

Annexes

Annex I List of contributing authors and organisations

Name	Institutional affiliation	Country	Field of work
Prof. Felix Stolberg (regional coordinator)	Kharkov Academy of Municipal Economy	Ukraine	Environmental engineering
Dr. Olena Borysova (deputy regional coordinator)	Kharkov Academy of Municipal Economy	Ukraine	Environmental policy
Dr. Igor Mitrofanov (local focal point since October 2002)	Institute of Biology, Kazakhstan Academy of Science, Alma-Aty	Kazakhstan	Marine biology
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Dr. Valeriy Barannik	Kharkov Academy of Municipal Economy	Ukraine	Water modelling
Prof. Mikhail Bolgov	Head of the Caspian Sea Laboratory, Institute of Water Problems, Russian Academy of Science	Russia	Marine water science
Dr. Latifa Husejnova	Senior expert, Department of Ecological Expertise, Ministry of Environment of Azerbaijan	Azerbaijan	Environmental Impact Assessment
Dr. Hamid Jafar-zadeh	Caspian Sea Environmental Program, Baku-Tehran	Iran	Environmental economics
Dr. Evgeniy Khlobystov	Council of the Study of the Production Forces, National Academy of Science, Kiev	Ukraine	Environmental economics
Prof. Martin Khublarian	Institute of Water Problems, Russian Academy of Science, Moscow	Russia	Water science
Dr. Aleksander Korshenko	Head of Marine Pollution Monitoring Laboratory, State Oceanographic Institute, Moscow	Russia	Environmental monitoring
Dr. Valeriy Lysenko	Department of Geo-Research, Institute of Ecology and Sustainable Development, Alma-Aty	Kazakhstan	Geology and geography
Dr. Irina Patoka	Senior researcher, Ukrainian National Academy of Science	Ukraine	Social geography
Dr. Djumamurad Saparmuradov	National Contact person for Biodiversity, Ministry of Nature protection of Turkmenistan	Turkmenistan	Biodiversity
Prof. Victor Sapozhnikov	Marine Ecology Laboratory Russian Federal Research Institute of Fisheries and Oceanography, Moscow	Russia	Fisheries
Mr. Olexiy Varivoda	MSc Student, Kharkov National University, Department of Geography	Ukraine	Geographic computer design
Dr. Vladimir Vladimirov	Caspian Sea Environmental Program, Baku	Azerbaijan	Scientific liaison and information management
Mr. Namiq Zeynalov	Expert, Department of Ecological Expertise, Ministry of Environment of Azerbaijan	Azerbaijan	Environmental Impact Assessment

Annex II

Detailed scoring tables

I: Freshwater shortage

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
1. Modification of stream flow	1	N/a*	Freshwater shortage	1.33
2. Pollution of existing supplies	2	N/a		
3. Changes in the water table	1	N/a		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	2	33.3
Degree of impact (cost, output changes etc.)	Minimum Severe	2	33.3
Frequency/Duration	Occasion/Short Continuous	2	33.4
Weight average score for Economic impacts			2.0
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	2	28.5
Degree of severity	Minimum Severe	2	28.5
Frequency/Duration	Occasion/Short Continuous	2	43
Weight average score for Health impacts			2.0
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	2	40
Degree of severity	Minimum Severe	2	40
Frequency/Duration	Occasion/Short Continuous	1	20
Weight average score for Other social and community impacts			1.8

*not applied






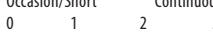



II: Pollution

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
4. Microbiological	1	N/a	Pollution	1.37
5. Eutrophication	2	N/a		
6. Chemical	2	N/a		
7. Suspended solids	1	N/a		
8. Solid wastes	1	N/a		
9. Thermal	1	N/a		
10. Radionuclide	1	N/a		
11. Spills	2	N/a		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	2	33.3
Degree of impact (cost, output changes etc.)	Minimum Severe	2	33.3
Frequency/Duration	Occasion/Short Continuous	2	33.4
Weight average score for Economic impacts			2.0
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	2	20
Degree of severity	Minimum Severe	2	40
Frequency/Duration	Occasion/Short Continuous	2	40
Weight average score for Health impacts			2.0
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	2	33.3
Degree of severity	Minimum Severe	2	33.3
Frequency/Duration	Occasion/Short Continuous	2	33.4
Weight average score for Other social and community impacts			2.0






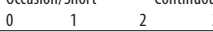


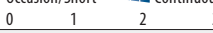
III: Habitat and community modification

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
12. Loss of ecosystems	2	N/a	Habitat and community modification	2.0
13. Modification of ecosystems or ecotones, including community structure and/or species composition	2	N/a		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small  Very large 0 1 2 3	2	28.5
Degree of impact (cost, output changes etc.)	Minimum  Severe 0 1 2 3	2	28.5
Frequency/Duration	Occasion/Short  Continuous 0 1 2 3	3	43
Weight average score for Economic impacts		2.43	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small  Very large 0 1 2 3	2	28.5
Degree of severity	Minimum  Severe 0 1 2 3	2	28.5
Frequency/Duration	Occasion/Short  Continuous 0 1 2 3	3	43
Weight average score for Health impacts		2.43	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small  Very large 0 1 2 3	1	16.7
Degree of severity	Minimum  Severe 0 1 2 3	2	33.3
Frequency/Duration	Occasion/Short  Continuous 0 1 2 3	3	50.0
Weight average score for Other social and community impacts		2.33	

IV: Unsustainable exploitation of fish and other living resources

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
14. Overexploitation	3	N/a	Unsustainable exploitation of fish	2.2
15. Excessive by-catch and discards	2	N/a		
16. Destructive fishing practices	2	N/a		
17. Decreased viability of stock through pollution and disease	2	N/a		
18. Impact on biological and genetic diversity	2	N/a		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small  Very large 0 1 2 3	2	33.3
Degree of impact (cost, output changes etc.)	Minimum  Severe 0 1 2 3	2	33.3
Frequency/Duration	Occasion/Short  Continuous 0 1 2 3	2	33.4
Weight average score for Economic impacts		2.0	
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small  Very large 0 1 2 3	2	33.3
Degree of severity	Minimum  Severe 0 1 2 3	2	33.3
Frequency/Duration	Occasion/Short  Continuous 0 1 2 3	2	33.4
Weight average score for Health impacts		2.0	
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small  Very large 0 1 2 3	2	28.5
Degree of severity	Minimum  Severe 0 1 2 3	2	28.5
Frequency/Duration	Occasion/Short  Continuous 0 1 2 3	3	43.0
Weight average score for Other social and community impacts		2.43	

V: Global change

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
19. Changes in the hydrological cycle	1	N/a	Global change	1.0
20. Sea level change	2	N/a		
21. Increased UV-B radiation as a result of ozone depletion	1	N/a		
22. Changes in ocean CO ₂ source/sink function	0	N/a		

Criteria for Economic impacts	Raw score	Score	Weight %
Size of economic or public sectors affected	Very small Very large	1	25
Degree of impact (cost, output changes etc.)	Minimum Severe	1	25
Frequency/Duration	Occasion/Short Continuous	2	50
Weight average score for Economic impacts			1.5
Criteria for Health impacts	Raw score	Score	Weight %
Number of people affected	Very small Very large	1	25
Degree of severity	Minimum Severe	1	25
Frequency/Duration	Occasion/Short Continuous	2	50
Weight average score for Health impacts			1.5
Criteria for Other social and community impacts	Raw score	Score	Weight %
Number and/or size of community affected	Very small Very large	1	33.3
Degree of severity	Minimum Severe	1	33.3
Frequency/Duration	Occasion/Short Continuous	1	33.4
Weight average score for Other social and community impacts			1.0

Comparative environmental and socio-economic impacts of each GIWA concern

Concern	Types of impacts								Overall Score
	Environmental score		Economic score		Human health score		Social and community score		
	Present (a)	Future (b)	Present (c)	Future (d)	Present (e)	Future (f)	Present (g)	Future (h)	
Freshwater shortage	1.33	2.3	2.0	2.3	2.0	2.3	1.8	2.2	1.99
Pollution	1.37	2.0	2.0	2.3	2.0	2.3	2.0	2.3	2.03
Habitat and community modification	2.0	3.0	2.43	3.0	2.43	2.8	2.33	2.7	2.59
Unsustainable exploitation of fish and other living resources	2.2	2.5	2.0	2.1	2.0	2.1	2.43	2.5	2.23
Global change	1.0	1.0	1.5	1.7	1.5	1.5	1.0	1.0	1.24

Annex III

Causal chain analysis – detailed evaluation tables

1. Environmental impacts

Habitat and community modification. Experts evaluation (all countries)

Organisms used as impact indicators		Environmental impacts								Total
		1. Modification of natural productivity or population size	2. Modification of biodiversity	3. Changes in ecosystem stability	4. Changes in community structure	5. Increase in susceptibility to disease	6. Changes in migratory species and in migratory system	7. Modification in natural storm barrier and reduced protection from erosion	8. Increased vulnerability to opportunistic invaders	
Fish (all species)	i	18	15	18	17	14	18	8	15	123
	ii	21	23	21	15	18	15	10	24	147
Caspian seal	i	11	11	13	9	18	9	3	8	82
	ii	18	13	16	14	21	11	3	14	110
Birds (terrestrial, waterfowl, shorebirds)	i	9	6	10	8	12	8	7	5	65
	ii	13	11	15	12	13	11	7	8	90
Mammals (terrestrial, wetland)	i	12	6	11	7	9	4	6	4	59
	ii	12	11	14	10	15	7	11	4	84
Zooplankton	i	18	14	19	14	6	9	9	15	104
	ii	19	15	18	16	6	11	8	17	110
Zoobenthos (macro-, micro-)	i	12	12	13	11	7	6	6	10	77
	ii	12	13	14	10	8	5	7	11	80
Total	i	80	64	73	66	66	54	39	57	
	ii	95	86	98	77	81	60	46	78	

Notes: i) current, ii) future

Expert evaluations suggest several conclusions:

1. The most vulnerable are fishes and zooplankton (seals are important, but come only second);
2. Birds and terrestrial mammals are of less concern;
3. Modification of natural storm barriers and reduced protection from erosion is of less concern for biota. This kind of impact could be left out in the further analysis;
4. All experts predict worsening of the situation in the future;
5. Modification of ecosystem productivity and change in ecosystem stability are the most important. This result can reflect the scientific backgrounds of experts (most of them are scientists: biologists, ecologists, chemists).

2. Socio-economic impacts

Habitat and community modification

Countries	Basin	Socio-economic impacts (1. Reduced capacity to meet human needs, 2. Loss of income, 3. Loss of employment, 4. Loss of aesthetic and recreation value, 5. Loss of cultural heritage, 6. Increased risk from natural disaster, 7. Costs of controlling invasive species, 8. Other)						
		Economic impacts (Weight average score 2.4 of max 3.0 - according to scoping results)		Health impacts (Weight average score 2.4 of max 3.0 - according to scoping results)		Social and community impacts (Weight average score 2.3 of max 3.0 - according to scoping results)		Economic damage by habitat modification (estimation) (million USD)
Azerbaijan	Sea	2	80%	1	100%	1	30%	
	Freshwater	3	100%	2	80%	2	60%	
Iran	Sea	1+2+3+4+6	100%	1+2+3+4	100%	1+2+3+4+7	100%	800
	Freshwater	1+2+3+4+6	100%	1+2+3+4	100%	1+2+3+4+7	100%	10 000
Kazakhstan	Sea	1+2+4+6+7	80%	1	60%	1+2+3	80%	5 000
	Freshwater	2	80%	1+7	60%	7	50%	3 000
Russia	Sea	2	80%	1	80%	All equal		500-3 000
	Freshwater	2+3	100%	1+4	80%	All equal		3 000-5 000
Turkmenistan	Sea	1+2+3	60%	1+2+3	60%	1+2+3	60%	55
	Freshwater	1+2+3	60%	1+2+3	60%	1+2+3	60%	150

3. Immediate causes

Habitat and community modification

Assessed area	Basin	Immediate causes									
		1. Unsustainable harvesting practices in fisheries	2. Chemical pollution including accidents	3. Stream flow regulation by hydro-technical constructions on rivers	5. Change of sea level as natural phenomena	6. Introduction of invasive species	7. Oil production and transport	8. Coastal erosion, sludging, dredging of water bodies	9. Land use	10. Eutrophication	11. Poaching
Azerbaijan	Sea	5	10	5	15	20	5	15	0	0	25
	Freshwater	5	10	5	20	10	5	15	0	5	25
Iran	Sea	10	25	10	10	25	10	5	5	5	0
	Freshwater	10	25	10	10	0	0	10	20	15	0
Kazakhstan	Sea	10	15	10	15	10	10	0	5	0	25
	Freshwater	10	15	15	10	0	5	5	10	5	25
Russia	Sea	10	10	25	5	10	15	0	0	10	15
	Freshwater	10	15	30	5	5	15	0	0	10	10
Turkmenistan	Sea	10	15	5	10	15	15	10	5	5	10
	Freshwater	10	5	35	20	10	5	5	5	5	10
Total	Sea	45	70	55	55	80	55	30	15	20	70
	Freshwater	45	75	95	65	25	30	35	35	40	75

Each country has its own priority concerning the immediate causes of the environmental problem. Usually causes are the same for the Sea (A) and freshwater basin(B).

Invasive species is the most important cause for the whole sea with two sub-dominants (chemical pollution and poaching). In the freshwater basin there is another dominant cause – stream flow regulation with the same sub-dominants (chemical pollution and poaching). Land use and eutrophication are of low importance both in the Sea and the freshwater basins, while species introduction is not a major issue in the freshwater basins.

4. Sector activities

Habitat and community modification

Sector activities	Immediate causes							
	1. Unsustainable harvest practices in fisheries	2. Pollution including accidents	3. Stream flow regulation by hydro-technical constructions on rivers	4. Introduction of invasive species	5. Deforestation	6. Coastal erosion, sludging, dredging of water bodies	7. Land use	8. Eutrophication
1. Agriculture		Run-off of pesticides 20%	Construction of irrigation systems 20%		Deforestation to create agricultural land 75%	Overgrazing of the coastal zone 25%	Agricultural fields 50%	Run-off of fertilisers 40%
2. Fishery	Overfishing 90%			Introduction of commercial and feeding species 33%		Dredging in river deltas 60%		
3. Industry		Discharges and air pollution 25%	Construction of reservoirs for industrial water supply 10%				Direct construction of plants, waste deposits etc. 30%	Thermal discharge 5%
4. Urbanisation		Run-off of surfactants and other 10%	Supply of drinking water 20%	Accidental introduction of pets into nature 2%	Deforestation to supply household heating 20%		Growth of towns and settlements 25%	Run-off of nutrients 30%
5. Oil extraction		Oil spills 40%						Influx of organic matter 10%
6. Transport		Direct input from vessels 5%	Special construction of dams 5%	Accidental introduction with ballast waters etc. 60%	Deforestation during road construction 5%	Inappropriate technology in road construction in the coastal zone 15%	Road construction 5%	
7. Energy production			Hydropower stations 45%					Thermal discharge 10%
8. Aquaculture	Take out of mature fishes for artificial spawning 10%			Accidental introduction with ballast waters etc. 5%				Run-off of nutrients 5%

"Kara-Bogaz-Gol hydrotechnical reconstruction" and "Change of sea level as natural phenomena" were taken out of the table as they have no connection with specific sectors of activity. Poaching is included in Fishery activity.

5. Root causes

Habitat and community modification

Sector activities	Root causes																	
	1. Demographic			2. Technological				3. Economic								4. Socio-cultural		
	1.2 Population growth	1.3 Urbanisation trends	1.4 Migration	2.1 Access to technology	2.2 Technological trends	2.3 Inadequate knowledge of technological and technical response function	2.4 Inappropriate expert advice on technology	3.1 Prices (inputs, outputs, consumption goods)	3.2 Incomes	3.3 Income distribution	3.4 Poverty	3.5 Economic growth	3.6 Economic structure	3.7 Market structure	3.8 Taxes and subsidies	3.9 Inadequate valuation of environmental goods and services	4.1 Traditions	4.4 Lifestyle
Agriculture	25				65			30	20	30	50			5		30		
Fisheries	15				30		40	60	60	30	50			80	80	10	70	100
Industry				NS	5				5			75	100		40			
Urbanisation	25	35																
Oil extraction						100												
Transport	20		100	NS						40								
Energy production	15	65					60	15				25			50			
Aquaculture								10						15	20			

Sector activities	Root causes																	
	5. Legal		6. Knowledge						7. Governance (including Policy failures)						8. Political		9. Natural phenomena	
	5.1 Laws (especially property rights)	5.2 Regulations	6.1 Information	6.2 Training	6.3 Education	6.4 Inadequate scientific understanding	6.5 Inadequate or unreliable information	6.6 Ineffective information interpretation	6.7 Inadequate access to technical and scientific information	7.3 Bureaucratic competence (including adequate budgets)	7.4 Deficiencies in stakeholder participation	7.5 Lack of coordination among the different levels of government	7.6 Corruption	7.7 Inadequate integration of environmental considerations into public policy	7.8 Inadequate coordination of national policies	8.1 Power structure (relative capacity of affected groups to oppose/promote policy)	8.2 Conflicts	9.1 Sea level changes
Agriculture			20	10	20				30							5	15	
Fisheries	70	50	10	10	10	50	100	100	20	70		25	50	5	20	5	10	
Industry		30	10	10	10							25	10			10	5	
Urbanisation			10	10	10											5	5	
Oil extraction	30		10	20	10				30	20	15	25	35	50	50	30	35	
Transport			10	10	10									50	30	25	10	
Energy production		20	20	10	10	50		50		80	30		50			5	5	
Aquaculture			10	20	20						30					15	15	

Annex IV

Policy options – detailed performance tables

1. Recommended involvement of the Caspian states on a local, national and international level

○ = not involved ● = local ● = national ● = international

Type	Policy options	Azerbaijan	Iran	Kazakhstan	Russian Federation	Turkmenistan
Legislative/Regulatory	Develop systems to stimulate the use of “green technologies”	●	●	●	●	●
	Fill the local market with cheap, effective and acceptable chemicals	●	●	●	●	●
	Expert independence from authorities and fishery industry	●	●	●	●	●
	Use of economic instruments such as penalties, compensations etc.	●	●	●	●	●
	Correct estimation of water prices (include attendant services and actions)	●	●	●	●	●
	Improvement and enforcement of regulation on dam construction/operation	●	●	●	●	●
Investment	Investments in refurbishment of old oil wells and oil pipelines	●	○	●	●	○
	Investments in refurbishment of old water purification systems	●	●	●	●	●
	Special investments in the equipment of control organisations	●	●	●	●	●
	Special investments to build purification facilities	●	●	●	●	●
Institutional strengthening	Create and/or strengthen control systems of forbidden chemicals	●	●	●	●	●
	Strengthened control of small leaks from active and blocked oil wells and oil pipelines	●	●	●	●	●
	Change and strengthening of control organisations	●	●	●	●	●
	Develop special systems of biological control in the artificial shipways	●	●	●	●	●
	Strengthening organisations controlling the introduction of alien species	●	●	●	●	●
Education	Special training courses, lectures, videos, etc.	●	●	●	●	●

2. Main root causes and policy options for Habitat and community modification by – Pollution

Root causes	Policy options	Priority	Possible outcomes and efficiency (low-medium-high)	Who could be responsible	Existing base for implementation	Preliminary cost (USD)
Agriculture						
Population growth	Population growth accompanied with economic growth of the region could be a positive factor and do not need any policy option to prevent it					
Economic growth in the region	Economic growth is a positive factor and do not need any policy option to prevent it					
Existing prices for agricultural products	Fill the market with cheap vegetables all year round by developing hot house gardening especially in the northern Caspian region	<u>5 recommended</u>	Stable vegetable market all the year without periodical price changes Efficiency - medium	Small business and Local authorities	Small market gardening	200 000 - 300 000
	Import of cheap vegetables from other regions, for example from southern Caspian countries to the north	6	Semi-stable vegetable market with small periodical price changes Efficiency - medium	Small business and Local authorities	Sea transport	Tax privileges
Poverty	There are several National programmes, so it is not GIWA responsibility					
Lack of incentives to promote "green technology"	Develop systems to stimulate "green technologies", for example reduction of discharge and air pollution, gardening without pesticides, etc.	<u>2 recommended</u>	Development of environment friendly "green technologies" in the region Efficiency - low	National and Local authorities		100 000
Availability of cheap, but old-type insecticides on the local market.	Create and/or strengthen systems at the municipal level controlling sale of forbidden chemicals	<u>1 recommended</u>	All forbidden chemicals (such as DDT) can be removed from the local market and become unavailable for further usage Efficiency - high	Local authorities	"Ecological police"	
Absence of effective and cheap insecticides and pesticides on the local market	Supply the local market with cheap, effective and acceptable chemicals	<u>2 recommended</u>	New acceptable chemicals will substitute old and dangerous ones Efficiency - medium	National authorities and International organisations		Tax privileges
Lack of control of pesticide usage in small-scale gardening and farming	Strengthening the control on sale and use of pesticides in farming and gardening (including sale on the market and black market)	4	Absence of illegal sale of pesticides, fertilisers, etc. Efficiency - low	Local authorities, Control organisations		
Technology and budget problems with creation of special water purification systems for run-off from small-scale farming	Investigate the possibilities of creating such systems					
Oil industry						
Technology and budget problems with refurbishment of old oil wells and pipelines	Investments in refurbishment of old oil wells and old oil pipelines	<u>1 recommended</u>	Absence of regular small leaks	Oil companies		?
	Strengthen control of small leaks from active and blocked oil wells and oil pipelines	<u>2 recommended</u>	Absence of regular small leaks	Local authorities	Existence of "ecological police"	
Technology and budget problems with refurbishment of old water purification systems	Investments in refurbishment of old water purification systems	<u>1 recommended</u>	Improved purification of discharges Efficiency - high	Local authorities		1 000 000
Education						
Lack of information, education and training in the negative effects of different pollutants on the Caspian ecosystem and human health	Special training courses, lectures, videos, etc.	<u>3 recommended on a broader scale</u>	Better understanding and education of local people, salesmen, producers and decision makers Efficiency - potentially very high, but low at the beginning	Local authorities, Universities, NGOs, etc.		100 000 - 200 000 annually

3. Main root causes and policy options for Habitat and community modification by – Overfishing and poaching

Root causes	Policy options	Priority	Possible outcomes and efficiency (low-medium-high)	Who could be responsible	Existing base for implementation	Preliminary cost (USD)
Tradition of continuous and non-selective fishing coupled to the lifestyle of local people	Increase fines for exceeding fishing quotas	8	Incomes and taxes on illegal fishing need to be comparable Efficiency - medium	National authorities, Ministries of Environment	Exist, but needs to be improved	
	Control by all official local fishermen	5	Permanent control in multiple places along the rivers Efficiency - medium	National and Local authorities, Ministries of Environment		
	Privileges for fishermen obeying the regulations i.e. fishing periods, species restrictions, quotas etc.	6	Preference of local fishermen to fish legal Efficiency - medium	National and Local authorities, Ministries of Environment		
Poverty and unemployment of local people	There are several National programmes, so it is not GIWA responsibility					
Market structure and high prices for valuable fish products	No policy options					
Tradition of exceeding quotas	Increase fines for exceeding fishing quotas	9	Fishlandings in accordance with quotas Efficiency - low (at present fishing above quotas is rare)	Ministries of Environment	Exist, but needs to be improved	
Inefficient fishery control due to corruption	Change and strengthening of control organisations	<u>1 recommended</u>	Better and more efficient staff Efficiency - medium	National authorities		From national budget
Inefficient fishery control due to lack of staff						
Inefficient fishery control due to lack of equipment	Special investments to provide controlling organisations with equipment	<u>2 recommended</u>	Properly equipped control organisations Efficiency - medium	National authorities, Ministries of Environment		1 000 000
Inadequate expert advice on quotas as a result of pressure from authorities	Expert independence from authorities and fishery industry	<u>3 recommended</u>	More realistic quotas Efficiency - high	Regional and International organisations, National authorities		500 000 annually
Inadequate expert advice on quotas as a result of lack of scientific equipment and funds	Special grants for the evaluation of quotas	7	More realistic quotas Efficiency - low	National authorities, International organisations		
Inadequate expert advice on quotas as a result of lacking experience and qualification	Expert training	<u>4 recommended</u>	More realistic quotas Efficiency - high	Academy of Sciences, Regional and International organisations		200 000 annually

4. Main root causes and policy options for Habitat and community modification – Introduction of invasive species

Root causes	Policy options	Priority	Possible outcomes and efficiency (low-medium-high)	Who could be responsible	Existing base for implementation	Preliminary cost (USD)
Absence of tank/hull decontamination facilities (lack of investments)	Special investment to the creation of purification facilities	<u>1 recommended</u>	Prevention of accidental species introduction with ballast water	Local authorities, Ministries of Environment	Under construction in the Volga delta	
Absence of special systems preventing penetration via existing shipways - absence of technological advice	Develop special systems of biological control in the artificial shipways	<u>3 recommended</u>	Prevention of self-introduction	Academy of Sciences, National authorities		1 000 000
Absence of systems for domestic pet care	Create special service for pet care	5	No pet introduction Efficiency - low	Local authorities, NGOs		
Lack or absence of regulation and control for introduction and farming of alien species	Strengthen organisations that control alien species introduction	<u>2 recommended</u>	Prevention of accidental introduction of aquaculture species	National authorities	Existing organisations and services (different in different countries)	100 000
Inadequate expert advice on species introduction	Expert training	4	Better expert advice	Academy of Sciences, International organisations		

5. Main root causes and policy options for Habitat and community modification by – Dam Constructions

Root cause	Policy option	Priority	Possible outcomes and efficiency (low-medium-high)	Who could be responsible	Existing base for implementation	Preliminary cost (USD)
Conflicts of interest among user groups	Shifting responsibilities to central authorities	6	medium-high	National Parliaments		5 000
	The use of economic instruments such as penalties and compensations etc.	<u>1 recommended</u>	high	Local and National authorities	Special instructions and recommendations	10 000
Lack of system approach	Identify decision makers and increase their competence	4	medium	International and Regional organisations, Local authorities		50 000
	Develop the scientific base through research/training	10	medium	Scientific organisations	A lot of data for analysis	1 000 000
Lack of public awareness	Training/ dissemination of information	9	low, medium, or high (depend on country)	Local authorities, Mass media	Experience of NGOs	500 000
	“Green movement” lobbying	11	low-medium	International organisations, Mass media, NGOs	“Green” NGOs	100 000
Inadequate scientific understanding of catchment area influence	Improve monitoring systems (include biological parameters)	5	medium-high	Local authorities, Scientific organisations, Environmental Ministries	Experience of monitoring in some scientific organisations	200 000
	Carry out integral research	7	medium	Environmental Ministries, Scientific organisations	Experience and high qualified experts	500 000
Weak management (operation) of dams due to lack of hydrological data	Improve monitoring of hydrological data	8	medium	Scientific organisations, Hydromet system	Experience in monitoring in some scientific organisations	1 000 000
Low prices for water supply for energy production and municipal usage	Correct estimation of water prices (include attendant services and actions)	<u>2 recommended</u>	medium-high	National Governments and Parliaments, Local authorities, Scientific organisations	Scientific experience	100 000
Insufficiency and inefficiency of regulation on dam safety	Improvement and enforcement of regulations on dam construction/operation	<u>3 recommended</u>	medium-high	National and Local authorities		

Annex V

List of important water-related programmes and assessments in the region

Caspian Environmental Programme (CEP)

The Caspian Environment Programme (CEP) is developed by the Governments of the five Caspian countries to solve common ecological problems with participation of international organisations (GEF, UNDP, UNEP, World Bank, Tacis). Within the framework of this Programme countries carry out the activities at national and regional levels. The purpose of CEP is to maintain sustainable development and rational management of the Caspian region environment.

The priority of actions within the framework of CEP is aimed at:

- Ensuring economic activity and sustainable living conditions for the human population under conditions of the Caspian sea level fluctuations;
- Ensuring ecological safety in the region and preservation of the environment for sustainable human development;
- Pollution liquidation and improvement of environmental quality and biodiversity conservation;
- Improvement and restoration of the Caspian sea ecosystems and biodiversity conservation.

Caspian Sea Environmental Pollution Programme

The purpose of this project is to look at the benefits of environmental management strategies in pollution prevention such as waste minimisation and clean technologies. This minimises the environmental problems due to waste generation and eliminates the cost of treatment and disposal of the waste. The benefits of the environmental management programme along the Caspian Sea will ensure clean water and a better environment. There are many research programmes investigating future waste minimisation in the Caspian Sea region.

The important ones are given as follows:

- The first plan is to identify the point sources of pollution along the Caspian coastline. This includes the pollution from all industries, commercial operations and cities around the Caspian Sea;
- The second task is to try to identify the non-point pollution sources and to characterise them as point sources of pollution;
- The third plan is the determination of the contribution of each point source pollutant including domestic, industrial and non-point

sources along the Caspian coastline and to prepare dispersion maps of sources of pollution;

- The forth plan is to investigate the effect of these pollutants on the aquatic life of the Caspian Sea;
- The last plan is to measure the amount of oil pollution in the Caspian Sea.

International Research and Exchange Board (IREX) Black Sea and Caspian Sea collaborative research programme

IREX is an international non-profit organisation dedicated to the advancement of knowledge. Central to its mission is the empowering of individuals and institutions to participate meaningfully in civil society. IREX administers programmes between the United States and the countries of Eastern Europe, the New Independent States (NIS), Asia, and the Near East.

IREX:

- Contributes to the development of students, scholars, policymakers, business leaders, journalists, and other professionals;
- Strengthens independent media, academic, public, and non-governmental institutions;
- Makes the knowledge and skills developed through its programmes available to universities, foundations, policymakers, and the corporate sector.

The last decade has unleashed major forces of change in the Black and Caspian Sea region. On the most rudimentary level, interactions of various types, including trade and travel, have proliferated in this region. Large regional projects, including political ones such as GUUAM (Georgia, Ukraine, Uzbekistan, Azerbaijan and Moldova) and the Black Sea Economic Cooperation Zone, and economic ones such as oil and gas pipelines, mean that regional developments will continue to bear consequences for each country in the region while developments at the national level will have regional effects. However, region-wide basic and comparative data, as well as regional analysis of ongoing trends, are lacking.

In September 2000, IREX convened a regional conference in Odessa, Ukraine, to assess the regional dynamics at work, as well as the state of existing knowledge and skills, and to analyse these trends. The participants of the Odessa Conference called attention to the pressing need to carry out collaborative research if understanding of the region and its dynamics are to improve. It is in response to this demand that IREX has decided to launch its collaborative research programme for the Black and Caspian Sea region. This collaborative research programme is made possible by a generous grant from The Starr Foundation.

Seeking Civil Society: Environmental NGOs and the Caspian

This activity addresses regional environmental issues and how partnerships among non-governmental organisations can influence government policies. It will also attempt to understand how environmental NGOs could contribute to the strengthening of civil society and human capital in the areas they serve, seeking ways to link partnerships with other local and international environmental NGOs, and crossing over geographic boundaries. Furthermore, this forum will highlight the newly emerged region's need to end its isolation by assembling the human capital to negotiate environmental policies.

The ISAR's Caspian Program

ISAR's Caspian Program has been working with NGOs in the Caspian region since October 1998 to protect the unique ecosystem of the Caspian Sea. The goal and principles of the Program were developed at ISAR's April 1999 conference, "Strengthening Partnerships Among NGOs Working on Environmental Problems of the Caspian Basin" (Baku, Azerbaijan), which was attended by more than 50 environmental NGO representatives.

To attain this goal, the following programme priorities have been established:

- Creating and developing systems of independent public environmental monitoring in the Caspian Basin. The Program supports efforts by local NGOs to conduct independent environmental monitoring through the entire Caspian Basin. ISAR also supports the inclusion of NGOs in the monitoring efforts of state and international organisations.
- Supporting NGO efforts to preserve, rehabilitate and rationally use the ecosystem of the Caspian Basin. The Program supports greater involvement of NGOs in evaluating the status of protected territories and biodiversity in the Caspian Basin, as well as protecting and rehabilitating them.
- Seeking and advancing alternative paths of economic development for the region. The Program supports the efforts of NGOs and other organisations to broaden the use of renewable natural resources in the region as economic alternatives to oil and gas extraction. These efforts may include: "clean" energy and programmes for energy conservation; ecotourism and other forms of environmentally friendly recreation; the development of marine resources and aquaculture; and the development of sustainable agriculture.

The Ecotoxicology Project (ECOTOX)

The Ecotoxicology Project (ECOTOX) carries out investigation into Toxic Contaminant Accumulation and Related Pathology in the Caspian sturgeon, seal and bony fish. The five Caspian countries participating

in the project are Azerbaijan, Iran, Kazakhstan, Russian Federation and Turkmenistan.

The Project was started within the Caspian Region in September 1999. An Inception Workshop was held in October 1999 in Baku, Azerbaijan. The contractor of the project is PADECO, a Japanese company. The project itself is sponsored by the World Bank.

The ECOTOX Project is divided into three "teams": the seal team, the sturgeon team and the bony fish team. Each team consists of National Experts in respective fields, nominated by the National Focal Points of the countries.

Caspian Transboundary Diagnostic Analysis

A Transboundary Diagnostic Analysis (TDA) is a scientific and technical assessment, through which the water-related environmental issues and problems of a region are identified and quantified, their causes analysed and their impacts, both environmental and economic, assessed. The analysis involves an identification of causes and impacts at national, regional, and global levels and the socio-economic, political and institutional context within which they occur. The identification of the causes would specify sources, locations, and sectors.

The purpose of conducting a TDA is to scale the relative importance of sources and causes, both immediate and root, of transboundary waters problems, and to identify potential preventive and remedial actions. The TDA was completed in 2002 and provided the technical basis for the Strategic Action Programme (SAP) in the area of International Waters of the GEF.

Annex VI

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

- EU Water Initiative, Johannesburg, 2002.
- EU Water Framework Directive 2000/60/EC of October 23, 2000.
- Agreement between Kazakhstan and Russia on co-operation in the use of Caspian resources and on oil transport via Novorossiysk (9.10.2000).
- Agreement between Azerbaijan and Russia on co-operation in the use of Caspian resources and on oil transport along the northern pipeline via Novorossiysk (9.01.2001).
- Agreement between Azerbaijan and Kazakhstan on co-operation in the use of Caspian resources and on oil transport through Georgia (1997).
- Agreement between Azerbaijan and Turkmenistan on gas transport (1998) through Georgia.
- Agreement between Azerbaijan, Turkey, and Georgia on oil transport (1999) and gas transport (2001) along a western pipeline.
- Treaty of Friendship between the Soviet Union and Persia, signed February 26, 1921, pertaining to freedom of navigation.
- Agreement between Persia and the Soviet Union of October 1, 1927, relating to fisheries in the southern parts of the Caspian Sea. This agreement, originally having a 25-year duration, was never renewed.
- Convention between Iran and the Soviet Union on Establishment, Commerce, and Navigation, signed in Tehran on October 27, 1931, reaffirming the principle of freedom of navigation and exclusive fishing rights up to 10 nautical miles from shore. This treaty was confirmed on March 25, 1940.
- Treaty of Commerce and Navigation signed by Iran and the Soviet Union on 25 March 1940.
- Agreement between Iran and the Soviet Union concerning Settlement of Frontier and Financial, establishing the demarcation between Iran and the Soviet Union, signed on December 2, 1954.
- Treaty between Soviet Union and Iran on May 14, 1957, giving rights to fish in frontier waters up to the frontier line.
- Almaty Declaration of December 21, 1991 between the four CIS countries stating that the new states would continue fulfill international obligations of the Soviet Union.
- Tehran Communique of October 1992, which committed the states to cooperation in environmental management of the Caspian Sea.
- Astrakhan Communique of 1993, which reinforced the need to cooperate on environmental matters.
- Almaty Declaration of Cooperation in the Field of Environmental Protection (May 1994).