Five LME Modules are used to assess the changing states of Large Marine Ecosystems. Each of the 5 modules has its own suite of indicators to assess changes in the LMEs and determine whether an LME is improving or deteriorating.

(iv) The Socioeconomics Module

SOCIOECONOMIC MODULE INDICATORS

The economic value of an LME is equivalent to the net present value of goods and services that flow from uses and non-uses of its resources and environment. Costanza et al. (1997) calculate that the coastal waters encompassing LMEs annually contribute US $12.6 trillion to the global economy. Although this estimate does not reflect the benefits or costs of marginal changes in marine ecosystem goods and services, it highlights the critical importance of LMEs to the economies of the world.

The socioeconomic module emphasizes the practical application of scientific findings to managing LMEs and the explicit integration of social and economic indicators and analyses with all other scientific assessments to assure that prospective management measures are efficient. Economists and policy analysts work closely with ecologists and other scientists to identify and evaluate management options that are scientifically based and economically practical with regard to sustaining optimal socioeconomic benefits of the LME's goods and services. A method for indexing the relationships between marine industry and socioeconomic development has been developed by Hoagland and Jin (2008) of the Marine Policy Center of the Woods Hole Oceanographic Institution. These researchers used indices of socioeconomic activity based on data from several marine economic sectors, including fish landings, aquaculture production, ship building, cargo traffic, merchant fleet size, oil production, oil rig counts, and tourism. The data were examined for the years between 2002 and 2004, to compare marine industry activity with indices for socioeconomic, fishing and aquaculture, tourism and shipping and oil activities. A summary ranking of LMEs by area adjusted marine industry activity is shown in **Table 1**. From the comparison of ranked socioeconomic and marine industry activity indices for LMEs, countries bordering the Yellow Sea, East China Sea, East Bering Sea and Insular Pacific-Hawaiian are the most economically active LMEs. High levels of marine industry activity often are associated with significant levels of environmental degradation, however.

Table 1. Socioeconomic and Marine Industry Activity Indexes for LMEs, ranked in order of Marine Activity Index (Hoagland and Jin 2006)

LME	LME#	Socioeconomic Index	Fishery & Aquaculture Index	Tourism Index	Ship & Oil Index*	Marine Industry Activity Index
Yellow Sea	48	73.442	71.837	44.410	36.865	45.369
East China Sea	47	84.076	51.891	30.773	42.147	41.821
East Bering Sea	1	93.900	17.438	57.893	43.969	41.448
Insular Pacific-Hawaiian	10	93.900	17.438	57.893	43.969	41.448
Northeast U.S. Continental Shelf	7	93.963	15.456	52.758	37.861	36.360
Gulf of Mexico	5	89.071	13.021	46.271	36.611	33.825
Kuroshio Current	49	93.628	18.324	6.705	45.846	32.514
California Current	3	88.015	12.055	43.729	35.002	32.158
Gulf of Alaska	2	94.019	13.716	48.248	32.496	31.891
Southeast U.S. Continental Shelf	6	90.830	13.131	44.030	33.082	31.282
Chukchi Sea	54	87.433	14.683	34.858	27.524	26.422
South China Sea	36	73.777	34.521	22.269	14.902	20.299
Beaufort Sea	55	94.163	9.198	36.539	18.570	20.289
Gulf of California	4	80.200	4.907	24.923	23.096	19.823
Norwegian Shelf	21	95.600	10.703	3.662	27.969	19.654
Sea of Japan	50	83.263	13.262	3.529	23.976	17.744
Celtic-Biscay Shelf	24	92.204	2.482	38.841	14.639	17.048
North Sea	22	94.021	5.275	14.384	16.405	13.775
Oyashio Current	51	83.278	13.031	2.138	14.904	11.976
Iberian Coastal	25	91.188	2.482	47.324	3.155	11.854
Scotian Shelf	8	94.300	4.880	25.351	5.262	9.204
Hudson Bay	63	94.300	4.880	25.351	5.262	9.204
Newfoundland-Labrador Shelf	9	93.668	4.848	25.182	5.227	9.142
North Australian Shelf	39	94.600	0.836	6.587	12.727	9.121
East-Central Australian Shelf	41	94.600	0.836	6.587	12.727	9.121
Southeast Australian Shelf	42	94.600	0.836	6.587	12.727	9.121
Southwest Australian Shelf	43	94.600	0.836	6.587	12.727	9.121
West-Central Australian Shelf	44	94.600	0.836	6.587	12.727	9.121
Northwest Australian Shelf	45	94.600	0.836	6.587	12.727	9.121
Northeast Australian Shelf/Great Barrier Reef	40	94.006	0.833	6.491	12.540	8.989
Mediterranean Sea	26	83.262	1.087	27.192	4.595	8.413
Barents Sea	20	83.939	10.839	1.288	9.972	8.409
West Bering Sea	53	80.956	11.553	6.199	7.251	7.901
Indonesian Sea	38	69.200	16.159	6.686	3.872	6.892
Pacific Central-American Coastal	11	77.304	2.431	8.856	7.634	6.838
East Brazil Shelf	16	77.500	2.257	4.676	8.716	6.616
South Brazil Shelf	15	77.525	2.249	4.662	8.679	6.589
Gulf of Thailand	35	73.826	7.309	13.395	3.268	6.102
Sea of Okhotsk	52	80.125	11.245	0.675	5.071	5.426
Patagonian Shelf	14	86.846	2.763	8.225	5.085	5.249
Bay of Bengal	34	63.400	7.675	4.571	4.088	4.902
Sulu-Celebes Sea	37	74.778	10.078	4.420	3.212	4.827
North Brazil Shelf	17	77.055	1.772	3.364	6.284	4.798
East Siberian Sea	56	79.500	10.891	0.385	3.122	4.128
Laptev Sea	57	79.500	10.891	0.385	3.122	4.128
Kara Sea	58	79.500	10.891	0.385	3.122	4.128
Canary Current	27	61.160	2.365	14.278	0.806	3.812
Humboldt Current	13	83.015	15.241	1.721	0.178	3.499

LME	LME#	Socioeconomic Index	Fishery & Aquaculture Index	Tourism Index	Ship & Oil Index*	Marine Industry Activity Index
Baltic Sea	23	90.324	2.120	8.086	2.378	3.468
Black Sea	62	77.323	2.859	7.941	1.176	2.865
Arabian Sea	32	62.635	2.895	2.300	2.766	2.698
Benguela Current	29	53.103	1.805	2.127	2.791	2.461
Caribbean Sea	12	73.177	1.010	3.603	2.197	2.241
Red Sea	33	62.564	0.268	5.583	1.381	1.999
Iceland Shelf	59	94.100	6.865	0.417	0.029	1.474
New Zealand Shelf	46	92.600	2.092	2.876	0.403	1.235
Agulhas Current	30	47.616	0.878	1.813	0.604	0.900
Guinea Current	28	47.619	0.350	0.294	0.718	0.560
Somali Coastal Current	31	34.710	0.098	0.357	0.025	0.106

* Including shipbuilding, shipping, and offshore oil.

Figure 1 examines economic sector activity for the Yellow Sea LME. The four sectors examined includ (1) socioeconomic activity, (2) shipping and offshore oil, (3) fisheries and aquaculture, and (4) tourism. The calculated index values for the three industry sectors were greater than the world average (**Figure 1**).

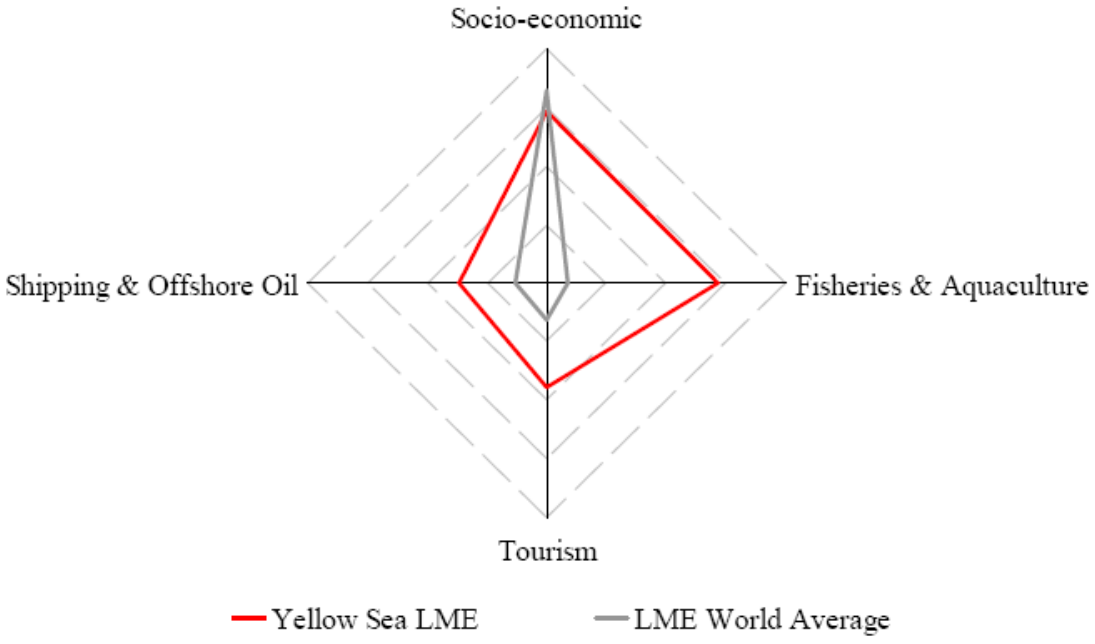

Figure 1. YSLME activity index values for three major marine sectors and the HDI ("socioeconomic") in comparison to the LME world average.

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