Appendix X. Results of the causal chain analyses for Main Area of Concern 03: Declines in Living Marine Resources

Table A3.1: Environmental Impacts of Declines in Living Marine Resources -(Severity)

Environmental Impacts	3.1.1.	3.1.2.	3.1.3.	3.1.4.	3.2.1.	3.2.2.	3.2.3.	3.2.4.	3.2.5.	3.3.1.	3.3.2	3.3.3	3.3.4	3.3.5	3.3.6	3.4.	3.5.
	...marine mammals	...cetaceans	...seabirds	...turtles	...sharks and rays	...large pelagics	...small pelagics	...deep water demersals	...reef and demersal fish	...molluscs (bivalves, gastropods)	...cephalopods	...sea cucumbers	...prawns and shrimp	...lobsters	...crabs	Excessive bycatch and discards	Expansion of mariculture industry
Loss of biodiversity	1	3	1	1	3	3	1	3	3	2	1	2	1	1	1	4	
Loss of marine biomass (and productivity)	1	2		1	4	4	3	2	3	1	1	2	2	2	1	3	
Enhanced risk of extinction of vulnerable or endangered species	4	1		2	3	2	1	3	3		1	3				3	
Reduction in genetic diversity of wild populations (meta-populations) and implications for their long term survival	2	1		2	3	2	1	3	3		1	3				3	
Reduction in genetic diversity of wild commercial stocks (e.g. reduction in proportion of fast growing and late spawning individuals).					3	2	1	3	3		3	3	1	1		3	
Trophic cascades (food-web impacts)	1	2	1	1		3	1	3	3				1	1		3	
Trophic cascades (food-web impacts) associated with the removal of apex predators			1		4	3			3							3	
Trophic cascades associated with other keystone predators (e.g. *Lethrinids* and sea urchins)					3	3			3							3	
Decline in ornamental species									3								
Change in community composition (increase / decrease in herbivores)								2	3			1					
Increased illegal fishing and more intense pressure in protected areas								2	3			4		3			
Changes in nutrient cycling pathways	1	1	1		1		1		2	1		1	1	1		3	2
Reduction in the control of nuisance species (e.g. Turtles - Jellyfish)				1	2				1							3	2
Shifts in benthic cover / composition as the result of the loss of the species / group									3	1		2	1	3			
Reduction in food available to other species (food-web cascade) as a result of fishery						2	3		3	2		2	2	1		3	
Impacts upon sedimentary processes (accretion and bioerosion)									1	2		3					
Physical impacts on the seabed from trawls and other mobile gear (e.g. dredges)									3				3	1	1	3	

Environmental Impacts	**3.1.1.**	**3.1.2.**	**3.1.3.**	**3.1.4.**	**3.2.1.**	**3.2.2.**	**3.2.3.**	**3.2.4.**	**3.2.5.**	**3.3.1.**	**3.3.2**	**3.3.3**	**3.3.4**	**3.3.5**	**3.3.6**	**3.4.**	**3.5.**
	...marine mammals	...cetaceans	...seabirds	...turtles	...sharks and rays	...large pelagics	...small pelagics	...deep water demersals	...reef and demersal fish	...molluscs (bivalves, gastropods)	...cephalopods	...sea cucumbers	...prawns and shrimp	...lobsters	...crabs	Excessive bycatch and discards	Expansion of mariculture industry
Increased use of poisons, and associated impacts on nursery habitats and coral reefs, seagrass beds and other shallow									3	1				1			
Increased use of dynamite fishing impacts on coral reefs									3							3	
Trampling impacts									3	2		2	1	1			
Reduction in food available to other species (food-web cascade) as a result of feed production							3		3								3
Potential introduction of alien species by aquaculture									2				1				3
Biosecurity issues associated with mariculture resulting of diseases in wild-stocks												1	1				3
Changes in water quality										1		1	1			1	4

Table A3.2: Inter-relationship between Declines in Living Marine Resource issues and other issues.

3.1.1	3.1.2	3.1.3	3.1.4	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.3.1	3.3.2	3.3.3	3.3.4	3.3.5	3.3.6	3.4.	3.5.	Issue	
...marine mammals	...cetaceans	...seabirds	...turtles	...sharks and rays	...large pelagics	...small pelagics	...deep water demersals	...reef and demersal fish	...molluscs (bivalves, gastropods)	...cephalopods	...sea cucumbers	...prawns and shrimp	...lobsters	...crabs	Excessive bycatch and discards	Expansion of mariculture industry		
																→	1.3.1	Microbiological contamination from land-based and marine sources
											→	→				→	1.3.2	Nutrient enrichment from land-based and marine (mariculture) sources
																→	1.3.3	Chemical contamination (excluding oil spills) from land-based and marine sources
					→							→				→	1.3.4	Suspended solids in coastal waters due to human activities
								→									1.3.5	Solid wastes / marine debris (plastics etc.) from shipping and land-based-sources
					→												1.3.6	Oil spills (drilling, exploitation, transport, processing, storage, shipping).
												→					2.2.5.	Disturbance, damage and loss of estuarine habitats
								→	→			→		→			2.2.6.	Disturbance, damage and loss of mangrove habitats
				→	→	→		→	→	→	→		→			→	2.3.1.	Disturbance, damage and loss of coral reef habitats
								→		→	→	→				→	2.3.2.	Disturbance, damage and loss of seagrass habitats
										→	→	→				→	2.3.3.	Disturbance, damage and loss of macroalgal habitats
											→	→				→	2.3.4.	Disturbance, damage and loss of soft sediment habitats
							→						→	→			2.3.5.	Disturbance, damage and loss of deep water habitats (including sea mounts)
→	→			→	→	→									→	→	2.4.	Disturbance, damage and degradation of pelagic habitats
			→					→									2.6.	Introduction of exotic non-native species, invasives and nuisance species
						→				→							3.1.2.	Decline in populations of cetaceans
					→	→									→		3.1.3.	Decline in populations of seabirds
					→	→											3.2.1.	Decline in populations of sharks and rays
		→															3.2.3.	Decline in populations of small pelagics
									→	→	→	→	→	→	→	→	3.2.5.	Decline in populations of reef and demersal fish
																→	3.3.3.	Decline in populations of sea cucumbers
																→	3.3.4.	Decline in populations of prawns and shrimp

																→	3.3.6.	Decline in populations of crabs

Table A3.3.: Ecosystem Services affected by environmental impacts of Declines in Living Marine Resources

	PROVISIONING SERVICES								REGULATING SERVICES									SUPPORTING				CULTURAL& AMENITY SERVICES							
Environmental Impacts	**Pro01**	**Pro02**	**Pro03**	**Pro04**	**Pro05**	**Pro06**	**Pro07**	**Pro08**	**Reg01**	**Reg02**	**Reg03**	**Reg04**	**Reg05**	**Reg06**	**Reg07**	**Reg08**	**Reg09**	**Sup02**	**Sup02**	**Sup03**	**Sup04**	**Cul01**	**Cul02**	**Cul03**	**Cul04**	**Cul05**	**Cul06**	**Cul07**	**Cul08**
Environmental Impacts	Food (e.g. fish, game fruit)	Freshwater (e.g. for drinking, irrigation, cooling)	Raw materials (e.g. fibre, timber, fuel wood,	Genetic resources (e.g. for crop improvements	Biochemical medicines and pharmaceuticals (e.g.	Ornamental resources (e.g. artisan work,	Geological resources*	Energy*	Air quality regulation (e.g. Capturing dust,	Climate regulation (e.g. Carbon sequestration,	Natural hazard regulation (e.g. Storm protection	Regulation of water flows (e.g. Natural drainage,	Waste treatment (especially water purification)	Erosion regulation / prevention	Nutrient cycling and maintenance of fertility (incl.	Pollination	Biological control (e.g. Seed dispersal, pest and	Maintenance of life cycles (incl. nursery,	Maintenance of genetic diversity (gene pool	Photosynthesis and primary production*	Secondary production*	Aesthetics information	Opportunities for recreation, tourism and lifestyle	Inspiration for culture, art and design (Cultural	Spiritual experience	Bequest, intrinsic and existence*	Information for cognitive development	Social relations*	Sense of place*
Loss of biodiversity	↑			↑																		↑	↑	↑	↑	↑	↑	↑	↑
Loss of marine biomass (and productivity)	↑							↑																					
Enhanced risk of extinction of vulnerable or endangered species	↑																↑	↑	↑		↑	↑	↑	↑	↑	↑	↑	↑	↑
Reduction in genetic diversity of wild populations (meta-populations) and implications for their long term survival	↑			↑													↑	↑	↑		↑								
Reduction in genetic diversity of wild commercial stocks (e.g. reduction in proportion of fast growing and late spawning individuals).	↑			↑													↑	↑	↑		↑						↑		
Trophic cascades (food-web impacts)	↑			↑													↑	↑	↑		↑						↑		
Trophic cascades (food-web impacts) associated with the removal of apex predators	↑			↑													↑	↑	↑		↑								
Trophic cascades associated with other keystone predators (e.g. *Lethrinids* and sea urchins)	↑										↑			↑	↑		↑	↑	↑		↑								
Decline in ornamental species	↑			↑		↑											↑	↑	↑			↑	↑	↑	↑	↑			
Change in community composition (increase / decrease in herbivores)	↑													↑	↑		↑	↑	↑	↑	↑								
Increased illegal fishing and more intense pressure in protected areas	↑																					↑	↑	↑	↑	↑			

	PROVISIONING SERVICES								REGULATING SERVICES									SUPPORTING				CULTURAL& AMENITY SERVICES							
Environmental Impacts	**Pro01**	**Pro02**	**Pro03**	**Pro04**	**Pro05**	**Pro06**	**Pro07**	**Pro08**	**Reg01**	**Reg02**	**Reg03**	**Reg04**	**Reg05**	**Reg06**	**Reg07**	**Reg08**	**Reg09**	**Sup02**	**Sup02**	**Sup03**	**Sup04**	**Cul01**	**Cul02**	**Cul03**	**Cul04**	**Cul05**	**Cul06**	**Cul07**	**Cul08**
Environmental Impacts	Food (e.g. fish, game fruit)	Freshwater (e.g. for drinking, irrigation, cooling)	Raw materials (e.g. fibre, timber, fuel wood,	Genetic resources (e.g. for crop improvements	Biochemical medicines and pharmaceuticals (e.g.	Ornamental resources (e.g. artisan work,	Geological resources*	Energy*	Air quality regulation (e.g. Capturing dust,	Climate regulation (e.g. Carbon sequestration,	Natural hazard regulation (e.g. Storm protection	Regulation of water flows (e.g. Natural drainage,	Waste treatment (especially water purification)	Erosion regulation / prevention	Nutrient cycling and maintenance of fertility (incl.	Pollination	Biological control (e.g. Seed dispersal, pest and	Maintenance of life cycles (incl. nursery,	Maintenance of genetic diversity (gene pool	Photosynthesis and primary production*	Secondary production*	Aesthetics information	Opportunities for recreation, tourism and lifestyle	Inspiration for culture, art and design (Cultural	Spiritual experience	Bequest, intrinsic and existence*	Information for cognitive development	Social relations*	Sense of place*
Changes in nutrient cycling pathways	↑														↑					↑	↑								
Reduction in the control of nuisance species (e.g. Turtles - Jellyfish)	↑																↑	↑	↑			↑	↑	↑	↑	↑			
Shifts in benthic cover / composition as the result of the loss of the species / group	↑			↑							↑			↑	↑		↑	↑	↑										
Reduction in food available to other species (food-web cascade) as a result of fishery	↑			↑							↑			↑	↑		↑	↑	↑	↑	↑	↑							
Impacts upon sedimentary processes (accretion and bioerosion)	↑						↑							↑	↑							↑	↑	↑	↑	↑		↑	↑
Physical impacts on the seabed from trawls and other mobile gear (e.g. dredges)	↑					↑				↑	↑			↑	↑							↑	↑	↑	↑	↑		↑	
Increased use of poisons, and associated impacts on nursery habitats and coral reefs, seagrass beds and other shallow	↑					↑					↑			↑			↑	↑	↑	↑	↑	↑	↑	↑	↑		↑	
Increased use of dynamite fishing impacts on coral reefs	↑					↑					↑			↑			↑	↑	↑	↑	↑	↑	↑	↑	↑		↑	
Trampling impacts	↑					↑					↑			↑			↑	↑	↑	↑	↑	↑	↑	↑	↑		↑	
Reduction in food available to other species (food-web cascade) as a result of feed production	↑			↑													↑								↑		↑	
Potential introduction of alien species by aquaculture	↑			↑													↑	↑	↑						↑		↑	
Biosecurity issues associated with mariculture resulting of diseases in wild-stocks	↑			↑													↑	↑	↑						↑		↑	
Changes in water quality	↑											↑			↑			↑	↑	↑	↑	↑	↑	↑	↑	↑		↑	

Table A3.4: Socio-economic impacts as a result of the loss of Ecosystem Services due to Declines in Living Marine Resources

	PROVISIONING SERVICES								REGULATING SERVICES								
	Pro01	**Pro02**	**Pro03**	**Pro04**	**Pro05**	**Pro06**	**Pro07**	**Pro08**	**Reg01**	**Reg02**	**Reg03**	**Reg04**	**Reg05**	**Reg06**	**Reg07**	**Reg08**	**Reg09**
Socio-economic Impacts	Food (e.g. fish, game fruit)	Freshwater (e.g. for drinking, irrigation, cooling)	Raw materials (e.g. fibre, timber, fuel wood, fodder, fertilizer)	Genetic resources (e.g. for crop improvements and medicinal purposes)	Biochemical medicines and pharmaceuticals (e.g. biochemical products, and test organisms)	Ornamental resources (e.g. artisan work, decorative plants, pet animals, fashion)	Geological resources*	Energy*	Air quality regulation (e.g. Capturing dust, chemicals, etc)	Climate regulation (e.g. Carbon sequestration, influence of vegetation on rainfall etc.)	Natural hazard regulation (e.g. Storm protection and flood prevention)	Regulation of water flows (e.g. Natural drainage, irrigation and drought prevention)	Waste treatment (especially water purification)	Erosion regulation / prevention	Nutrient cycling and maintenance of fertility (incl. soil formation)*	Pollination	Biological control (e.g. Seed dispersal, pest and disease control)
Increased malnutrition																	
Reduction in food availability / security due to trophic cascades	←																
Reduction in food availability / security (local) due to local overexploitation	←																
Reduction in food availability / security (local) due to destructive / non-selective gear by local vessels	←																
Reduction in food availability / security (local) due to destructive / non-selective gear used by foreign industrial vessels	←																
Increased food prices for local community	←																
Increased operational costs for fishers	←																
Increased cost of living for local community	←																
Increased migration (people) leading to social issues	←																
Abuse of office by government officers	←																
Increased non-compliance (illegal fishing)	←																
Increased rent-seeking behaviour (bribery) by government officers	←																
Change in gear and increased use of destructive fishing practices	←																

	PROVISIONING SERVICES								REGULATING SERVICES								
	Pro01	Pro02	Pro03	Pro04	Pro05	Pro06	Pro07	Pro08	Reg01	Reg02	Reg03	Reg04	Reg05	Reg06	Reg07	Reg08	Reg09
Socio-economic Impacts	Food (e.g. fish, game fruit)	Freshwater (e.g. for drinking, irrigation, cooling)	Raw materials (e.g. fibre, timber, fuel wood, fodder, fertilizer)	Genetic resources (e.g. for crop improvements and medicinal purposes)	Biochemical medicines and pharmaceuticals (e.g. biochemical products and test organisms)	Ornamental resources (e.g. artisan work, decorative plants, pet animals, fashion)	Geological resources*	Energy*	Air quality regulation (e.g. Capturing dust, chemicals, etc)	Climate regulation (e.g. Carbon sequestration, influence of vegetation on rainfall etc.)	Natural hazard regulation (e.g. Storm protection and flood prevention)	Regulation of water flows (e.g. Natural drainage, irrigation and drought prevention)	Waste treatment (especially water purification)	Erosion regulation / prevention	Nutrient cycling and maintenance of fertility (incl. soil formation)*	Pollination	Biological control (e.g. Seed dispersal, pest and disease control)
Reduction in opportunities for recreation, tourism and leisure due to loss of biodiversity																	
Reduction in aesthetics 'landscape/seascape' value of the natural environment																	
Reduction in income generating livelihoods (non-fisheries related e.g. tourism) due to foreign commercial vessels	←																
Reduction in income generating livelihoods (fisheries related) due to unsustainable harvesting and destructive practices	←																
Reduction in future use value (bequest, intrinsic and existence value) of ecosystems	←																
Reduction in local biodiversity derivable benefits due to foreign commercial vessels	←																
Reduction in foreign earnings due to loss of biodiversity	←																
Reduction in real estate values																	
Decrease in value of catches as a result of "fishing down the food chain"	←																
Unpredictable household income due to unsustainable nature of fishery - 'boom and bust'	←																
Increased vulnerability decreased resilience.	←										←		←	←	←		←
Reduction in biomedical resources				←	←												←
Impacts upon traditional resource use patterns	←					←											
Livelihood impacts due to theft and vandalism	←					←											
Increased dependence on tourism due to a reduction in income generating fishery	←					←											

	PROVISIONING SERVICES								REGULATING SERVICES								
	Pro01	Pro02	Pro03	Pro04	Pro05	Pro06	Pro07	Pro08	Reg01	Reg02	Reg03	Reg04	Reg05	Reg06	Reg07	Reg08	Reg09
Socio-economic Impacts	Food (e.g. fish, game fruit)	Freshwater (e.g. for drinking, irrigation, cooling)	Raw materials (e.g. fibre, timber, fuel wood, fodder, fertilizer)	Genetic resources (e.g. for crop improvements and medicinal purposes)	Biochemical medicines and pharmaceuticals (e.g. biochemical products and test organisms)	Ornamental resources (e.g. artisan work, decorative plants, pet animals, fashion)	Geological resources*	Energy*	Air quality regulation (e.g. Capturing dust, chemicals, etc)	Climate regulation (e.g. Carbon sequestration, influence of vegetation on rainfall etc.)	Natural hazard regulation (e.g. Storm protection and flood prevention)	Regulation of water flows (e.g. Natural drainage, irrigation and drought prevention)	Waste treatment (especially water purification)	Erosion regulation / prevention	Nutrient cycling and maintenance of fertility (incl. soil formation)*	Pollination	Biological control (e.g. Seed dispersal, pest and disease control)
Reduction in ornamental resources	←					←											
Unpredictable household incomes	←																
Loss of cultural heritage																	
Increased unemployment	←					←											
Increased poverty	←					←											
Social conflicts	←					←											←
Conflicts between sectors (artisanal and industrial)	←																←
Loss of traditional management practices	←																
Loss of agricultural land	←																
Change in land-use and loss of critical habitats (e.g. mangrove)	←																
Pride - saltwater in the veins	←																
Increased (dependence on) mariculture	←																
Reduction in well-being	←										←	←	←	←	←		←

Table A3.5: Socio-Economic Impacts of Declines in Living Marine Resources -(Severity)

Socio-economic Impacts	**3.1.1.**	**3.1.2.**	**3.1.3.**	**3.1.4.**	**3.2.1.**	**3.2.2.**	**3.2.3.**	**3.2.4.**	**3.2.5.**	3.3.1.	3.3.3.	3.3.4.	3.3.5.	3.3.6.	3.3.7.	3.4.	3.5.
	...marine mammals	...cetaceans	....seabirds	...turtles	...sharks and rays	...large pelagics	...small pelagics	...deep water demersals	...reef and demersal fish	...molluscs (bivalves, gastropods)	...cephalopods	...sea cucumbers	...prawns and shrimp	...lobsters	...crabs	Excessive bycatch and discards	Expansion of mariculture
Increased malnutrition							4		4	3	2	1	4	1	1	4	
Reduction in food availability / security due to trophic cascades		1		1	2	2	3		4				1			3	
Reduction in food availability / security (local) due to local overexploitation				1	2	3	3	2	4	3	1	1	3	1	1	4	
Reduction in food availability / security (local) due to destructive / non-selective gear by local vessels					2	1	2	1	4	1			4			4	
Reduction in food availability / security (local) due to destructive / non-selective gear used by foreign industrial vessels				1	3	1	1	1	1				3			4	
Increased food prices for local community							4	2	4	3	1		3		1	3	
Increased operational costs for fishers							3	2	3	3	3	3	3	3	3	3	
Increased cost of living for local community							3	2	3	3	3	3	3	3	3	3	
Increased migration (people) leading to social issues							4		3	3	3	3	3	3	3	3	
Abuse of office by government officers					2	2			1	2	2	2	2	2	2	2	
Increased non-compliance (illegal fishing)					2	2		1	3	2		2	2	3	2	4	
Increased rent-seeking behaviour (bribery) by government officers					1	1			1	2		2	2	3	2	3	
Change in gear and increased use of destructive fishing practices			1					1	3				4			3	
Reduction in opportunities for recreation, tourism and leisure due to loss of biodiversity	1	2	1	1	3	3		1	3							2	
Reduction in aesthetics 'landscape/seascape' value of the natural environment	1	2	2	1	1	1			3	1		1		1		2	
Reduction in income generating livelihoods (non-fisheries related e.g. tourism) due to foreign commercial vessels	1	1		1	3	2			1							1	
Reduction in income generating livelihoods (fisheries related) due to unsustainable harvesting and destructive practices	1				3	2	2	2	4	2	2	2	2	2	2	2	
Reduction in future use value (bequest, intrinsic and existence value) of ecosystems	2	3	1	2	4	1	2	2	3	2	2	2	2	2	2	3	
Reduction in local biodiversity derivable benefits due to foreign commercial vessels	1	1		1	4	1		2					1			2	
Reduction in foreign earnings due to loss of biodiversity	1	2		1	2				3		2	2	2	2		2	
Reduction in real estate values																	
Decrease in value of catches as a result of "fishing down the food chain"					1		3		3							3	

Socio-economic Impacts	**3.1.1.**	**3.1.2.**	**3.1.3.**	**3.1.4.**	**3.2.1.**	**3.2.2.**	**3.2.3.**	**3.2.4.**	**3.2.5.**	3.3.1.	3.3.3.	3.3.4.	3.3.5.	3.3.6.	3.3.7.	3.4.	3.5.
	...marine mammals	...cetaceans	....seabirds	...turtles	...sharks and rays	...large pelagics	...small pelagics	...deep water demersals	...reef and demersal fish	...molluscs (bivalves, gastropods)	...cephalopods	...sea cucumbers	...prawns and shrimp	...lobsters	...crabs	Excessive bycatch and discards	Expansion of mariculture
Unpredictable household income due to unsustainable nature of fishery - 'boom and bust'											2		2				
Increased vulnerability decreased resilience.				1	1	2		2	3	2	2	2	2	2	2	2	
Reduction in biomedical resources					2				1			1					
Impacts upon traditional resource use patterns	1	1		1	2	1	2	3	3	2	2	2	2	2	2	2	
Livelihood impacts due to theft and vandalism									3								
Increased dependence on tourism due to a reduction in income generating fishery						3	3	3	3				2			2	
Reduction in ornamental resources				1	1			1	1							1	
Unpredictable household incomes					1	2	3	3	3		2	2	2			2	
Loss of cultural heritage	1	1		2	1			3	3	2						2	
Increased unemployment	1	1		1	2	3	3	3	3	2	2	2	2	2	2	2	
Increased poverty	1	1		1	2	2	3	3	3	2	2	2	3	2	2	2	
Social conflicts	1	1		1	1	1	3	3	3			2	2			2	
Conflicts between sectors (artisanal and industrial)				2	2	3		3	3				3			3	
Loss of traditional management practices									3		1						
Loss of agricultural land																	
Change in land-use and loss of critical habitats (e.g. mangrove)										3			4	4			
Pride - saltwater in the veins								1	3								
Increased (dependence on) mariculture													3		2		
Reduction in well-being	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	

Table A3.6A: Stakeholders affected by Socio-Economic Impacts of Declines in Living Marine Resources

STAKEHOLDERS

	Fisheries and Aquaculture						Agriculture and Forestry										
Socio-economic Impacts	Artisanal fishers	Industrial fishers	Recreational fishers	Seaweed farmers	Industrial prawn farmers	Fish & shellfish farmers	Charcoal makers	Small-scale loggers	Industrial loggers	Small-scale farmers	Large-scale farmers	Forest users/herbalists	Pastoralists	Ranchers	Poultry farmers	Dairy farmers	Beekeepers
Increased malnutrition																	
Reduction in food availability / security due to trophic cascades																	
Reduction in food availability / security (local) due to local overexploitation																	
Reduction in food availability / security (local) due to destructive / non-selective gear by local vessels																	
Reduction in food availability / security (local) due to destructive / non-selective gear used by foreign industrial vessels																	
Increased food prices for local community																	
Increased operational costs for fishers																	
Increased cost of living for local community																	
Increased migration (people) leading to social issues																	
Abuse of office by government officers																	
Increased non-compliance (illegal fishing)																	
Increased rent-seeking behaviour (bribery) by government officers																	
Change in gear and increased use of destructive fishing practices																	
Reduction in opportunities for recreation, tourism and leisure due to loss of biodiversity																	
Reduction in aesthetics 'landscape/seascape' value of the natural environment																	
Reduction in income generating livelihoods (non-fisheries related e.g. tourism) due to foreign commercial vessels																	
Reduction in income generating livelihoods (fisheries related) due to unsustainable harvesting and destructive practices																	
Reduction in future use value (bequest, intrinsic and existence value) of ecosystems																	
Reduction in local biodiversity derivable benefits due to foreign commercial vessels																	
Reduction in foreign earnings due to loss of biodiversity																	
Reduction in real estate values																	
Decrease in value of catches as a result of "fishing down the food chain"																	
Unpredictable household income due to unsustainable nature of fishery - 'boom and bust'																	
Increased vulnerability decreased resilience.																	
Reduction in biomedical resources																	
Impacts upon traditional resource use patterns																	
Livelihood impacts due to theft and vandalism																	

STAKEHOLDERS																		
	Fisheries and Aquaculture						Agriculture and Forestry											
Socio-economic Impacts	Artisanal fishers	Industrial fishers	Recreational fishers	Seaweed farmers	Industrial prawn farmers	Fish & shellfish farmers	Charcoal makers	Small-scale loggers	Industrial loggers	Small-scale farmers	Large-scale farmers	Forest users/herbalists	Pastoralists	Ranchers	Poultry farmers	Dairy farmers	Beekeepers	
Increased dependence on tourism due to a reduction in income generating fishery																		
Reduction in ornamental resources																		
Unpredictable household incomes																		
Loss of cultural heritage																		
Increased unemployment																		
Increased poverty																		
Social conflicts																		
Conflicts between sectors (artisanal and industrial)																		
Loss of traditional management practices																		
Loss of agricultural land																		
Change in land-use and loss of critical habitats (e.g. mangrove)																		
Pride - saltwater in the veins																		
Increased (dependence on) mariculture																		
Reduction in well-being																		

Table A3.6B: Stakeholders affected by Socio-Economic Impacts Declines in Living Marine Resources

STAKEHOLDERS																		
	Industry				Transportation								Energy Production			Urbanisatio		
Socio-economic Impacts	Heavy manufacturing industry	Light manufacturing industry	Agro-processing industries	Oil refining	Ports	Dredging companies	Clearing and forwarding	Railway	Roads (incl. traffic)	Airports	Airlines	Shipping	Hydro-dam operators	Power station operators	Renewable energy producers	Solid waste operators	Sewage managers	
Increased malnutrition																		
Reduction in food availability / security due to trophic cascades																		
Reduction in food availability / security (local) due to local overexploitation																		
Reduction in food availability / security (local) due to destructive / non-selective gear by local vessels																		
Reduction in food availability / security (local) due to destructive / non-selective gear used by foreign industrial vessels																		
Increased food prices for local community																		
Increased operational costs for fishers																		
Increased cost of living for local community																		
Increased migration (people) leading to social issues																		
Abuse of office by government officers																		
Increased non-compliance (illegal fishing)																		
Increased rent-seeking behaviour (bribery) by government officers																		
Change in gear and increased use of destructive fishing practices																		
Reduction in opportunities for recreation, tourism and leisure due to loss of biodiversity																		
Reduction in aesthetics 'landscape/seascape' value of the natural environment																		
Reduction in income generating livelihoods (non-fisheries related e.g. tourism) due to foreign commercial vessels																		

STAKEHOLDERS																		
	Industry				Transportation								Energy Production			Urbanisatio		
Socio-economic Impacts	Heavy manufacturing industry	Light manufacturing industry	Agro-processing industries	Oil refining	Ports	Dredging companies	Clearing and forwarding	Railway	Roads (incl. traffic)	Airports	Airlines	Shipping	Hydro-dam operators	Power station operators	Renewable energy producers	Solid waste operators	Sewage managers	
Reduction in income generating livelihoods (fisheries related) due to unsustainable harvesting and destructive practices																		
Reduction in future use value (bequest, intrinsic and existence value) of ecosystems																		
Reduction in local biodiversity derivable benefits due to foreign commercial vessels																		
Reduction in foreign earnings due to loss of biodiversity																		
Reduction in real estate values																		
Decrease in value of catches as a result of "fishing down the food chain"																		
Unpredictable household income due to unsustainable nature of fishery - 'boom and bust'																		
Increased vulnerability decreased resilience.																		
Reduction in biomedical resources																		
Impacts upon traditional resource use patterns																		
Livelihood impacts due to theft and vandalism																		
Increased dependence on tourism due to a reduction in income generating fishery																		
Reduction in ornamental resources																		
Unpredictable household incomes																		
Loss of cultural heritage																		
Increased unemployment																		
Increased poverty																		

STAKEHOLDERS																		
	Industry				Transportation								Energy Production			Urbanisatio		
Socio-economic Impacts	Heavy manufacturing industry	Light manufacturing industry	Agro-processing industries	Oil refining	Ports	Dredging companies	Clearing and forwarding	Railway	Roads (incl. traffic)	Airports	Airlines	Shipping	Hydro-dam operators	Power station operators	Renewable energy producers	Solid waste operators	Sewage managers	
Social conflicts																		
Conflicts between sectors (artisanal and industrial)																		
Loss of traditional management practices																		
Loss of agricultural land																		
Change in land-use and loss of critical habitats (e.g. mangrove)																		
Pride - saltwater in the veins																		
Increased (dependence on) mariculture																		

Table A3.7A: Direct Causes of Declines in Living Marine Resources - Contribution

Direct Causes	3.1.1	3.1.2	3.1.3	3.1.4	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5.	3.3.1.	3.3.2	3.3.3	3.3.4	3.3.5	3.3.6	3.4.	3.5.	
	...marine mammals	...cetaceans	..seabirds	...turtles	...sharks and rays	...large pelagics	...small pelagics	...deep water demersals	...reef and demersal fish	...molluscs (bivalves,	...cephalods	...sea cucumbers	...prawns and shrimp	...lobsters	...crabs	Excessive bycatch and	Expansion of mariculture	**Contribution**
Accidental capture / bycatch	4	4	2	4	4		2		3									**23**
Unsustainable harvesting		1		3	4	3	2	2	4	4	4	4	4	4	2		1	**44**
Poaching / illegal fishing	2	2		4	3	3	1	1	2	3		4		3			2	**34**
Illegal , Unregulated and Unreported fishing	2	2		4	3	3	1	1	1	3		4		3			2	**33**
Overexploitation / overfishing					4	3	2	2	4	4	4	4	4	4	2		1	**40**
Recruitment overfishing					3	4	2	2	4	4	1	3	2	2				**31**
Destructive fishing methods							2		4		4							**10**
Navigational hazards / collisions	3	4																**7**
Killing of animals and eggs			3	3														**6**
Changes in ocean circulation and seawater temperature	2	2	2	2	2	3	3		2	2	2	1	1	2	2		2	**32**
Physical habitat damage, degradation and loss	3		2	4					4	2		3	3	1	2			**26**
Disturbance of nests (birds and turtles)			3	4														**7**
Damage to nursery habitats			3	3	3				4			2	2					**19**
Noise disturbance	4	4		2														**10**
Ocean acidification									2	2			2	2	2		2	**14**
Coral bleaching									4									**4**
Sea level rise			2	2													2	**6**
Poor water quality				1					3	2			2				2	**10**
Sedimentation									4	2							2	**8**
Alteration of river flows, changes in salinity and freshwater inflows					2		1		4				4		2		2	**15**
Decline in fisheries (food supply)		1	2	2	2												4	**11**
Unemployment				2	2		2		4								4	**14**
TOTAL	**20**	**20**	**19**	**40**	**32**	**19**	**18**	**8**	**53**	**28**	**15**	**25**	**24**	**21**	**12**	**0**	**26**	

Table A3.7B: Direct Causes of Declines in Living Marine Resources - Irreversibility

	3.1.1	3.1.2	3.1.3	3.1.4	3.2.1	3.2.2	3.2.3	3.2.4	3.2.5	3.3.1.	3.3.2.	3.3.3	3.3.4	3.3.5	3.3.6	3.4.	3.5.	
Direct Causes	...marine mammals	...cetaceans	...seabirds	...turtles	...sharks and rays	...large pelagics	...small pelagics	...deep water demersals	...reef and demersal fish	...molluscs (bivalves, gastropods)	...cephalods	...sea cucumbers	...prawns and shrimp	...lobsters	...crabs	Excessive bycatch and discards	industry (biosecurity, diseases in wildstocks, exotics, habitat	**Irreversibility**
Accidental capture / bycatch	3	3	2	2	1		2		3									**16**
Unsustainable harvesting		2			3	2	2	2	4	3	2	2	2	2	2		1	**29**
Poaching / illegal fishing		3		3	3	3	1	4	4	3	2	3		3			1	**33**
Illegal , Unregulated and Unreported fishing		3		3	3	3	1	4		3		3		3			1	**27**
Overexploitation / overfishing					1	2	2	2	4	3	2	2	2	2	2		1	**25**
Recruitment overfishing					3	3	2	3	3	3	3	3	3	3				**29**
Destructive fishing methods							3		4		3							**10**
Navigational hazards / collisions	4	4																**8**
Killing of animals and eggs			3	3														**6**
Changes in ocean circulation and seawater temperature	4	4	4	4	4	4	4		4	4	4	4	4	4	4		4	**60**
Physical habitat damage, degradation and loss	2		2	2					3	3		3	3	3	3			**24**
Disturbance of nests (birds and turtles)			2	2														**4**
Damage to nursery habitats			2	2	2				4			3	3					**16**
Noise disturbance	2	2		2														**6**
Ocean acidification									4	4		4	4	4			4	**24**
Coral bleaching									4									**4**
Sea level rise			4	4													3	**11**
Poor water quality				2					2	2			4				3	**13**
Sedimentation									3	3							3	**9**
Alteration of river flows, changes in salinity and freshwater inflows					3		3		3				4		4		4	**21**
Decline in fisheries (food supply)		2	2	2	2												3	**11**
Unemployment				4	4		4										4	**16**
TOTAL	**15**	**23**	**21**	**35**	**29**	**17**	**24**	**15**	**49**	**31**	**16**	**27**	**29**	**24**	**15**	**0**	**32**	

Table A3.8 : Direct causes and Sectors contributing towards Declines in Living Marine Resources

	Urbanisation	Tourism	Agriculture & Forestry	Industry	Transportation & Shipping	Mining	Fisheries (industrial / commercial)	Fisheries (semi-industrial - local)	Fisheries (artisanal / traditional)	Fisheries (small scale)	Fisheries (inshore trawl fishery	Fisheries (recreational)	Fisheries (sports)	Fisheries (poaching / illegal)	Fisheries (mariculture)	Energy	Environmental	**TOTAL (no. sectors**
Accidental capture / bycatch							Y	Y	Y	Y	Y							**5**
Unsustainable harvesting							Y	Y	Y	Y	Y	Y	Y		Y			**8**
Poaching / illegal fishing							Y	Y	Y	Y	Y	Y	Y		Y			**8**
Illegal , Unregulated and Unreported fishing							Y	Y	Y	Y	Y	Y	Y		Y			**8**
Overexploitation / overfishing							Y	Y	Y	Y	Y	Y	Y					**7**
Recruitment overfishing							Y	Y	Y	Y	Y	Y	Y					**7**
Destructive fishing methods							Y	Y	Y	Y	Y							**5**
Navigational hazards / collisions					Y													**1**
Killing of animals and eggs									Y	Y								**2**
Changes in ocean circulation and seawater temperature																Y	Y	**2**
Physical habitat damage, degradation and loss	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y				Y	Y	Y	**13**
Disturbance of nests (seabirds and turtles)	Y	Y				Y			Y	Y								**5**
Damage to nursery habitats	Y	Y	Y	Y		Y	Y	Y	Y	Y	Y				Y	Y	Y	**13**
Noise disturbance	Y	Y			Y	Y	Y	Y			Y							**7**
Ocean acidification																	Y	**1**
Coral bleaching																	Y	**1**
Sea level rise																	Y	**1**
Poor water quality	Y	Y	Y	Y	Y	Y									Y			**7**
Sedimentation	Y	Y	Y	Y		Y												**5**
Alteration of river flows, changes in salinity and freshwater inflows	Y	Y	Y			Y											Y	**5**
Decline in fisheries (food supply)							Y	Y	Y	Y	Y	Y	Y		Y			**8**
Unemployment																		**0**
TOTAL (No. causes)	**7**	**7**	**5**	**4**	**3**	**7**	**11**	**11**	**12**	**12**	**11**	**6**	**6**	**0**	**7**	**3**	**7**	

Table A3.9 : Sectors, Resource Use Practices, Underlying and Root Causes

		Root Causes									
Sector and Underlying Resource Use Practice	**Underlying Social, Economic, Legal and Political Causes**	[A]Inappropriate governance	[B] Economic drivers	[C] Inadequate financial resources	[D] Inadequate knowledge & awareness	[E] Cultural traditions	[F] Population pressure & demographics	[G] Poverty & inequality	[H] Climate change & natural processes	[I] Voluntary action fills the governance void	[J] Personal Attitude
3.2.1	**Declines in population of sharks and rays**										
Fisheries & Aquaculture											
(1) Overfishing	External market demand		←								
	Cultural / traditional consumption of shark fin soup		←			←	←				
(2) Accidental capture (tuna longliners)	No means of monitoring, control or surveillance	←		←							
	Inappropriate regulation (don't know life cycle)				←						
	Inadequate enforcement of regulations	←									
(3) Shark finning	International market demand for fins		←								←
	Price of fins much higher (storage)		←								←
	Inadequate data / monitoring			←	←						
	Irresponsible fishing practices	←			←						←
	Political / financial need to allow foreign fleets to fish	←	←								
	Conflicting decision making framework	←									
(4) Finning and dumping	International market demand for fins not bodies		←								←
	Price of fins much higher (storage)		←								←
	Greed		←								←
	Limits and regulations in place		←								←
	Limits and regulations poorly defined				←						
	Inadequate enforcement of regulations	←									
	Corruption	←	←								←
	Inadequate funds for research			←	←						
	Lack of political understanding of need for R&D				←						
	Shortage of trained scientists			←	←						
	Difficulty attracting scientists		←		←	←					←
	Failure in local education system	←			←						
	Treasury not willing to commit more funds than funding model allows			←							
	No more funds available as insufficient tax revenues to cover social relief			←				←			
	Funding model based of levies - which are insufficient			←							
	Treasury not willing to increase levies -		←	←							
	Source of foreign revenue		←								
	Government fear that higher levies will increase unemployment	←		←				←			
3.2.2	**Declines in population of large pelagics**										
Fisheries & Aquaculture											

		Root Causes									
Sector and Underlying Resource Use Practice	**Underlying Social, Economic, Legal and Political Causes**	[A]Inappropriate governance	[B] Economic drivers	[C] Inadequate financial resources	[D] Inadequate knowledge & awareness	[E] Cultural traditions	[F] Population pressure & demographics	[G] Poverty & inequality	[H] Climate change & natural processes	[I] Voluntary action fills the governance void	[J] Personal Attitude
Overfishing of large pelagics due to use of: **(1)** Non selective gear **(2)** Drifting FADs	External market demand		←				←				
	Loss of jobs - unemployment		←				←	←			
	No catch quotas or limits	←			←						
	Fishing licences source of revenue for Government		←								
(3) Illegal, unregulated and unreported in EEZ	External market demand		←				←				
	Lack of regulations	←									
	Local market demand		←								
	Overcapacity in fishery	←	←								
	Limited management of fishery	←	←	←							
	Inadequate resources (no patrol vessels)			←							
	Inadequate monitoring, control and surveillance	←		←							
(4) Fishing techniques (innovations)	External market demand		←								
	Political / financial need to allow foreign fleets to fish	←	←								
	Conflicting decision making framework	←									
(5) Overcapacity	Government lacks alternative means of generating revenues		←	←							
	No management of catches	←		←	←						
(6) Recruitment overfishing - e.g. use of gill nets catch juvenile tunas	Scientific recommendations not considered	←									
	No monitoring, control or surveillance capacity	←									
	Other priorities	←	←								
	No alternative livelihood for sustainable livelihood						←	←			
	Lack of education and training				←						
Tourism											
(7) Tourist sports fishing	Increasing demand for sports fishing activities		←								
	Decline in fisheries catches and increased unemployment							←			
	Increasing number of fishers becoming skippers		←				←	←			
	Inward migration from other countries (e.g. France and elsewhere) to set up businesses	←	←								
	Inadequate or lack of monitoring or management of recreational and sports fishery (e.g. permitted under different ministry)	←		←	←						
	No regulation or control over fishery	←		←							
Natural environmental variability and change											
Reduced primary production									←		
3.2.3	**Declines in population of small pelagics**										
Fisheries & Aquaculture											
(1) Expansion of small	Local market demand for seafood		←				←	←			

		Root Causes									
Sector and Underlying Resource Use Practice	**Underlying Social, Economic, Legal and Political Causes**	[A]Inappropriate governance	[B] Economic drivers	[C] Inadequate financial resources	[D] Inadequate knowledge & awareness	[E] Cultural traditions	[F] Population pressure & demographics	[G] Poverty & inequality	[H] Climate change & natural processes	[I] Voluntary action fills the governance void	[J] Personal Attitude
pelagic fisheries	Removal of large pelagics so no choice		←				←	←			
	Cheaper food fish for local consumption						←	←			
	Change in distribution pattern of other species						←	←	←		
	Accessible species						←	←			
	Money making livelihood						←	←			
	Lack of regulations	←									
	Lack of monitoring control and surveillance	←		←							
	Lack of knowledge of sustainability principles				←						
Environmental											
Freshwater input									←		
Seawater temperature									←		
Nutrients									←		
Shifts in primary and secondary production									←		
3.2.5	**Declines in population of reef and demersal fish**										
Fisheries & Aquaculture											
(1) Overexploitation of ornamental species	International market demand for ornamental species	←	←					←			
	(see chain on coral reefs for further details)	←						←			
(2) Destructive fishing methods	Market demand for reef fish species		←				←	←			
	Preference for reef fish										←
	Migration to coast		←				←	←			
	Decline in stocks increased use of destructive / illegal methods	←					←	←			
	Lack of compliance with regulations	←					←	←			
	Inadequate awareness and knowledge				←						
	Rent-seeking behaviour (bribery)	←	←					←			
	Conflicts between resource users	←						←			
	Lack of monitoring control and surveillance	←		←							
	Lack of data on species				←						
	Lack of fisheries management	←			←						
	Weak enforcement	←		←							
(3) Non-selective gear	Market demand for reef fish species		←				←				
	Preference for reef fish										←
	Lack of compliance with regulations	←					←	←			
	Lack of data on species				←						
	Inadequate awareness and knowledge				←						
	Lack of monitoring control and surveillance	←		←							
	Lack of fisheries management	←									

		Root Causes									
Sector and Underlying Resource Use Practice	**Underlying Social, Economic, Legal and Political Causes**	[A]Inappropriate governance	[B] Economic drivers	[C] Inadequate financial resources	[D] Inadequate knowledge & awareness	[E] Cultural traditions	[F] Population pressure & demographics	[G] Poverty & inequality	[H] Climate change & natural processes	[I] Voluntary action fills the governance void	[J] Personal Attitude
	Weak enforcement	←		←							
(4) Illegal fishing	Market demand for reef fish species		←				←	←			
	Preference for reef fish										←
	Lack of monitoring control and surveillance	←		←							
	Lack of fisheries management	←									
	Weak enforcement	←		←							
(5) Overcapacity	Money making livelihood		←				←	←			
	Preference for reef fish										←
	Open access resource						←	←			←
	Lack of alternatives		←		←						
(6) Overfishing by: (i) artisanal / small scale fishers (ii) semi-industrial fishers (iii) industrial fishers (iv) poachers / illegal	Market demand for reef fish species		←				←	←			
	Lack of alternative livelihood						←	←			
	Open access fishery	←	←				←	←			
	Overcapacity	←					←	←			
	No management plan	←		←	←						
	No enforcement	←	←	←							
(7) Recruitment overfishing by: (i) semi-industrial fishers (ii) recreational fishers (iii) artisanal / small-scale fishers (iv) poachers /illegal	Overcapacity (commercial)	←	←								
	Culture of entitlement and blame shifting				←						←
	Greed		←								←
	Continued fishing of heavily depleted stocks	←	←								
	Lack of awareness and knowledge	←	←		←						
	Small-scale fisher use recreational permits (and sell fish which is illegal)	←	←					←			
	Money making livelihood (small-scale / artisanal)		←								
	No management plan	←		←	←						
	No enforcement	←	←	←							
	Political pressure for continued access	←	←				←	←			
(8) By-catch from inshore trawl fishers	Trawl fishery grounds overlap	←									
	Lack of technology to avoid by-catch	←		←	←						
(9) Opportunistic targeting by trawl fishery	Inadequate management system and compliance	←			←						
	Trawl fishery grounds overlap	←									
	If catches are low in trawls will target line fish		←								
	Poor compliance and enforcement	←									
	Opportunistic catches are profitable		←								
Urbanisation											
(10) Unplanned settlements / townships	Inappropriate development in estuaries and near the mouth	←	←		←		←				
(11) Poor disposal of water waster	Rural poverty driving people to the coast / Migration to coast				←		←	←			

		Root Causes									
Sector and Underlying Resource Use Practice	**Underlying Social, Economic, Legal and Political Causes**	[A]Inappropriate governance	[B] Economic drivers	[C] Inadequate financial resources	[D] Inadequate knowledge & awareness	[E] Cultural traditions	[F] Population pressure & demographics	[G] Poverty & inequality	[H] Climate change & natural processes	[I] Voluntary action fills the governance void	[J] Personal Attitude
(soakaways, septic tanks)	Illegal immigration to country		←				←	←			
	Regional instability	←									
	Increased unplanned developments	←	←				←	←			
	Poor strategic planning	←									
	Outdated wastewater infrastructure	←		←							
	Poor implementation of ICZM plan	←									
	Failure to cost environment	←	←		←						
Tourism											
(12) Construction of holiday homes	Inappropriate development in estuaries and near the mouth		←				←				
(13) Recreational activities (i) Trampling (ii) Water sports (iv) Boat anchors	Expansion of the tourism sector	←	←		←						
	Lack of awareness and knowledge				←						
	ICZM plan not implemented	←			←						
(14) Illegal fishing by recreational divers (tourists) (e.g. Spearfishing)	Market demand	←	←		←						←
	Lack of enforcement	←		←	←	←					←
(15) Poor disposal of water waster (soakaways, septic tanks)	Lack of investment and maintenance of sewage infrastructure			←							
	Poor municipal management / infrstructrure	←									
	Poor implementation of ICZM plan	←									
	Failure to cost environment		←								
Mining											
(16) Coral mining for lime	Migration to coast		←				←	←			
	Demand for building materials		←								
	Lack of alternative / expensive							←			
(17) Mining in estuaries	Market demand for sand and minerals		←								
	Lack of control and enforcement	←									
Agricultural & Forestry											
(18) Dam building	Expansion of agricultural sector		←				←				
(19) Use of agric-chemical	Water Act not enforced	←									
(20) Land-use practices increase sedimentation and reduce water quality.	Poor land use practices	←					←	←			
	Failure to protect watershed	←									
	Poor land planning	←									
	ICZM plan not implemented	←		←	←						
(21) Low productivity, poor soils and poorly adapted crops	Poor knowledge of farming				←						
	Lack of extension officers	←		←							
(22) Introduction of non-native species of trees and aquatic plants		←									

		Root Causes									
Sector and Underlying Resource Use Practice	**Underlying Social, Economic, Legal and Political Causes**	[A]Inappropriate governance	[B] Economic drivers	[C] Inadequate financial resources	[D] Inadequate knowledge & awareness	[E] Cultural traditions	[F] Population pressure & demographics	[G] Poverty & inequality	[H] Climate change & natural processes	[I] Voluntary action fills the governance void	[J] Personal Attitude
Industry											
(23) Discharge of untreated industrial effluents	Lack of investment in wastewater treatment and disposal infrastructure	←	←	←							
	Poor processing of industrial effluents	←	←								
Environmental											
Ocean acidification									←		
Coral bleaching									←		
Changes in river flow and sediment load									←		
Sea level rise									←		
Arid climate = erosion and sedimentation									←		
3.3.3	**Declines in population of sea cucumber**										
Fisheries & Aquaculture											
(1) Overexploitation	International market demand	←									
	Internal restaurant trade (Chinese)		←								
	Unemployment and poverty in fisheries sector due to the reduction in catches		←				←	←			
	Lack of alternative income generating livelihoods for fishers		←		←		←	←			
	Money making potential / livelihood		←					←			
	Open access fishery				←	←	←	←			
	No catch limit	←		←	←	←					
	Inadequate surveillance and enforcement	←									
(2) Illegal fishing	External market demand (Chinese)		←								
	Internal restaurant trade (Chinese)		←								
	Unemployment and poverty in fisheries sector due to the reduction in catches		←				←	←			
	Lack of alternative income generating livelihoods for fishers		←		←		←	←			
	No means of control	←		←							
	Self-funding drug dependent culture		←		←						
	Money from sea cucumbers used to purchase drugs	←	←		←						
	Drugs used to improve catches	←	←		←						←
(3) Dangerous (diving)	Money making potential	←	←		←		←	←			←
	No means of control	←		←	←						

		Root Causes									
Sector and Underlying Resource Use Practice	**Underlying Social, Economic, Legal and Political Causes**	[A]Inappropriate governance	[B] Economic drivers	[C] Inadequate financial resources	[D] Inadequate knowledge & awareness	[E] Cultural traditions	[F] Population pressure & demographics	[G] Poverty & inequality	[H] Climate change & natural processes	[I] Voluntary action fills the governance void	[J] Personal Attitude
3.3.4	**Declines in population of prawn and shrimp**										
Fisheries & Aquaculture											
(1) Overfishing	Market demand		←								
	Increasing unemployment						←	←			
	Lack of alternative employment		←					←			
	Overcapacity of fishery	←						←			
	Increase in traditional fishing as no licencing, or tax and requires minimum investment		←					←			
	Overcapitalisation	←	←	←							
	No management plan	←		←							
	Lack of monitoring and control	←		←							
	Post-harvest losses			←	←	←		←			←
	Lack of access to post-harvest processing facilities			←							
(2) Overexploitation of juveniles	High demand and market prices		←								
	High investment in gear / boats		←								
	Little gear choice			←	←						
	Lack of knowledge				←						
	Lack of regulations and management plan	←		←							
	Lack of MCS	←		←	←						
(3) Physical damage from bad fishing practices (trawling) leading to decreased productivity of system	Market demand		←								
	Profit drive, high value		←								
	Competition with aquaculture		←								
	Overcapitalisation	←	←								
	Inefficient boats		←	←							
	Increased fuel prices		←								
	No management plan	←		←	←						
	Illegal fishing - increases with decline in catches	←					←	←			←
	No enforcement	←		←							
	Better technology increased effort	←									
	No respect for good environmental practices				←		←	←			←
Agriculture & Forestry											
(5) Clearing of mangroves	Demand for wood products for building and fuel		←				←	←			
	Lack of alternative fuel source							←			
	Lack of alternative construction material							←			
(4) Abstraction of water for irrigation	Expansion of commercial agriculture sector		←								
	Economic priorities		←								
	Poor planning	←		←	←						

		Root Causes									
Sector and Underlying Resource Use Practice	**Underlying Social, Economic, Legal and Political Causes**	[A]Inappropriate governance	[B] Economic drivers	[C] Inadequate financial resources	[D] Inadequate knowledge & awareness	[E] Cultural traditions	[F] Population pressure & demographics	[G] Poverty & inequality	[H] Climate change & natural processes	[I] Voluntary action fills the governance void	[J] Personal Attitude
	Lack of access to technology	←		←	←						
	Lack of technical and financial capacity	←			←						
Mining											
(6) Coral mining for lime	Demand for building materials		←			←					
	Lack of alternative / expensive	←	←				←	←			
Industry											
(7) Clearing of mangroves for salt production	Demand for salt		←								
	Lack of alternative liveilhood						←	←			
	Commercial profits		←								
	Poor planning	←		←							
Urbanisation											
(8) Clearing of mangroves / deforestation	Demand for timber for construction and fuel	←	←				←	←			
Environmental											
Changes in freshwaterinput and rainfall / run-off									←		
Changes in nutrients, primary and secondary production									←		
Rainfall									←		
3.3.5	**Declines in population of lobster**										
Fisheries											
(1) Artisanal fishery (i) Non-selective gear (tangle nets, traps) (ii) Diving (SCUBA and snorkelling) (iii) Collection of egg bearing females (iv) Collection of undersized individuals	Open access fishery (no licences no regulations)	←	←								
	Lack of education and awareness (but the fishers know)	←			←						
	Tragedy of commons	←	←								
	Greed		←								
	High market prices		←								
	Still profitable		←								
	Reduction in the number of export companies		←								
	Lack of management - collapse of government	←	←								
	No law enforcement	←									
	No capacity for management	←									
	No resources (financial or human)			←							
	Lack of technical training (for new generation)	←		←	←						
	Other priorities (i.e. security)			←							
(2) Industrial fishery (i) Trawl nets (big and small mesh sizes)	Open access fishery (no licences no regulations)										
	Licences should be paid for but there is no one to ask for the payment	←									

		Root Causes									
Sector and Underlying Resource Use Practice	**Underlying Social, Economic, Legal and Political Causes**	[A]Inappropriate governance	[B] Economic drivers	[C] Inadequate financial resources	[D] Inadequate knowledge & awareness	[E] Cultural traditions	[F] Population pressure & demographics	[G] Poverty & inequality	[H] Climate change & natural processes	[I] Voluntary action fills the governance void	[J] Personal Attitude
(ii) Collection of egg-bearing females (iii) Collection of undersized individuals	No administration authority to collect fees	←									
	Lack of management - collapse of government	←									
	Internal conflicts on boundaries (between Puntland and Somaliland)	←									
	Irresponsible fishing companies know they can get away with fishing illegally	←									
	EEZ not declared so no legal boundaries (can claim fishing in international waters	←									
3.4	**Bycatch and discards**										
Fisheries & Aquaculture											
(1) Increased bycatch due to: (i) Increased fishing pressure (ii) Use of non-selective gear (iii) Illegal gear (iv) Low efficiency of BRDs (v) Limited use of exclusion devices (vi) Inappropriate gear (FADs) (vii) Illegal, Unregulated and Unreported (viii) Increased use of technology fishing	International market demand		←								
	Local market demand		←			←	←	←			
	Selection pressure and consumer demand for certain species (others discarded)		←				←				
	Lack of market / low prices for certain species		←								
	Lack of gear regulations (for selective gear)	←									
	Lack of MCS	←		←							
	Poor legislation and framework	←									
	Lack of compliance	←		←			←	←			←
	Overcapitalisation of fisheries leading to increased competition	←	←								
	Lack of fisheries management plans for some species	←		←	←						
	Conflicting policies (employment focus v sustainability)	←									
	Weak enforcement	←									
	Cultural attitude towards openness to exploit the sea		←		←						←
	Political driver (due to the need for foreign revenues)	←	←				←				