Chapter 44

Appendix. List of condition assessments

List of condition assessments (ranked as very good, good, poor, very poor) for estuaries and deltas in different regions, and the trend in condition (over time interval specified). Year of assessment, the number of estuaries or deltas included and references are indicated for each region. Indicative grading statements used to define the condition are as follows:

Very Good = Estuarine habitats are essentially structurally and functionally intact and able to support all dependent species. Only a few, if any, species populations have declined as a result of human activities or declining environmental conditions. There are no significant changes in physical-chemical-ecological processes or ecosystem services as a result of human activities.

Good = There is some habitat loss or alteration in some small areas, leading to minimal degradation but no persistent substantial effects on populations of dependent species. Populations of a number of significant species but no species groups have declined significantly as a result of human activities or declining environmental conditions. There are some significant changes in physical-chemical-ecological processes as a result of human activities in some areas, but these are not to the extent that they are significantly affecting ecosystem functions or services.

Poor = Habitat loss or alteration has occurred in a number of areas, leading to persistent substantial effects on populations of some dependent species. Populations of many species or some species groups have declined significantly as a result of human activities or declining environmental conditions. There are substantial changes in physical-chemical-ecological processes as a result of human activities, and these are significantly affecting ecosystem functions and services in some areas.

Very Poor = There is widespread habitat loss or alteration, leading to persistent substantial effects on many populations of dependent species. Populations of a large number of species or species groups have declined significantly as a result of human activities or declining environmental conditions. There are substantial changes in physical-chemical-ecological processes across a wide area of the region as a result of human activities, and ecosystem function and services are seriously affected in much of the region.

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Key	
	Integrated assessment, including multiple indicators or indices of habitat, biota, water quality and socioeconomics
	Partly integrated assessment based on several (3 or more) indicators and/or multiple studies
	Assessments based on one or only a few (<3) indicators, mainly water quality

Name of Region	Number of estuaries and deltas	Condition	Trend	References	Parameters assessed and other notes
Australia and South Pacific					
Australia, SW Coast	20	Very Poor (2011)	Stable (2006-11)	Department of Environment (2011) Harris and Heap (2003)	Integrated assessment
Australia, NW Coast	162	Very Good (2011)	Stable (2006-11)	Department of Environment (2011) Harris and Heap (2003)	Integrated assessment
Australia, North Coast	164	Good (2011)	Declining (2006-11)	Department of Environment (2011) Harris and Heap (2003)	Integrated assessment
Australia, Moreton Bay	1	Very Poor (2006)	Declining (historic)	Lotze et al. (2006)	Integrated assessment
Australia, NE Coast	199	Good (2011)	Declining (2006-11)	Department of Environment (2011) Harris and Heap (2003)	Integrated assessment
Australia, SE Coast	172	Poor (2011)	Declining (2006-11)	Department of Environment (2011) Harris and Heap (2003)	Integrated assessment

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New Zealand, Waikato Region	5	Good (2013)		Waikato Regional Council (2013)	Water quality (dissolved oxygen, pH, turbidity, total ammonia, nitrate, total phosphorus and chlorophyll a)
New Zealand, New River	1	Very Poor (2011)	Declining (2007-2011)	Environment Southland (2011)	Water quality
North America					
Canada, Nova Scotia	?	Good (2009)	Declining (1985-2000)	Nova Scotia (2009)	Water quality
Canada, Gulf of St Lawrence and Bay of Fundy	1	Very Poor (2006)	Declining (historic)	Lotze et al. (2006)	Integrated assessment
Canada, Salish Sea	>4	Poor (2011)		Barrie et al. (2012)	Benthic habitat mapping – impacted by fishing, pollution, catchment disturbance
Canada, Gilbert Bay, Southern Labrador	1	Good (2011)		Copeland et al. (2012)	Benthic habitat mapping – impacted by scallop dredging
United States, Massachusetts Bay, Delaware Bay, Chesapeake Bay, Pamlico Sound	4	Very Poor (2006)	Declining (historic)	Lotze et al. (2006)	Integrated assessment
United States, NE Coast	12	Very Poor (2000-02)	Declining (2000-02)	EPA (2007) Bricker et al (2007)	Based on five indicators of ecological condition: water quality index (including dissolved oxygen, chlorophyll a, nitrogen, phosphorus, and water clarity), sediment quality index (including sediment toxicity, sediment contaminants, and sediment total organic carbon [TOC]), benthic index,

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					coastal habitat index, and a fish tissue contaminants index.
United States, Hudson River Estuary	1	Very Poor (2012)	Stable (2005-2010)	New York and New Jersey Harbor and Estuary Program (2012)	Assessment of marine habitats, fish, birds and pollution impacts.
United States, SE Coast	2	Good (2000-02)	Stable (2000-02)	EPA (2007) Bricker et al (2007)	Based on five indicators of ecological condition…
United States, Gulf Coast	7	Poor (2000-02)	Stable (2000-02)	EPA (2007) Bricker et al (2007)	Based on five indicators of ecological condition…
United States, W Coast	6	Poor (1999-03)	Improving (1999-03)	EPA (2007) Bricker et al (2007)	Based on five indicators of ecological condition…
United States, Glacier Bay, Alaska	1	Good (2011)		Cochrane et al. (2012)	Benthic habitat mapping – area impacted by fishing and tourism
United States, Alaska		Very Good (1999-03)		EPA (2007)	Based on five indicators of ecological condition…
United States, Hawaii		Good (1999-03)		EPA (2007)	Based on five indicators of ecological condition…
United States, San Francisco Bay	1	Poor (2011)	Declining (2011)	Lotze et al. (2006); San Francisco Bay Partnership (2011)	Integrated assessment (2003) plus water quality (2008)
United States, Oregon	30	Very Good (1999)		Sigmon et al. (2006)	General habitat condition; Water quality; Pollutant exposure and Benthic condition
United States, Puerto Rico	6	Very Poor (2002)		EPA (2007)	Based on five indicators of ecological condition…
United States, Florida Everglades	1	Very Poor (1900-2010)	Improving (1986-2006)	Entry and Gottlieb (2014)	Water quality
Central and South America					

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Caribbean river basins	>4	Poor (2002)	Declining	Kjerfve et al. (2002)	Integrated LOICZ assessment covering Caroni River (Trinidad), Kingston Harbour (Jamaica), Parque Nacional Morrocoy (Venezuela) and Magdelena River (Costa Rica)
Uruguay, Río de la Plata, estuarine environment Montevideo Bay (including Montevideo Harbour)	1	Poor to very poor (1997-2010)	Improving	Muniz et al., (2002, 2004, 2005, 2006, 2011, 2012) García-Rodríguez et al. (2010) Burone et al. (2006, 2011) Danulat et al (2002) Gómez –Erache et al. (2001)	Biotic indices based on benthic communities; coastal eutrophication; heavy metals and PAH in sediments
Uruguay, Río de la Plata estuarine environment (seaward), Montevideo Coastal zone	1	Poor to good (1997-2012)	Declining	Muniz et al., (2002, 2004, 2005, 2006, 2011) Burone et al. (2006) Venturini et al. (2004, 2012, in press) Muniz & Venturini (2011) Gómez-Erache et al (2001) García-Rodríguez et al. (2011, 2014)	Biotic indices based on benthic communities; coastal eutrophication; contaminants in water, sediment and biota
Río de la Plata estuarine environment	1	Poor (1980-2000)	Declining	Nagy et al. (2000, 2002) FREPLATA 2005	Eutrophication
Argentina, North Coast of Río de la Plata	1	Good (2005-2010)		Gómez et al .(2012)	Biotic index indicative of eutrophication and organic pollution
East coast of Uruguay	6	Good (2007-2008)		Defeo et al. (2009) Muniz et al. (2012)	Biotic indices based on benthic communities

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(coastal lagoons and sub-estuaries)				Conde & Rodríguez-Gallego (2002)	
Brazil, Ceará River	3	Poor (2006-2007)	Declining (2006-2007)	Nilan et al (2013)	Toxicity bioassays and metal distribution
Brazil, Santos-São Vicente Estuary	1	Poor (2007)	Declining (2007)	Buruaem et al. (2013)	Acute toxicity of whole sediment and chronic toxicity of liquid phases, grain size, organic matter, organic carbon, nitrogen, phosphorus, trace metals, polycyclic aromatic hydrocarbons, linear alkylbenzenes and butyltins; benthic community descriptors.
Brazil, Pará River (Amazon estuary)	1	Poor (2009)		Viana et al. (2012)	Multimetric indices of ecosystem integrity: Abundance Biomass Comparation (ABC); Biological Health Index; Estuarine Fish Community, Transitional Fish Classification and Estuarine Biotic Integrity Indexes
Chile, Lenga Estuary	1	Poor		Moscoso et al (2006); Díaz-Jaramillo et al (2013)	Benthic Macroinfauna; oxidative stress responses, including glutathione-S-transferase (GST) activity, total antioxidant capacity (ACAP) and lipid peroxidation levels (TBARS) in estuarine crabs
Chile, Tabul-Raqui Estuary	2	Good		Díaz-Jaramillo et al (2013)	Oxidative stress responses, including glutathione-S-transferase (GST) activity, total antioxidant capacity (ACAP) and lipid peroxidation levels (TBARS) in estuarine crabs.
Asia					

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Russian Federation, North Dvina River Estuary	1	Very Poor (1990-2006)	Declining (2006)	Gordeev et al. (2006)	LOICZ – DPSIR approach based mainly on water quality (heavy metals and hydrocarbons, acidification and radionuclide contamination)
Russian Federation, Small rivers of the Kola Peninsula	>5	Very Poor (1990-2006)	Declining (2006)	Gordeev et al. (2006)	LOICZ – DPSIR approach based mainly on water quality
Russian Federation, Pechora Estuary	1	Poor (1990-2006)	Declining (2006)	Gordeev et al. (2006)	LOICZ – DPSIR approach based mainly on water quality
Russian Federation, Ob River	1	Poor (1990-2006)	Stable (2006)	Gordeev et al. (2006)	LOICZ – DPSIR approach based mainly on water quality
Russian Federation, Yenisey River	1	Very Poor (1990-2006)	Stable (2006)	Gordeev et al. (2006)	LOICZ – DPSIR approach based mainly on water quality
Russian Federation, Lena Delta	1	Good (1990-2006)	Stable (2006)	Gordeev et al. (2006)	LOICZ – DPSIR approach based mainly on water quality
Bangladesh, Ganges – Brahmaputra Delta	1	Poor (2005)	Declining	Ramesh et al. (2009); Ahmed et al., (2010, 2011)	LOICZ – DPSIR approach – integrated assessment. Heavy metals in water, sediment and fish from Buriganga River channel; Heavy metal concentrations in macrobenthic fauna from Sundarbans mangrove forest.
India and Sri Lanka, Peninsular	4	Poor (2005)	Declining	Ramesh et al. (2009)	LOICZ – DPSIR approach – integrated assessment

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rivers					
India, small western rivers flowing into the Arabian Sea	?	Very Poor (2005)	Declining	Ramesh et al. (2009)	LOICZ – DPSIR approach – integrated assessment
India and Pakistan, Indus River	1	Very Poor (2005)	Declining	Ramesh et al. (2009)	LOICZ – DPSIR approach – integrated assessment
India, Sabarmati River	1	Very Poor (2014)	Declining (2009-2014)	Haldar et al (2014)	Turbidity, dissolved oxygen, BOD, phenol, and petroleum hydrocarbons, phytoplankton and total and selective bacterial count.
South China Sea estuaries and deltas		Poor (2012)	Declining (2005-2012)	Ward (2012)	Integrated assessment
China, Changjiang (Yangtze) River estuary	1	Very Poor (2003)	Declining (1999-2010)	Xiao et al. (2007); Wang (2007); Liu et al (2013)	Eutrophication - ASSETS and AMBI index methods
China, Jiaozhou Bay	1	Very Poor (2006)	Declining (1980-2005)	Dang et al. (2010); Sun and Sun (2008)	Eutrophication; Index based on macrobenthic community, phytoplankton community, sediments , water quality.
China, Pearl River Estuary	1	Very Poor (2009)	Declining (1980-2009)	Chen et al. (2013)	Ecosystem health index based on biodiversity, water and sediment quality
China, Huanghe (Yellow) River Delta	1	Very Poor (2008)	Declining (2008)	Zhu et al (2003); Fan and Huang (2008)	Water quality; dissolved inorganic nitrogen
Taiwan, Dapeng Bay	1	Poor	Improving (2003-2009)	Hung et al. (2013)	Eutrophication
Iraq, Shat al	1	Very Poor	Declining	Richardson and Hussain	Plant and fish communities and

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Arab Waterway		(2012)		(2006); Mohamed et al. (2012)	production, changes in water quality, and specific populations of rare and endangered species
Republic of Korea, Gwangyang Bay	1	Good (2012)	Stable (2010-2012)	Kim et al., (2008); Lee et al., (2010); KIOST (2013)	Organochlorine pesticides; Water quality, the carbon isotope ratio of particulate organic matter and sediment, and the nutrients limiting phytoplankton growth; marine ecosystem health index (MEHI) based on water quality, sediment quality, plankton, and benthos
Republic of Korea, Jinhae Bay	1	Poor (2012)	Stable (2010-2012)	Lim et al., (2012); KIOST (2013)	Sediment core records of C, N, CaCO3, trace metals; MEHI
Japan, Mutsu Bay	1	Good (2012)	Declining (2004-12)	Environment Management Bureau, Ministry of the Environment (2005-13)	Environmental status evaluated by Dr. K. Kohata from Japanese Environmental Quality Standards (for Living Environment)
Japan, Toyama Bay	1	Very Good (2012)	Stable (2003-12)	Toyama Prefecture (2009, 2014)	Environmental status evaluated by Dr. K. Kohata from Japanese Environmental Quality Standards
Japan, Tokyo Bay	1	Poor (2012)	Stable (2003-12)	Environment Management Bureau, Ministry of the Environment (2013)	Environmental status evaluated by Dr. K. Kohata from Japanese Environmental Quality Standards
Japan, Ise Bay	1	Poor (2012)	Improving (2003-12)	Environment Management Bureau, Ministry of the Environment (2013)	Environmental status evaluated by Dr. K. Kohata from Japanese Environmental Quality Standards
Japan, Osaka Bay	1	Poor (2012)	Stable (2003-12)	Environment Management Bureau, Ministry of the Environment (2013)	Environmental status evaluated by Dr. K. Kohata from Japanese Environmental Quality Standards
Japan, Ariake Sea and	1	Good (2012)	Stable (2003-12)	Environment Management Bureau, Ministry of the	Environmental status evaluated by Dr. K. Kohata from Japanese Environmental

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Shimabara Bay				Environment (2013)	Quality Standards
Japan, Yatsushiro Sea	1	Good (2012)	Stable (2003-12)	Environment Management Bureau, Ministry of the Environment (2013)	Environmental status evaluated by Dr. K. Kohata from Japanese Environmental Quality Standards
Africa					
South Africa, Cool Temperate	23	Poor (1993-99)	Declining (2004)	Turpie (2004); Harrison and Whitfield (2006) Van Niekerk et al (2013)	Integrated assessment
South Africa, Warm Temperate	104	Good (1993-99)	Stable (2004)	Turpie (2004); Harrison and Whitfield (2006)	Integrated assessment
South Africa, Subtropical	62	Good (1993-99)	Declining (2004)	Turpie (2004); Harrison and Whitfield (2006)	Integrated assessment
Guinea Current LME		Poor (2013)	Declining (2008-2013)	Guinea Current Report some.grida.no	Integrated assessment
Niger Delta Nigeria	21	Poor (2011)	Declining 2000 -present	Awosika et al (1993); Folorunsho et al. (1994); Awosika and Folorunsho (in press); Folorunsho and Awosika (in press); UNEP (2011)	Petroleum pollution
The Gambia, Gambia Estuary	1	Good (2006)		Simier et al. (2006)	Fish assemblages
Sierra Leone	>1	Good (2014)	Stable (2014)	http://some.grida.no/sierra-leone/1-habitat.aspx	Integrated assessment
Ghana, Iture Estuary	1	Very Poor (2006)		Fianko et al (2007)	Cd, Zn, Se and Pb in water samples
Egypt, Nile Delta	1	Very Poor (2010)	Declining (1984-2010)	El-Asmar and Al-Olayan (2013)	Satellite image analysis of coastal change; heavy metal pollution

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				Gu et al. (2013)	
Kenya, Tana and Athi-Sabaki estuaries	2	Good (2009)	Declining	UNEP/Nairobi Convention Secretariat and WIOMSA (2009)	Nutrient levels in the Tana and Athi-Sabaki estuaries are high; the threshold chemical contamination levels of both Tana and Athi-Sabaki rivers have not been attained
Tanzania, Pangani Estuary	1	Very Poor (2009)	Declining	UNEP/Nairobi Convention Secretariat and WIOMSA (2009)	Poor water quality, stream morphology and aquatic life (low DO and eutrophication)
Tanzania, Rufiji Estuary	1	Good (2009)	Stable	UNEP/Nairobi Convention Secretariat and WIOMSA (2009)	DDT and nutrient flows from agricultural activities – local effects only to date.
Mozambique, Ruvuma River Estuary	1	Very Good (2009)	Stable	UNEP/Nairobi Convention Secretariat and WIOMSA (2009)	Best preserved mangrove forests along the coastline
Mozambique, Zambezi River Delta	1	Poor (2009)	Declining	UNEP/Nairobi Convention Secretariat and WIOMSA (2009)	Changed river flow caused loss of fisheries; pollution from sewage and industrial waste
Mozambique, Pungwe River Estuary	1	Good (2009)	Declining	UNEP/Nairobi Convention Secretariat and WIOMSA (2009)	Water abstraction has lead to reduced sediment loads and habitat loss.
Mozambique, Limpopo River Delta	1	Poor (2009)	Declining	UNEP/Nairobi Convention Secretariat and WIOMSA (2009)	Increasing salinity; discharge of untreated or partially treated domestic and industrial effluents; declining of river flows due to escalating demands for water; and discharge of untreated loads from upstream mining activities.
Madagascar, Betsiboka Estuary	1	Very Poor (2009)	Declining	UNEP/Nairobi Convention Secretariat and WIOMSA (2009)	Eutrophication, chemical pollution due to mining, port activities, effluent from oil refinery, harmful algal blooms, loss of

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					mangrove and coral reef habitat, overfishing
Europe					
United Kingdom, England	43	Poor (1993-99)		UKTAG (2008)	Dissolved inorganic nitrogen
United Kingdom, Scotland	51	Very Good (1993-99)		UKTAG (2008)	Dissolved inorganic nitrogen
United Kingdom, Scotland, Firth of Clyde	1	Very Poor	Declining	Thurstan and Roberts (2010)	Fisheries data (species, population, catch statistics)
United Kingdom, Wales	17	Good (1993-99)		UKTAG (2008)	Dissolved inorganic nitrogen
United Kingdom, Bristol Channel	1	Poor (2011)		James et al. (2012)	Benthic habitat mapping
United Kingdom, Northern Ireland	10	Good (1993-99)		UKTAG (2008)	Dissolved inorganic nitrogen
Ireland	67	Good (2001-2005)	Improving (1995-2005)	Environmental Protection Agency (Ireland), (2006); Borja et al (2012)	Eutrophication
Adriatic Sea	1	Very Poor (2006)	Declining	Lotze et al. (2006)	Integrated assessment
Wadden Sea	1	Very Poor (2006)	Declining	Lotze et al. (2006) Dankers et al. (2012)	Integrated assessment
Baltic Sea	1	Very Poor	Declining	Lotze et al. (2006)	Integrated assessment

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		(2006)		Ezhova et al. (2012)	
Finland, Kvarken Archipelago	1	Good (2010)		Kotilainen et al., (2012)	Benthic habitat mapping
Russian Federation, Neva Bay, Gulf of Finland	1	Very Poor (2005)	Improving (2000-2005)	Balushkina (2009)	Water quality, species diversity of zoobenthos
Spain, Basque Country	18	Good (1995-2003)	Improving (1995-2003)	Muxika et al. (2007); Borja et al (2012)	Physico-chemical, chemical, hydromorphological, and biological (phytoplankton, macroalgae, macroinvertebrates, and fishes) elements
Portugal, Mondego estuary	1	Good (2000-2001)		Chainho et al. (2007)	Benthic invertebrate communities
France, Mediterranean lagoons	7	Poor (2011)	Declining 2000-2011	Ifremer (2011); Borja et al (2012)	Eutrophication, including physicochemical elements in water and sediment, phytoplankton, macroalgae, and macroinvertebrates
Italy, Italian estuaries	22	Poor (2004)	Improving (2004)	Giordani et al. (2005)	LOICZ – water quality, DIN levels
Greece, Amvrakikos Gulf	1	Poor (1996-98)		Tsangaris et al. (2010)	Combination of bioenergetics and biochemical biomarkers in mussels
Greece, Saronikos Gulf	1	Good (2000-2012)	Improving (2000-2012)	Simboura et al (2013)	Benthic communities (BENTIX index)
Romania, Danube Delta	1	Very Poor (2001-2007)	Stable (2001-2007)	Török et al (2008)	Eutrophication
Norway, Southern fjords		Poor (2014)	Declining	www.environment.no /Topics/Marine-	Eutrophication problem areas, sugar kelp forests have almost disappeared

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on the Skagerrak coast				areas/Coastal-waters/	
Norway, Nothern fjords		Good (2014)	Declining	www.environment.no /Topics/Marine-areas/Coastal-waters/	
Antarctica					
Prydz Bay fjords	1	Very Good (2010)		O'Brien et al. (2012)	Benthic habitat mapping
Antarctic Peninsula, Fjords		Very Good (2010)		Grange and Smith (2013)	Benthic megafaunal abundance, community structure, and species diversity

Chapter 44

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