

Annexes

Annex I List of contributing authors and organisations

Name	Institutional affiliation	Country	Field of work
Dr Kim Prochazka (Regional Focal point)	International Ocean Institute Southern Africa, Department of Biodiversity and Conservation Biology, University of the Western Cape	South Africa	Marine biology and ecology
Prof. Bryan Davies	Freshwater Research Unit, Zoology Department, University of Cape Town	South Africa	Freshwater biology , ecology and policy
Prof. Charles Griffiths	Marine Biology Research Institute, Zoology Department, University of Cape Town	South Africa	Marine biology and ecology, Benguela fisheries
Dr Mafa Hara	Programme for Land and Agrarian Studies, School of Government, University of the Western Cape	South Africa	Fisheries policy, Fisheries socio-economics
Mr Nkosi Luyeye	BCLME Country Coordinator (Angola), Ministry of Fisheries	Angola	Marine biology and ecology, Benguela fisheries, Benguela dynamics
Dr Mick O'Toole	Chief Technical Advisor, Benguela Current Large Marine Ecosystem Programme	Namibia	Marine biology and ecology, Benguela fisheries, Benguela dynamics
Ms Janet Bodenstien	Enivronmental Evaluation Unit, Department of Environmental and Geographical Sciences, University of Cape Town	South Africa	Socio-economics, Coastal communities
Dr Trevor Probyn	Marine and Coastal Management, Department of Environmental Affairs and Tourism	South Africa	Marine ecology, Oceanography & Benguela dynamics, Marine pollution
Dr Barry Clark	Anchor Environmental Consultants	South Africa	Marine biology and ecology, Benguela fisheries, Climate change
Mr Anton Earle	African Water Issues Research Unit, University of Pretoria	South Africa	Freshwater policy
Prof. Chris Tapscott	School of Government, University of the Western Cape	South Africa	Economics of Benguela coast and fisheries
Mr Richard Hasler	Private consultant	South Africa	Social aspects of freshwater use

Annex II

Detailed scoring tables: Freshwater component

I: Freshwater shortage

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
1. Modification of stream flow	3	50	Freshwater shortage	3
2. Pollution of existing supplies	3	25		
3. Changes in the water table	3	50		

Criteria for Economics impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	3	33
Degree of impact (cost, output changes etc.)	Minimum Severe	3	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Economic impacts		3	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	2	40
Degree of severity	Minimum Severe	2	30
Frequency/Duration	Occasion/Short Continuous	3	30
Weight average score for Health impacts		2	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	1	25
Degree of severity	Minimum Severe	2	50
Frequency/Duration	Occasion/Short Continuous	3	25
Weight average score for Other social and community impacts		2	

II: Pollution

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
4. Microbiological	3	20	Pollution	3
5. Eutrophication	3	20		
6. Chemical	3	20		
7. Suspended solids	2	10		
8. Solid wastes	3	10		
9. Thermal	1	5		
10. Radionuclides	3	5		
11. Spills	3	10		

Criteria for Economics impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	3	33
Degree of impact (cost, output changes etc.)	Minimum Severe	3	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Economic impacts		3	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	1	33
Degree of severity	Minimum Severe	2	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Health impacts		2	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	0	33
Degree of severity	Minimum Severe	0	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Other social and community impacts		1	

III: Habitat and community modification

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
12. Loss of ecosystems	3	50	Habitat and community modification	3
Soligenous bogs	3			
Marshes (vleis)	3			
Riparian belts	3			
Endorheic pans	2			
Floodplains	3			
Intermittent rivers	3			
Permanent rivers	2			
13. Modification of ecosystems or ecotones, including community structure and/or species composition	3	50		
Soligenous bogs	3			
Marshes (vleis)	3			
Riparian belts	3			
Endorheic pans	3			
Floodplains	3			
Intermittent rivers	3			
Permanent rivers	3			

Criteria for Economics impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	2	33
Degree of impact (cost, output changes etc.)	Minimum Severe	2	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Economic impacts		2	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	2	33
Degree of severity	Minimum Severe	1	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Health impacts		2	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	1	33
Degree of severity	Minimum Severe	2	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Other social and community impacts		2	

V: Global change

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
19. Changes in the hydrological cycle	2	50	Global change	2
20. Sea level change	Not assessed			
21. Increased UV-B radiation as a result of ozone depletion	2	50		
22. Changes in ocean CO ₂ source/sink function	Not assessed			

Criteria for Economics impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	0	50
Degree of impact (cost, output changes etc.)	Minimum Severe	0	50
Frequency/Duration	Occasion/Short Continuous	3	0
Weight average score for Economic impacts		0	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	2	33
Degree of severity	Minimum Severe	1	33
Frequency/Duration	Occasion/Short Continuous	1	33
Weight average score for Health impacts		1	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	0	33
Degree of severity	Minimum Severe	0	33
Frequency/Duration	Occasion/Short Continuous	0	33
Weight average score for Other social and community impacts		0	

Annex II

Detailed scoring tables: Marine component

II: Pollution

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
4. Microbiological	2	20	Pollution	2
5. Eutrophication	1	20		
6. Chemical	1	20		
7. Suspended solids	2	10		
8. Solid wastes	2	10		
9. Thermal	1	5		
10. Radionuclides	1	5		
11. Spills	3	10		

Criteria for Economics impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	3	33
Degree of impact (cost, output changes etc.)	Minimum Severe	3	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Economic impacts		3	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	1	33
Degree of severity	Minimum Severe	2	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Health impacts		2	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	0	33
Degree of severity	Minimum Severe	0	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Other social and community impacts		1	

III: Habitat and community modification

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
12. Loss of ecosystems	1	50	Habitat and community modification	2
Sandy foreshores	1			
Lagoons	2			
Estuaries	3			
Rocky foreshores	1			
Mangroves	2			
Kelp systems	0			
Mud bottom	0			
Sand and gravel bottom	0			
Rocky bottom	0			
13. Modification of ecosystems or ecotones, including community structure and/or species composition	2	50		
Sandy foreshores	2			
Lagoons	2			
Estuaries	3			
Rocky foreshores	2			
Mangroves	1			
Kelp systems	2			
Mud bottom	2			
Sand and gravel bottom	2			
Rocky bottom	2			

Criteria for Economics impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	2	33
Degree of impact (cost, output changes etc.)	Minimum Severe	2	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Economic impacts		2	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	2	33
Degree of severity	Minimum Severe	1	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Health impacts		2	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	1	33
Degree of severity	Minimum Severe	2	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Other social and community impacts		2	

IV: Unsustainable exploitation of fish and other living resources

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
14. Overexploitation	3	60	Unsustainable exploitation of fish	2
15. Excessive by-catch and discards	1	20		
16. Destructive fishing practices	2	10		
17. Decreased viability of stock through pollution and disease	0	5		
18. Impact on biological and genetic diversity	2	5		

Criteria for Economics impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	2	33
Degree of impact (cost, output changes etc.)	Minimum Severe	2	33
Frequency/Duration	Occasion/Short Continuous	3	33
Weight average score for Economic impacts		2	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	2	33
Degree of severity	Minimum Severe	2	33
Frequency/Duration	Occasion/Short Continuous	2	33
Weight average score for Health impacts		2	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	1	33
Degree of severity	Minimum Severe	2	33
Frequency/Duration	Occasion/Short Continuous	2	33
Weight average score for Other social and community impacts		2	

V: Global change

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
19. Changes in the hydrological cycle	2	50	Global change	1
20. Sea level change	1	20		
21. Increased UV-B radiation as a result of ozone depletion	0	20		
22. Changes in ocean CO ₂ source/sink function	1	10		

Criteria for Economics impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	0	50
Degree of impact (cost, output changes etc.)	Minimum Severe	0	50
Frequency/Duration	Occasion/Short Continuous	3	0
Weight average score for Economic impacts		0	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	2	33
Degree of severity	Minimum Severe	1	33
Frequency/Duration	Occasion/Short Continuous	1	33
Weight average score for Health impacts		1	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	0	33
Degree of severity	Minimum Severe	0	33
Frequency/Duration	Occasion/Short Continuous	0	33
Weight average score for Other social and community impacts		0	

Comparative environmental and socio-economic impacts of each GIWA concern

Freshwater component

Types of impacts										Overall score	Rank
Concern	Environmental score		Economic score		Human health score		Social and community score				
	Present (a)	Future (b)	Present (a)	Future (b)	Present (a)	Future (b)	Present (a)	Future (b)			
Freshwater shortage	3	3	3	3	2	2	2	2	2.5	1	
Pollution	3	3	3	3	2	2	1	3	2.5	2	
Habitat and community modification	3	3	2	3	2	2	2	2	2.4	2	
Global change	2	3	0	2	1	2	0	1	1.4	2	

Marine component

Types of impacts										Overall score	Rank
Concern	Environmental score		Economic score		Human health score		Social and community score				
	Present (a)	Future (b)	Present (a)	Future (b)	Present (a)	Future (b)	Present (a)	Future (b)			
Pollution	2	3	3	3	2	2	1	2	2.3	2	
Habitat and community modification	2	3	2	3	2	2	2	2	2.3	2	
Unsustainable exploitation of fish and other living resources	2	3	2	2	2	2	2	2	2.1	1	
Global change	1	3	0	2	1	2	0	1	1.3	1	

Annex III

List of conventions and specific laws that affect water use in the region

The following table lists a number of international agreements relating to the natural environment in general and aquatic systems in particular, and protection thereof in Angola, Namibia and South Africa. Please note that much of Namibia's legislation is similar to that of South Africa as it has not been changed since gaining independence. Please also note that the table is not necessarily comprehensive.

Agreement	Status
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, 1989	Ratified by Namibia and South Africa
United Nations Convention on the Law of the Sea, 1994	Not ratified by any of the countries in the region, but many aspects are provided for in national laws of the countries
International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL)	South Africa and Namibia have acceded and enacted domestic legislation
International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties	Legislated in South Africa as the International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties Act, 64 of 1987
International Convention on Civil Liability for Oil Pollution Damage	Legislated in South Africa and Namibia as the Prevention and Combating of Pollution of the Sea by Oil Act of 1981
Convention of the International Maritime Organization, 1948	Angola, Namibia and South Africa are all parties to the Convention
International Convention on Oil Pollution Preparedness, Response and Cooperation, 1990	South Africa is a party to this Convention, although Angola and Namibia are not
Convention on Biological Diversity, 1992	Angola, Namibia and South Africa have all ratified the Convention
Ramsar Convention on Wetlands of International Importance	Namibia and South Africa are parties to the Convention
International Convention on the Regulation of Whaling	Ratified by Namibia and South Africa, and legislated through the marine Living Resources Act of 1998 and the Marine Resources Act of 2000 in these countries respectively
Convention on the Ban of Import into Africa and the Control of Transboundary Movement and Management of Hazardous Waste within Africa – Bamako Convention, 1991	Neither Angola, Namibia nor South Africa have acceded to the Convention
Convention for the Prevention of Marine Pollution from Land-based Sources, 1974	Neither Angola, Namibia nor South Africa have acceded to the Convention
Southern African Development Community (SADC) Environmental Policy and Regulatory Framework for Mining	Angola, Namibia and South Africa all require environmental impact assessment. Namibia and South Africa both require monitoring of impacts throughout the lifespan of the mining operation, and South Africa requires provision for rehabilitation and/or ongoing management of impacts
Southern African Development Community (SADC) Protocol on Fisheries	This protocol has not yet come into force
South East Atlantic Fisheries Organization (SEAFO)	Ratified by Namibia, signed but not yet ratified by Angola and South Africa
UN Agreement for the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	Signed by Namibia and South Africa, not yet signed by Angola
FAO Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas	
Southern African Development Community (SADC) Protocol on Shared Watercourse Systems in the SADC Region	
Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter (London Convention), 1972	Legislated in South Africa through the Dumping at Sea Control Act, 73 of 1980, not yet legislated for in Angola or Namibia

Annex IV

List of national policy and legislation

National policy and legal frameworks aimed at protection of the natural environment are in place in the countries falling within the Benguela Current region. The following table outlines some of the legislation and policy pertinent to protection of domestic and transboundary waters within Angola, Namibia and South Africa. A brief explanation of the key elements of each, as relates to aquatic environments, is given.

Legislation	Coverage	Key elements
Angola		
Constitution of the Republic of Angola, 1992	Environmental protection in general	Provides the basis for environmental protection and conservation and the right to a healthy and unpolluted environment
Environmental Framework Act, 1998	Environmental protection in general	Provides the framework for all environmental legislation and regulations Incorporates key international policies
Fisheries Act, 1992	EEZ, internal waters and all inland waters	Sustainable management Vessel licensing International and regional cooperation Supply of fisheries data Mariculture Quality and export of fisheries products Monitoring, control and surveillance of fishing activities
Interior and Marine Exclusive Economic Zone Act, 1992	EEZ, internal waters and all inland waters	Use of natural resources Protection of the environment Promotion of scientific research
Petroleum Activities Act, 1978	Oil industry	Exclusive rights to SOLANGOL for exploration, drilling and production of oil products Facilitation of international partnerships to increase local capacity
Petroleum Activities Decree, 2000	Oil industry	Sustainable development of the oil industry Compulsory use of environmental impact assessment
Mining Act, 1979	National	Declares all mineral resources as state property Regulates exploration and mining activities
Local Municipalities Act, 1999	National	Development, sanitation, environmental protection and land management responsibility of provincial and local government
Foreign Investment Act, 1994	National	Regulates foreign investments to ensure compliance with local policies on environmental protection, safety, health and environment of workers
Water Act (Draft)	National	Access to, use and protection of water resources Compulsory environmental impact assessment for all water projects
Environmental Impact Assessment Decree (Draft)	National	Requirements and standards for environmental impact assessment
Namibia		
Constitution of the Republic of Namibia, 1990	Environmental protection in general	Maintenance of ecosystems, processes, biodiversity Sustainable utilization of natural resources Dumping or recycling of foreign nuclear waste
Green Plan, 1992	Environmental protection in general	Sustainable use of living and non-living natural resources Environmental auditing and environmental impact assessment Pollutant treatment and disposal, including hazardous waste Protection of representative landscapes and ecological diversity
Environmental Assessment Policy for Sustainable Development and Environmental Conservation, 1994	National	Sustainable development Compulsory environmental impact assessment Requirements for environmental impact assessment
Environmental Management Bill (Draft)	National	Management of the environment and natural resources Provide mechanisms for implementation of obligations under international conventions Establish institutions for environmental management and protection
White Paper on National Water Policy for Namibia, 2000	Primarily freshwaters	Inter-sectoral coordination Need for realistic water pricing Protection from pollution, and polluter pays principle Water quality monitoring Development of alternative water sources Improvement of knowledge of critical wetlands and management thereof
Water Act, 1956	Freshwater and seawater	Establishes water rights Regulates against pollution of water resources
Health Act, 1919	Sanitation, food and public water supplies	Regulation of pollution from a public health perspective
The Hazardous Substances Ordinance, 1974	Hazardous substances	Regulation regarding import, export, manufacture, sale, use, disposal dumping of hazardous substances Makes provision for appointment of inspectors
Pollution Control and Waste Management Bill (Draft)	Air, water and land	To prevent discharge of pollutants and fulfill international obligations
Prevention and Combating of Pollution of the Sea by Oil, 1981	Oil discharge	Stipulates liability caused by discharge from ships, tankers, offshore installations Exceptions include emergencies and accidental leakage Includes provisions for inspection of vessels and land-based facilities Legislates 'polluter-pays' principle

Legislation	Coverage	Key elements
Angola		
Constitution of the Republic of Angola, 1992	Environmental protection in general	Provides the basis for environmental protection and conservation and the right to a healthy and unpolluted environment
Environmental Framework Act, 1998	Environmental protection in general	Provides the framework for all environmental legislation and regulations Incorporates key international policies
Fisheries Act, 1992	EEZ, internal waters and all inland waters	Sustainable management Vessel licensing International and regional cooperation Supply of fisheries data Mariculture Quality and export of fisheries products Monitoring, control and surveillance of fishing activities
Interior and Marine Exclusive Economic Zone Act, 1992	EEZ, internal waters and all inland waters	Use of natural resources Protection of the environment Promotion of scientific research
Petroleum Activities Act, 1978	Oil industry	Exclusive rights to SOLANGOL for exploration, drilling and production of oil products Facilitation of international partnerships to increase local capacity
Petroleum Activities Decree, 2000	Oil industry	Sustainable development of the oil industry Compulsory use of environmental impact assessment
Mining Act, 1979	National	Declares all mineral resources as state property Regulates exploration and mining activities
Local Municipalities Act, 1999	National	Development, sanitation, environmental protection and land management responsibility of provincial and local government
Foreign Investment Act, 1994	National	Regulates foreign investments to ensure compliance with local policies on environmental protection, safety, health and environment of workers
Water Act (Draft)	National	Access to, use and protection of water resources Compulsory environmental impact assessment for all water projects
Environmental Impact Assessment Decree (Draft)	National	Requirements and standards for environmental impact assessment
Namibia		
Constitution of the Republic of Namibia, 1990	Environmental protection in general	Maintenance of ecosystems, processes, biodiversity Sustainable utilization of natural resources Dumping or recycling of foreign nuclear waste
Green Plan, 1992	Environmental protection in general	Sustainable use of living and non-living natural resources Environmental auditing and environmental impact assessment Pollutant treatment and disposal, including hazardous waste Protection of representative landscapes and ecological diversity
Environmental Assessment Policy for Sustainable Development and Environmental Conservation, 1994	National	Sustainable development Compulsory environmental impact assessment Requirements for environmental impact assessment
Environmental Management Bill (Draft)	National	Management of the environment and natural resources Provide mechanisms for implementation of obligations under international conventions Establish institutions for environmental management and protection
White Paper on National Water Policy for Namibia, 2000	Primarily freshwaters	Inter-sectoral coordination Need for realistic water pricing Protection from pollution, and polluter pays principle Water quality monitoring Development of alternative water sources Improvement of knowledge of critical wetlands and management thereof
Water Act, 1956	Freshwater and seawater	Establishes water rights Regulates against pollution of water resources
Health Act, 1919	Sanitation, food and public water supplies	Regulation of pollution from a public health perspective
The Hazardous Substances Ordinance, 1974	Hazardous substances	Regulation regarding import, export, manufacture, sale, use, disposal dumping of hazardous substances Makes provision for appointment of inspectors
Pollution Control and Waste Management Bill (Draft)	Air, water and land	To prevent discharge of pollutants and fulfill international obligations
Prevention and Combating of Pollution of the Sea by Oil, 1981	Oil discharge	Stipulates liability caused by discharge from ships, tankers, offshore installations Exceptions include emergencies and accidental leakage Includes provisions for inspection of vessels and land-based facilities Legislates 'polluter-pays' principle
National Oil Spill Contingency Plan (Draft)	Oil spills	Provides a framework for response in the event of a spill
Minerals Policy of Namibia	Mining sector	Ensuring environmentally sustainable exploration and mining activities
Minerals (Prospecting and Mining) Act, 1992	Mining sector	Mineral rights belong to the state Environmental protection within mining operations
Petroleum (Exploration and Production) Act, 1991	Petroleum industry	Rights for exploration, production and disposal belong to the state License holders may not interfere with fishing or navigation, must prevent pollution of any water License holders are required to minimize environmental effects and to undertake environmental rehabilitation if necessary

