fisheries plants. These economic activities have generated significant pressure on the goods and services generated by marine systems and at present a complete analysis of the costs and benefits of these productive activities has not been performed. In this study, emergy evaluation was used to assess the overall sustainability of three coastal systems in northern Chile influenced by upwelling (Mejillones, Antofagasta and Tongoy Bays). The environmental, ecological and economic contributions of the coastal marine ecosystems to the local, regional and national economies were assessed.

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