

# Annexes

## Annex I List of contributing authors and organisations

Name	Institutional affiliation	Country	Field of work
Anond Snidvongs (Task Team Leader)	Southeast Asia START Regional Center	Thailand	Oceanography; Global Climate Change
Seng-Keh Teng	Life Science Bio-Technology Ventures	Singapore	Fisheries
Chaiyuth Suksri	Mekong River Commission	Cambodia	Environmental governance
David Coates	Mekong River Commission	Lao PDR	Biodiversity, fisheries management
David Jezeph	Economic and Social Commission for Asia and The Pacific, UN	Thailand	Water resources management, policies and strategies
Hans Friedrich	Regional Wetlands and Water Resources Programme, IUCN	Thailand	Water resources management
Ian Campbell	Mekong River Commission	Cambodia	Ecology
Ing Try	Department of Fisheries	Cambodia	Fisheries biology and management
John Dore	Social Research Institute	Thailand	Environmental governance, political economy
Huu Ti Le	Economic and Social Commission for Asia and The Pacific, UN	Thailand	Hydrology
Quang Minh Le	Can Tho University	Vietnam	Water resources management
Ge Li	Department of International Cooperation, Ministry of Science and Technology	China	Water resources management
Nicholaas van Zalinge	Mekong River Commission	Cambodia	Fisheries
Sansanee Choowaew	Faculty of Environment & Resource Studies, Mahidol University	Thailand	Environmental planning, wetland conservation & management, social & economic aspects of fisheries
Sein Mya	Mekong River Commission	Cambodia	Environmental information management
Somrudee Nicro	Urbanisation and Environment Program, Thailand Environment Institute	Thailand	Sociology
Thavivongse Sriburi	Environmental Research Institute, Chulalongkorn University	Thailand	Water resources planning and management
Wijarn Simachaya	Pollution Control department	Thailand	Coastal/freshwater quality management
Ruud Corseel	Mekong River Commission	Cambodia	Water utilisation

# Annex II

## Detailed scoring tables

### I: Freshwater shortage

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
1. Modification of stream flow	3	60	Freshwater shortage	2.2
2. Pollution of existing supplies	1	20		
3. Changes in the water table	1	20		

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

N/a=Not applied

### II: Pollution

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
4. Microbiological	1	15	Pollution	2.0
5. Eutrophication	2	20		
6. Chemical	1	15		
7. Suspended solids	3	40		
8. Solid wastes	0	0		
9. Thermal	0	0		
10. Radionuclides	0	0		
11. Spills	1	10		

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

N/a=Not applied

### III: Habitat and community modification

Environmental issues	Score	Weight	Environmental concern	Weight averaged score
12. Loss of ecosystems	3		Habitat and community modification	3
13. Modification of ecosystems or ecotones, including community structure and/or species composition	3			

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

N/a=Not applied

### IV: Unsustainable exploitation of fish and other living resources

Environmental issues	Score	Weight %	Environmental concern	Weight averaged score
14. Overexploitation	3	50	Unsustainable exploitation of fish	2.7
15. Excessive by-catch and discards	1	5		
16. Destructive fishing practices	2	20		
17. Decreased viability of stock through pollution and disease	N/a	N/a		
18. Impact on biological and genetic diversity	3	25		

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

N/a=Not applied

Presently, there is insufficient data to demonstrate conclusively the current impacts of Global Change.

### Comparative environmental and socio-economic impacts of each GIWA concern

Concern	Types of impacts								Overall score	Rank
	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	2	3	1	0	1	2	2	1	1.71	3
Pollution	2	2	1	1	2	2	2	2	1.75	4
Habitat and community modification	3	2	3	2	1	1	2	2	2.00	1
Unsustainable exploitation of fish and other living resources	3	3	3	2	0	0	2	1	2.33	2
Global change	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	N/a	5

N/a=Not applied

## Annex III

# Functions and activities of the regional institutions and agencies involved in addressing and managing water-related environmental issues and problems in the GIWA Mekong River region

### Asian International Rivers Center (AIRC)

AIRC was established in October, 2000 and headed by Professor He Daming. The Center is primarily engaged in basic and applied research, information development and capacity building related to the study of international rivers in China and Asia. It is located in the campus of Yunnan University in Kunming City, Yunnan province, China. The AIRC provides necessary research for addressing issues related to the conservation of natural resources and is meeting the growing demand for high quality information and analysis on which environmental management decisions should be based. Studies related to the well-being of ecosystems in the Upper Mekong River Basin, or the Lancang River Basin, are undertaken by the program entitled "Ecosystem Changes in Longitudinal Range-Gorge Region and Transboundary Ecological Security in Southwest China, 2004-2008".

### Australian Mekong Resource Centre (AMRC)

AMRC is a resource centre established in 1997 and based at the School of Geosciences, University of Sydney, Australia. AMRC defines the Mekong Region into two levels, the first level is the Mekong Basin proper, i.e. the catchment of the Mekong River and its tributaries, covering an area of 795 000 km<sup>2</sup> and providing home to 65 million people in six different countries; the second level has a broader geographical framework including what has become known as the Greater Mekong Subregion (GMS). GMS comprises an area that is home to some 250 million people and is based on five of the countries through which the Mekong River flows – Myanmar, Thailand, Lao PDR, Cambodia and Vietnam – plus Yunnan province in southern China. The Centre promotes research, discussion and debate on development and environmental issues in the Mekong Region, focusing on the role that Australia plays in the region as a near neighbour, donor and major trading partner. The Centre is a focal point for information, dialogue and activities in support of an equitable and sustainable development path for the Region. By fostering a deeper and wider understanding of contemporary changes in the Mekong Region, the AMRC aims to support development paths that maintain the integrity, diversity and symbiosis of local livelihoods, cultures and ecosystems.

### Association of Southeast Asian Nations (ASEAN)

ASEAN was established on 8 August 1967 in Bangkok by the five original Member Countries: Indonesia, Malaysia, Philippines, Singapore, and Thailand. Brunei Darussalam joined on 8 January 1984, Vietnam on 28 July 1995, Laos and Myanmar on 23 July 1997, and Cambodia on 30 April 1999. The ASEAN region has a population of about 500 million, a total area of 4.5 million km<sup>2</sup>, a combined gross domestic product of 737 billion USD, and a total trade of 720 billion USD. ASEAN functions in accordance to the ASEAN Declaration as the guiding principles. The Declaration states that the aims and purposes of the Association are: (i) to accelerate the economic growth, social progress and cultural development in the region

through joint endeavours in the spirit of equality and partnership in order to strengthen the foundation for a prosperous and peaceful community of Southeast Asian nations; and (ii) to promote regional peace and stability through abiding respect for justice and the rule of law in the relationship among countries in the region and adherence to the principles of the United Nations Charter.

### Greater Mekong Subregion Academic and Research Network (GMSARN)

GMSARN carries out activities related to human resources development, joint research, and dissemination of information and intellectual assets generated in the Greater Mekong Subregion (GMS). The Network seeks to ensure that the holistic intellectual knowledge and assets generated, developed and maintained are shared by organisations within the region. Primary emphasis is placed on complementary linkages between technological and socio-economic development issues. An agreement among the founding GMS country institutions was signed on 26 January 2001, based on resolutions reached at the Greater Mekong Subregional Development Workshop convened earlier. The GMSARN member institutions are the Asian Institute of Technology; the Institute of Technology of Cambodia; the Kunming University of Science and Technology, Yunnan province, China; the National University of Laos; the Yangon Technological University, Myanmar; the Khon Kaen University, Thailand; Thammasat University, Thailand; the Hanoi University of Technology, Vietnam, and the Ho Chi Minh City University of Technology as well as the Royal University of Phnom Penh in Cambodia and Yunnan University in Yunnan province, China. The agreement commenced on the date of signing and will remain in effect for four years, subject to extension by the GMSARN member institutions. Objectives of the GMSARN are (i) To enhance the roles and functions of regional academics in project evaluation and development planning in order to achieve the region's truly self-reliant and sustainable development; (ii) to foster multi-disciplinary research and academic development within and among academic and research institutions in the GMS through relevant joint activities; (iii) to formulate and resolve, scientifically and objectively, complex problems covering both cross-border issues and issues that are common to GMS countries; and (iv) to take stock of intellectual assets developed for the GMS so as to ensure transparently accessible reference and utilisation among the GMS countries.

### Greater Mekong Subregion Program of the Asian Development Bank

The Program was created by the Asian Development Bank (ADB) in 1992 to enhance economic cooperation among the Greater Mekong Subregion (GMS) countries including Cambodia, Lao PDR, Myanmar, Thailand, Vietnam, and Yunnan province in China. The Program has contributed to the development of infrastructure to enable the development and sharing of

the resource base, and promote the freer flow of goods and people in the subregion. It has also led to the international recognition of the subregion as a growth area. In addition, the Program has produced a comprehensive "Atlas of the Environment" for the GMS that describes in detail the profile, environmental and natural resources, people and environment, sustainable development, remote sensing images of ecoregions and information resources of the subregion.

### **International Rivers Network (IRN)**

IRN is an international non-governmental organisation (NGO) that supports local communities working to protect their rivers and watersheds. Efforts of IRN are to halt destructive river development projects, and to encourage equitable and sustainable methods of meeting needs for water, energy and flood management. IRN also seeks a world in which rivers and their watersheds are valued as living systems and are protected and nurtured for the benefit of the human and biological communities that depend on them. Overall vision of IRN is to develop worldwide understanding of the importance of rivers and their essential place in the struggle for environmental integrity, social justice, and human rights. Its mission is to halt and reverse the degradation of river systems; to support local communities in protecting and restoring the well-being of the people, cultures and ecosystems that depend on rivers; to promote sustainable, environmentally sound alternatives to damming and channelling rivers; to foster greater understanding, awareness and respect for rivers; to support the worldwide struggle for environmental integrity, social justice and human rights; and to ensure that our work is exemplary of responsible and effective global action on environmental issues. IRN has initiated a Mekong Campaign project that watches over the development activities for instance, the hydropower development, improvement of the navigation routes, etc., which could induce adverse impacts on the ecosystems of the Mekong River Basin.

### **Mekong River Commission**

The Mekong River Commission (MRC) was founded under the "Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin" signed by Cambodia, the Lao PDR, Thailand and Vietnam on the 5th of April 1995 in replacement of the Committee for Coordination of Investigation of the Lower Mekong Basin (the Mekong Committee) and the Interim Mekong Committee, which were established earlier in 1957 and 1978, respectively. The purpose of the 1995 Agreement is to optimise the use and minimise the waste of the Basin's water resources. The MRC also holds an official dialogue with the two other states of the Mekong River Basin, China and Myanmar, which are not signatories of the 1995 Agreement. The MRC enjoys the status of an international body and it has signed several agreements and holds obligations with the donors and the international community. There are three permanent bodies in the MRC: Council, Joint Committee and Secretariat. Acting as focal points for the Commission in each of the member countries are the National Mekong Committees (NMCs). The MRC is the lead agency which deals with every aspect (from environment and natural resources to socio-economic management) relating to the management of the Mekong River Basin. The MRC Secretariat is the executive arm of the MRC with its headquarters in Phnom Penh, Cambodia. The Commission has formal agreements for cooperation with regional and international organisations, e.g. ADB, AIT, and ICLARM. Current programs carried out by MRC include: Water Utilisation Programme (WUP); Basin Development Plan (BDP); Environment Programme (EP); Integrated Capacity Building Programme; Fisheries Pro-

gramme; Agriculture, Irrigation and Forestry Programme; Water Resources Management Programme; Flood Management Programme; and Navigation Programme.

### **Oxfam International**

Oxfam International is an international non-governmental organisation (NGO) which seeks increased worldwide public understanding that economic and social justices are crucial to sustainable development. It strives to be a global campaigning force promoting the awareness and motivation that comes with global citizenship whilst seeking to shift public opinion in order to make equity the same priority as economic growth. Oxfam's goal is to enable people to exercise their rights and manage their own lives. From long-term programmes to short-term emergency relief and immediate campaign action, Oxfam believes in empowering people. Oxfam strives to work with local partners and takes a rights based approach to development work. Oxfam International has conducted several projects relating to the impacts of hydropower development on the environment and ecosystems of the Mekong River Basin over the past decade.

### **Partnership in Environmental Management for the Seas of East Asia (PEMSEA)**

PEMSEA is a GEF project which aims to build partnership within and among governments as well as with the public and private sectors of the East Asian Seas region in environmental management and to reduce or remove barriers to effective environmental management such as inadequate or inappropriate policies, disparate institutional and technical capabilities and limited investment in environmental facilities and services. PEMSEA is based on two management frameworks, namely, the integrated coastal management (ICM) framework for coastal area management and the risk assessment/management framework for assessing the impacts of human activities on marine ecosystems in sub-regional sea areas. Six ICM demonstration sites (one in each of Vietnam, Cambodia, Indonesia, Thailand, DPR Korea and Malaysia) and two sub-regional sea environmental management demonstration sites, in the Gulf of Thailand and the Bohai Sea, were established to test and validate the implementation of PEMSEA's environmental management frameworks. The ICM demonstration sites in Cambodia and Vietnam established by PEMSEA also conduct studies that have some direct relation with the Mekong River Basin.

### **Southeast Asia START Regional Center (SEA START RC)**

Southeast Asia START Regional Center is one of the regional research nodes of the Southeast Asia Regional Committee for START (SARC). Southeast Asia is one of eight regions in the Global Change System for Analysis, Research and Training (START) network, initiated jointly by the International Geosphere-Biosphere Programme (IGBP), the International Human Dimension Programme (IHDP), and the World Climate Research Programme (WCRP). START is a global network aimed at encouraging multidisciplinary research on the interactions of humans and the environment which are affecting and being affected by global changes. The START regional networks cover areas in Pan-Africa, Southeast Asia, South Asia, Temperate East Asia, Mediterranean, and Oceania. SEA START RC represents geographically: Australia, Brunei Darussalam, Cambodia, China-Taipei, Indonesia, Lao, Malaysia, Philippines, Singapore, Thailand and Vietnam.

SEA START RC was established in 1996 under a Memorandum of Understanding among Chulalongkorn University (CU), National Research Council of Thailand (NRCT), and International START. The Center is located on the Chulalongkorn Campus in Bangkok, Thailand. Its operational objectives are:

1. To develop integrated scientific and socio-economic approaches to reduce uncertainties of forecasting and assessing impacts of environmental change in the Southeast Asia region;
2. To provide recommendations and expert advice to governments and the private sector on coping with long-term environmental changes;
3. To encourage and support the sharing and exchange of environmental data and information within and between regions, and;
4. To promote public awareness on global environmental issues

### **Strategic environmental framework (SEF) for the Greater Mekong Subregion (GMS)**

The Strategic Environmental Framework (SEF) Project was created to help the Asian Development Bank (ADB) make funding decisions about infrastructure projects in the Greater Mekong Subregion (GMS) which includes Cambodia, Lao PDR, Myanmar, China (Yunnan province), Thailand and Vietnam. The Project was implemented with consulting inputs from the Stockholm Environment Institute (SEI), in collaboration with the UNEP Regional Resource Centre for Asia and the Pacific (UNEP RCC AP) and the Mekong River Commission (MRC). The project employs analytical, participatory and policy oriented processes to develop a strategic environmental framework for guiding investment decisions in the transport, water resources development and environmental sectors in the GMS. Its ultimate goal is to ensure these investments are environmentally and socially sustainable, and that environmental and social aspects, as well as cumulative impacts, are considered at an earlier stage in the planning process than currently takes place. It involved four broad phases: 1. Inception Phase (November 1998 - September 1999); 2. Analysis Phase (October 1999 - July 2000); 3. Production Phase (August 2000 - December 2000); and 4. Communication Phase (January 2001- April 2001). These phases involved a broad range of consultations with a spectrum of stakeholders and decision-makers in the region. The project has been completed and a final report of the project prepared.

### **United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP)**

The regional arm of the United Nations Secretariat for the Asian and Pacific region is the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP). The functions of UNESCAP have been defined by the Secretary General as follows:

1. Promoting economic and social development through regional and subregional cooperation and integration;
2. Serving as the main economic and social development forum within the United Nations system for the UNESCAP region;
3. Formulating and promoting development assistance activities and projects commensurate with the needs and priorities of the region while acting as an executing agency for relevant operational projects;
4. Providing substantive and secretariat services and documentation for the Commission and its subsidiary bodies;
5. Carrying out studies, research and other activities within the terms of reference of the Commission;
6. Providing advisory services to governments at their request;
7. Developing and executing programmes of technical cooperation;

8. Coordinating UNESCAP activities with those of the major departments/offices of the United Nations at Headquarters and specialised agencies and intergovernmental organisations.

Water-related activities in Asia and the Pacific Region are carried out under ESCAP's Water Resources Programme in the Environment and Natural Resources Development Division. The UNESCAP organises seminars and workshops in tackling various issues including those related to: (a) Water resources assessment; (b) Integrated water resources development and management; (c) Protection of water resources, water quality and aquatic ecosystems; (d) River basin development and management; (e) Promotion of infrastructure development and investment for drinking water supply and sanitation; (f) Water pricing and promotion of private investment in the water sector; (g) Water demand management, water saving and economic use of water; and (h) Mitigation of water-related natural disasters, particularly flood loss reduction. UNESCAP also undertakes studies relating to the environment and sustainable development, and provides a statistical database for the riparian countries of the Mekong River Basin.

### **UNEP Regional Office for Asia and the Pacific (ROAP)**

ROAP reports directly to the Division of Regional Cooperation and Representation of UNEP's headquarters in Nairobi. It was established to adopt global environmental policies to meet the regional priorities and needs, putting particular emphasis on building partnerships with regional and sub-regional and intergovernmental agencies, other UN agencies, national governments, NGOs, the private sector, academic and research institutions, civil society and the media. ROAP also acts as a catalyst, coordinator, facilitator and mobiliser of resources to support these activities.

### **World Resources Institute (WRI)**

WRI is an independent non-profit organisation based in Washington D.C., United States. The organisation has more than 100 scientists, economists, policy experts, business analysts, statistical analysts, mapmakers and communicators working to protect the Earth and improve people's lives. Studies on the biodiversity, protected areas and watersheds of the Mekong River Basin are being undertaken by two of its core programs: Biodiversity and Protected Areas and Water Resources and Freshwater Ecosystems.

# Annex IV

## List of conventions and specific laws that affect water use in the GIWA Mekong River region

### (A) List of Convention, Treaties and Agreements

Conventions/Treaties/Agreements	Year
<b>(1) Cambodia</b>	
- Ramsar Convention	1999
- International Trade of Endangered Species of Wild Flora and Fauna	1997
- Framework Convention on Climate Change	1996
- Convention on the Prevention of Marine Pollution	1996
- Convention on Biological Diversity	1995
- Coordinate Body of Southeast Asia Seas Agreement	1996
- International Convention for the Prevention of Pollution from Ships	1995
- International Convention on Civil Liability for Oil Pollution Damage	1995
- International Tropical Timber Agreement	1994
- Convention on the Protection of World Heritage	1993
- Plant Protection Agreement for Asia and the Pacific Region	1969
- Convention on the Fishing and Conservation of the Living Resources of the High Seas	1966
- Convention on Road Traffic	1956
- International Plant Protection Convention	1952
<b>(2) Yunnan province of China</b>	
- United Nations Convention on the Law of the Sea	1996
- Framework Convention on Climate Change	1994
- International Convention for the Prevention of Pollution from Ships, 1973 (MARPOL) Annex III (Optional): Hazardous Substances Carried in Packaged Form	1994
- Convention on Biological Diversity	1993
- Agreement for the Establishment of the Asia Pacific Fishery Commission	1993
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat	1992
- Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	1992
- Montreal Protocol for CFC Control	1991
- Plant Protection Agreement for Asia and the Pacific Region	1990
- Agreement for the Establishment of Network of Aquaculture Centers in Asia and the Pacific	1990
- Convention for the Protection of the Ozone Layer	1989
- Protocol to the International Convention on Civil Liability for Oil Pollution Damage	1986
- Convention on Protection of World Heritage	1986
- International Tropical Timber Agreement	1986
- Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	1985
- Amendments to the Annexes to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter	1985
- International Convention for the Prevention of Pollution from Ships (as modified by the Protocol of 1978)	1983
- Convention on International Trade of Endangered Species of Wild Flora and Fauna	1981
- International Convention on Civil Liability for Oil Pollution Damage	1980
- Convention on Road Traffic	1957
<b>(3) Lao PDR</b>	
- Convention for the Protection of the Ozone Layer	1998
- United Nations Convention on the Law of the Sea	1998
- Montreal Protocol for CFC Control	1998
- Convention on Biological Diversity	1996
- Framework Convention on Climate Change	1995
- Agreement on Cooperation for the Sustainable Development of the Mekong River Basin	1995
- Convention on the Protection of World Heritage	1987
- Convention on Road Traffic	1959
- Plant Protection Agreement for Asia and the Pacific Region	1950
- International Plant Protection Convention	1955

(Source: ADB/UNEP 2004)

Conventions/Treaties/Agreements	Year
<b>(4) Myanmar</b>	
- United Nations Convention on the Law of the Sea	1996
- Framework Convention on Climate Change	1995
- Convention for the Protection of the Ozone Layer	1994
- Montreal Protocol for CFC Control	1994
- Convention on Biological Diversity	1995
- Convention on the Protection of World Heritage	1994
- International Tropical Timber Agreement	1994
- Agreement for the Establishment of Network of Aquaculture Centers in Asia and the Pacific	1990
- International Convention for the Prevention of Pollution from Ships	1988
- Statutes of the International Center for the Study of the Preservation and Restoration of Cultural Property	1987
- Convention on the International Maritime Organisation	1963
- Agreement for the Establishment of the Asia Pacific Fishery Commission	1949
<b>(5) Thailand</b>	
- Framework Convention on Climate Change	1995
- Convention for the Protection of the Ozone Layer	1989
- Protocol on Substances that Deplete the Ozone Layer	1989
- Montreal Protocol for CFC Control	1989
- International Tropical Timber Agreement	1997
- Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin	1995
- Agreement for the Establishment of Network of Aquaculture Centers in Asia and the Pacific	1994
- Agreement for the Establishment of the Asia Pacific Fishery Commission	1948
- Convention on the Protection of World Heritage	1987
- Convention on International Trade of Endangered Species of Wild Flora and Fauna	1983
- International Plant Protection Convention	1978
- Convention on the International Maritime Organisation	1973
- Convention on the Fishing and Conservation of the Living Resources of the High Seas	1968
- Agreement on Establishing the Southeast Asian Fisheries Development Center	1967
- Statutes of the International Center for the Study of the Preservation and Restoration of Cultural Property	1967
- Convention on Road Traffic	1962
- Plant Protection Agreement for Asia and the Pacific Region	1956
- Convention on Biological Diversity	1989
<b>(6) Vietnam</b>	
- Framework Convention on Climate Change	1995
- Convention for the Protection of the Ozone Layer	1994
- Montreal Protocol for CFC Control	1994
- United Nations Convention on the Law of the Sea	1994
- Convention on Biological Diversity	1995
- Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	1995
- Agreement on the Cooperation for the Sustainable Development of the Mekong River Basin	1995
- Convention on International Trade of Endangered Species of Wild Flora and Fauna	1994
- Amendment to the Convention on International Trade of Endangered Species of Wild Flora and Fauna (Art XI)	1994
- International Convention for the Prevention of Pollution from Ships	1991
- Agreement for the Establishment of Network of Aquaculture Centers in Asia and the Pacific	1990
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat	1989
- Convention on the Protection of World Heritage	1988
- Convention on the International Maritime Organisation	1984
- Statutes of the International Center for the Study of the Preservation and Restoration of Cultural Property	1972
- Agreement on Establishing the Southeast Asian Fisheries Development Center	1968
- Plant Protection Agreement for Asia and the Pacific Region	1956
- Agreement for the Establishment of the Asia Pacific Fishery Commission	1951

(Source: ADB/UNEP 2004)

## (B) List of Policies, Laws, Decrees, Rules and Regulations

Policy/Law/Decree/Rule/Regulation	Year	Policy/Law/Decree/Rule/Regulation	Year
<b>(1) Cambodia</b>		<b>(4) Thailand</b>	
<b>1.1. Policies</b>		<b>4.1. Policies</b>	
- Natural Environmental Action Plan	1998 - 2003	- Policy and Prospective Plan for National Environmental Quality Enhancement and Protection	1997 – 2017
<b>1.2. Laws, Decrees, Rules &amp; Regulations</b>		- Environmental Quality Management Plan	1999 - 2006
- Sub-Decree on Water Pollution Control	1999	<b>4.2. Laws, Decrees, Rules &amp; Regulations</b>	
- Sub-Decree on Solid Waste Management	1999	- National Environmental Quality Enhancement and Protection Act	1992
- Sub-Decree on Environmental Impact Assessment (EIA)	1999	- Factories Act	1992
- Law on Environmental Protection and Natural Resources Management	1996	- Public Health Act	1992
- Royal Decree on Protected Areas	1993	- Cleanliness and Orderliness of the Country Act	1992
<b>(2) Yunnan province of China</b>		- Hazardous Substances Act	1992
<b>2.1. Policies</b>		- Poisonous Substances Act	1967
- 9th 5-Year Plan and Long-term Environmental Protection Plan for 2010 for Yunnan province	1996-2010	- Energy Conservation Promotions Act	1992
<b>2.2. Laws, Decrees, Rules &amp; Regulations</b>		- Wildlife Conservation and Protection Act	1992
- Forestry Law of the People's Republic of China	1998	- Forest Plantation Act	1992
- Law of the People's Republic of China on Conserving Energy	1997	- Forest Reserve Act	1964
- Flood Control Law of the People's Republic of China	1997	- National Park Act	1961
- Mineral Resources Law of the People's Republic of China	1996	- Forestry Act	1947
- Law of the People's Republic of China on the Coal Industry	1996	- Conservation of Wild Elephants Act	1921
- Law of the People's Republic of China on Prevention and Control of Water Pollution	1996	- Fishery Act	1945
- Law of the People's Republic of China on Prevention and Control of Environmental Pollution by Solid Waste	1995	- Mineral Act	1967
- Law of the People's Republic of China on Water and Soil Conservation	1991	- Groundwater Act No. 2	1992
- Law of the People's Republic of China on the Protection of Wildlife	1988	- Prevention of Ships Collision Act	1979
- Environmental Protection Law of the People's Republic of China	1989	- Groundwater Act	1977
- Water Law of the People's Republic of China	1988	- Navigation in Thai Waterways Act	1913
- Fisheries Law of the People's Republic of China	1986	<b>(5) Myanmar</b>	
- Grassland Law of the People's Republic of China	1985	<b>5.1. Policies</b>	
- Law of the People's Republic of China on the Protection of Cultural Relics	1982	- Myanmar Agenda 21	1997
- Circular on Strengthening Environmental Protection in the Tourism Area	1995	- National Environmental Policy	1994
- Regulation on Examining an Environmental Protection Facility along with Construction Projects	1994	- Forest Policy	1995
- Regulation on Environmental Pollution Prevention from the Electrical Facility and Wastes involved with PCBs	1991	<b>5.2. Laws, Decrees, Rules &amp; Regulations</b>	
- Ordinance on Radioactive Safeguards for Radioactive Isotope and Radiation	1989	- Draft Environmental Law	2000
- Regulation on Undertaking an Environmental Impact Assessment for the Construction Project	1989	- Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law	1994
- Circular on Strengthening the Supervision to the Wastewater Discharge from Pesticide Production	1997	- Mines Law	1994
- Provisional Regulations on Environmental Control for Economic Zones Open to Foreigners	1986	- Plant Pest Quarantine Law	1993
- Regulations on Management of the Environmental Protection Standards	1983	- Forestry Law	1992
<b>(3) Lao PDR</b>		- Freshwater Fisheries Law	1991
<b>3.1. Policies</b>		- Pesticide Law	1990
- Environmental Action Plan	1993	- Law on Aquaculture	1989
<b>3.2. Laws, Decrees, Rules &amp; Regulations</b>		- Law on Fishing Rights of Foreign Fishing Vessels	1989
- Prime Minister's Decree on Vientiane Urban Development and Administration Authority	2000	- Irrigation Laws and Regulations	1982
- Formalised Environmental Impact Assessment (EIA)	2000	- Factory Act	1950
- Environmental Protection Law	1999	<b>(6) Vietnam</b>	
- President's Decree on Urban Planning Law	1999	<b>6.1. Policies</b>	
- Mining Law	1997	- National Plan for Environmental and Sustainable Development	1991 - 2000
- President's Decree on Historical, Cultural and National Heritage Protection	1997	- Draft National Strategy for Environment Protection	2001 - 2010
- Prime Minister's Decree on Urban Development and Administration Authority (UDAA)	1997	<b>6.2. Laws, Decrees, Rules &amp; Regulations</b>	
- Prime Minister's Decree on Management and Use of Forest and Forestland	1993	- Instruction No. 490/1998/TT-BKHCMNT on Environmental Impact Assessments	1998
- Water and Water Resources Law	1996	- Decree No. 28/CP on Sanctions against Administrative Violations on Environmental Protection	1996
- Land Law	1997	- Law on Minerals	1996
- Forest Law	1996	- Decree No. 02/CP on Toxic Chemicals and Radioactive Substances	1995
- Prime Minister's Decree on the Protection of Sites and Buildings of National Importance	1994	- Instruction No.1420/QD-MTg for Guiding Environmental Impact Assessment to the Operating Units	1994
- Decree on Logging Ban	1991	- Decree 09/CP of the Government on Organising and Managing the Tourist Enterprise	1994
- Decree on Adoption of Tropical Forest Programme	1991	- Law on Environmental Protection	1993
- Decree on Wild Animals, Fisheries, Hunting and Fishing	1989	- Law on Land	1993
- Provisions on Discharge of Wastewater from Factories	1994	- Decree 14/CP on Administrative Fines in the Management and Protection of Forests	1992
- Regulations of Environmental Assessment in Lao PDR	2000	- Precious and Rare Wild Plants and Animals Regulating their Management and Protection	1992
		- Law on Forest Protection and Development	1991
		- Vietnam Maritime Code	1990
		- Law on the Protection of People's Health	1989
		- Law on Fisheries (draft)	
		- Law on Water Resources (draft)	
		- Vietnam Standards, Water Quality – Maximum Allowable Pesticide Residues in the Soil, TCVN 5941	1995
		- Vietnam Standards, Water Quality – Surface Water Quality Standard, TCVN 5942	1995
		- Vietnam Standards, Water Quality – Coastal Water Quality Standard, TCVN 5943	1995
		- Vietnam Standards, Water Quality – Ground Water Quality Standard, TCVN 5944	1995
		- Vietnam Standards, Water Quality – Discharge Standard, TCVN 5945	1995

(Source: ADB/UNEP 2004)

# Annex V

## Impact Assessment for GIWA Mekong River region:

### Environmental & socio-economic impact statements and causes of priority GIWA concerns and environmental issues

Priority GIWA Concern			Priority GIWA Environmental Issue		Impact Statement (environmental & socio-economic)	Possible Causes
Concern	Overall Environmental Impact Score	Socio-economic Impact Scores*	Issue	Overall Score		
III. Habitat and community modification	3	2-3-1	12. Loss of ecosystems	3	<p>1) The area of forestland decreased by 98 145 km<sup>2</sup> between 1993 and 2003; a loss of around 12% of the total forestland area.</p> <p>2) Large areas of mangrove forests around the Mekong Delta have been destroyed over the past 2-3 decades; around 120 000 ha remain today.</p> <p>3) The livelihood of the population in the MRB has been affected by the loss of forestland and mangrove forests.</p> <p>4) The loss of ecosystems in the region has substantial transboundary implications.</p>	<p>1) The loss was largely due to excessive logging, uncontrolled shift cultivation, encroachment of forest reserves by human settlements, and uncontrolled farming and infrastructure development, as well as the increasing use of wood fuel and inappropriate land occupation.</p> <p>2) The loss was due to wartime hostilities and post-war agricultural expansion as well as the conversion of mangroves to shrimp ponds.</p> <p>3) Because the rural communities in the region depend on the natural resources of the ecosystems to subsist, the loss of ecosystems will reduce their income and quality of life.</p> <p>4) Most of the fish species in the MRB are migratory; the destruction of spawning or breeding habitats in one riparian country affects the recruitment and harvest of fish in other riparian countries.</p>
			13. Modification of ecosystems	3	<p>1) Millions of hectares of valuable forestland in the region have been degraded to inferior shrub, grassland or savannah.</p> <p>2) The aesthetic and recreational values of the habitats have been greatly reduced.</p> <p>3) Cost of controlling alien species and restoring ecosystems.</p> <p>4) Employment opportunities, particularly in the fisheries sector, have substantially declined.</p> <p>5) Modification of ecosystems, e.g. the Melaleuca forest land, has substantial transboundary implications for environmental management.</p>	<p>1) The degradation is caused by unsustainable human and development activities, e.g. population growth, deforestation, urbanisation, dam construction, irrigation, etc.</p> <p>2) The modification of habitats has reduced the number of goods and services that they provide.</p> <p>3) The introduction of alien species for aquaculture, the stocking of lakes and reservoirs and the aquarium trade.</p> <p>4) Modifications or loss of habitats indirectly influences fisheries production which, in turn, changes the employment opportunities for fishers.</p> <p>5) Some of these forests are transboundary in that they cover more than one territory.</p>
IV. Unsustainable exploitation of fish & other living resources	3	2-3-0	14. Overexploitation	3	<p>1) Catches per fisherman have declined by approximately 44% between the 1940s and 1995.</p> <p>2) The abundance of fish resources in the region has declined over the past decade.</p> <p>3) Employment opportunities in the fisheries sector have decreased.</p> <p>4) The livelihood strategies of local communities have significantly changed.</p> <p>5) Competition among fishermen from different countries due to them fishing the same migratory stocks.</p>	<p>1) The number of fishermen has greatly increased and the larger population places additional pressure on the fisheries.</p> <p>2) The building and operation of dams and weirs has disrupted fish migration and spawning, thus reducing fisheries productivity; habitat loss and deforestation have modified or destroyed habitats that fish require for spawning and feeding; the use of destructive fishing practices has reduced fish recruitment.</p> <p>3) Overexploitation has led to a reduced catch per unit effort, which has affected employment opportunities in the fisheries sector.</p> <p>4) The loss of commercially valuable fish species and the destruction of habitats has forced fishers to seek alternative livelihoods.</p> <p>5) Migratory fish constitute a significant proportion of the some 1 500 species of ichthyofauna in the MRB. Conflicts arise from foreign fishers operating in the fishing grounds of their neighbouring country.</p>

\* Scores for: Social & Community – Economic – Human Health, respectively.

Priority GIWA Concern			Priority GIWA Environmental Issue		Impact Statement (environmental & socio-economic)	Possible Causes
Concern	Overall Environmental Impact Score	Socio-economic Impact Scores*	Issue	Overall Score		
<b>IV. Unsustainable exploitation of fish &amp; other living resources</b> <i>- continued</i>	3	2-3-0	<b>18. Impact on biological &amp; genetic diversity</b>	3	<p>1) Current practices used for the introduction and movement of alien fish in the MRB have resulted in the degradation of the genetic quality of wild stocks.</p> <p>2) The degradation of the genetic quality of fish stocks has transboundary implications for fisheries management.</p>	<p>1) Such practices are chaotic and uncontrolled, particularly in the aquaculture sector; alien fish species that are established in the local environment have replaced endemic species and reduced the biodiversity of wild stocks.</p> <p>2) Most of the fish species in the region are migratory species. There is evidence that the biological and genetic diversity of some of these species has changed as a result of overexploitation.</p>
<b>II. Pollution</b>	2	2-1-2	<b>7. Suspended solids</b>	3	<p>1) High TSS loads in the mainstream and the tributaries of Mekong.</p> <p>2) High TSS loads in the Mekong River system have affected the well-being of the population in the MRB.</p> <p>3) TSS pollution has transboundary implications for management.</p>	<p>1) Development activities such as deforestation, mining, grazing and urbanisation have caused extensive erosion in many parts of the MRB.</p> <p>2) High TSS loads destroy or modify critical habitats, particularly spawning and breeding grounds of fish, resulting in a reduction in ecosystem products and services.</p> <p>3) Suspended solids are carried from one part of the MRB to another, from upstream to downstream of the Mekong River, blocking channels, destroying or modifying habitats and forming deltas at the river mouths.</p>
<b>I. Freshwater shortage</b>	2	2-1-1	<b>1. Modification of stream flow</b>	3	<p>1) The hydrological cycle of the Mekong River and its tributaries is altered periodically.</p> <p>2) The course and flow volume of the Mekong River and its tributaries has changed.</p> <p>3) Changes in the hydrological cycle and the flow volume of the Mekong River and its tributaries have imposed substantial transboundary implications for environmental management.</p> <p>4) The well-being of the population in the MRB has been affected by changes in the course and flow volume of the Mekong River and its tributaries.</p>	<p>1) Heavy rainfall during the rainy season results in the flooding of lowland areas in the MRB.</p> <p>2) Human and development activities, such as the construction of dams, improvement of river navigation routes, diversion of river water for irrigation etc., have greatly modified the flow regime of the Mekong River and its tributaries.</p> <p>3) The Mekong River is an international river that traverses six countries. The upstream modification of stream flow affects downstream environmental conditions.</p> <p>4) Flooding causes varying degrees of damage to agricultural production, rural infrastructure and human settlements, as well as causing a loss of life.</p>

\* Scores for: Social & Community – Economic – Human Health, respectively.

# Annex VI

## Alien species introduced to the Mekong River Basin

(Source: Welcomme & Vidthayanom 2003)

Introduced/alien species	Description of the introduction
1. Arapaima ( <i>Arapaima gigas</i> )	This species has been introduced to the MRB through the aquarium fish trade. Some experiments have been made for its aquaculture development. Escaped individuals have occasionally been found in natural waters in central Thailand. The species is long-lived and can grow to a very large size. It is a voracious predator and a mouth brooder.
2. Goldfish ( <i>Carassius auratus</i> )	It has been introduced to Thailand as an ornamental fish from China around 1300 AD and to Vietnam at an unknown date. The species reproduces naturally in captivity but does not apparently do so in the natural waters of Thailand. More recently, a variety of this species was recorded in the MRB; these are probably escapees from the Red River Basin in Vietnam and from the river network in Lao PDR, and they are presumed to be breeding naturally. Goldfish is a generalised feeder and sticks its spawned eggs onto aquatic plants.
3. Mrigal carp ( <i>Cirrhinus cirrhinus</i> )	This species is one of the Indian major carps introduced from India into Lao PDR (1977) and Thailand (1979), and later from Lao PDR into Vietnam (1984) for aquaculture. The species is also used for stocking dams. It is thought to be breeding naturally within the basin, since its fry have been found in the mainstream of the Mekong River in northeast Thailand. There are two native or endemic species of <i>Cirrhinus</i> , which have better eating qualities, but do not respond well to culture in ponds. The species is used for aquaculture throughout the MRB, where it is regarded as generally beneficial. The Mrigal carp lays demersal eggs and feeds on detritus and periphyton.
4. African catfish ( <i>Clarias gariepinus</i> )	The African catfish was first introduced into Vietnam from the Central African Republic in 1974 for aquaculture. It has since been introduced into other riparian countries of the MRB by internal transfer. It has been widely used for aquaculture and has been hybridised with the native <i>Clarias macrocephalus</i> ( <i>C. gariepinus</i> male x <i>C. macrocephalus</i> female). A wild population of the fish has been reported to be established throughout the MRB. However, no immediate detrimental environmental effects have been noted in the MRB or in other areas to which the species has been introduced. The species has a wide range of feeding habits from predation to generalised benthic feeders, and migrates to shallow flooded areas to spawn large quantities of adhesive eggs. The fish and its hybrids are highly tolerant of poor water quality and deoxygenated conditions. This tolerance gives the species and the hybrid a competitive advantage over native clariid catfish.
5. Grass carp ( <i>Ctenopharyngodon idella</i> )	It is one of the first species introduced to the MRB. It was introduced from China and Hong Kong to Thailand in 1932, to Vietnam in 1958 and to Lao PDR at an undetermined date. The species is used for aquaculture throughout the MRB and is highly appreciated by consumers. It has also been stocked in reservoirs, ditches and canals to control invasive aquatic vegetation. The species does not breed naturally in any part of the MRB and its aquaculture is normally maintained by artificial reproduction and continuous stocking. As its name suggests, the grass carp is one of the few fish to feed primarily on higher vegetation.
6. Common carp ( <i>Cyprinus carpio</i> )	The species was introduced into Thailand from China, Japan, Israel and Germany from 1913 onwards, into Lao PDR from Thailand and India in 1977, and into Vietnam from Hungary during the period 1969–1975. A complex of variant species has established themselves since the introduction of the species to the MRB. They can be differentiated into two groups: the silver varieties originating from southern China and northern Vietnam, and the yellow varieties originating from eastern Europe. The Common carp has been the keystone species for many aquaculture development projects in the MRB. The species complex is widely established in the wild and in many areas, and is now regarded as a permanent element of the fauna in the MRB. Common carp are notorious for the way their populations rapidly increase following environmental disturbances by dams. Their habit of digging around in the bottom and muddying the water can seriously alter the environment to the detriment of other species. Given that the species is now firmly established, there seems little that can be done to eradicate this potentially troublesome fish. Common carp are basically detritus and mud feeders. They breed on the vegetated margins of lakes and rivers where they deposit their adhesive eggs on submerged vegetation.
7. Mosquito fish ( <i>Gambusia affinis</i> )	The species was introduced into drainage ditches throughout the MRB at an unknown date for mosquito control, escaping later into the main tributaries of the Mekong River. It is now found at the margins of most water bodies including rice fields and floodplain lakes. The species is tolerant of high salinity and it is not regarded as detrimental although its habit of eating eggs and larvae of other fish may do some damage to fish stocks. The species feeds on surface-living insects and other particulate matter falling on the surface, and it is a live-bearer.
8. Catla carp ( <i>Catla catla</i> )	The species was introduced into Lao PDR from India in 1977 and Thailand in 1979. Subsequently, some of Lao PDR's stock was introduced to Vietnam for aquaculture in 1984. It is also used for stocking dams and has been recorded as breeding naturally within the waters of MRB but no natural stocks have been reported. Due to its slow growth rate, culture of this species has been largely abandoned in Thailand and Vietnam. The Catla carp feeds on phytoplankton and detritus and normally lays demersal eggs in the mainstream of a river.
9. Silver carp ( <i>Hypophthalmichthys molitrix</i> )	The species was introduced from China into Thailand in 1913 and Vietnam in 1958 for aquaculture. It is widely used for aquaculture throughout the MRB and is artificially bred for this purpose. The species is recorded as having established itself in the Saigon River. Fry of the species have been reported in tributaries of the Mekong River in LMRB, indicating that it has possibly established there. The species feeds on detritus and phytoplankton and may compete with species of similar habit in the MRB.
10. Bighead carp ( <i>Hypophthalmichthys nobilis</i> )	Bighead carp were introduced from China into Thailand in 1932 and Vietnam in 1958 for aquaculture. This species does not breed naturally in ponds and continues to be artificially reproduced. However, fry of the species have been found in the Red River and Saigon River indicating that it has possibly established in those rivers as well. The species feeds primarily on phytoplankton.
11. Black sucker catfish ( <i>Hypostomus plecostomus</i> )	Black sucker catfish were introduced throughout the MRB countries for the aquarium fish trade. They have been found in rice fields in northeast Thailand for at least ten years and in small urban water bodies. The natural environment where the species dwells ranges from rapids to floodplain pools. Therefore, it can be anticipated that it will spread throughout the MRB.
12. Rohu carp ( <i>Labeo rohita</i> )	This is another species of the Indian major carp group that was introduced from India into Thailand in 1968, Lao PDR in 1977 and Vietnam in 1982–1984 for aquaculture. Nowadays, the species is widely used for aquaculture throughout the MRB countries. It is preferred more than the native species because it is easier to breed artificially and responds better to handling. Its fry are occasionally found in the mainstream of the Mekong River, indicating that the species is breeding naturally although some fry may be released from culture installations. The Rohu carp are generally periphyton and detritus feeders and lay semi-pelagic eggs.
13. Black carp ( <i>Mylopharyngodon aureus</i> )	Black carp were introduced from China into Thailand for aquaculture as early as 1913. But since 1980, the species has not been aquacultured; the reason for the disappearance of the species is not known.
14. Green tilapia ( <i>Oreochromis aureus</i> )	This species was introduced into Thailand in 1970 from Israel. Although the species has not been popular for aquaculture, it appears to have established itself in reservoirs in tributaries of the Mekong River in northern Thailand. These populations are still in existence and the spread of the species further downstream cannot be excluded. The species is a generalised feeder with a preference for detritus and decanted phytoplankton. It also eats small fish and fish larvae. The species is a maternal mouth brooder that constructs nests in shallow water for breeding and fertilisation.
15. Red throat tilapia ( <i>O. mossambicus</i> )	This is one of the most widespread tilapia species used for aquaculture and stocking of reservoirs in the MRB. It was first introduced to Thailand in 1949 from Malaysia, and into Vietnam from Africa and the Philippines during the period of 1951–1955, into Lao PDR in 1955 from Thailand, and into Cambodia at an unknown date. The species may form established stocks in the MRB, particularly in saline environments, such as Lake Nont Bo in northeast Thailand, as well as throughout the Mekong Delta. Red throat tilapia is notorious for forming dense populations of stunted fish, particularly in brackish water areas and small canals and lakes, as has happened in the Mekong Delta. The species is a maternal mouth brooder that constructs nests in shallow water for breeding and fertilisation.

16. Nile tilapia ( <i>O. niloticus</i> )	This introduced species is one of the most popular for aquaculture and for stocking dams and reservoirs throughout the tropical world, including the LMRB. It was introduced into Thailand from Japan in 1965, into Vietnam in 1973 and 1994 from Taiwan, the Philippines and Thailand, and into Lao PDR and Cambodia at an unknown date. The species is not known to have any detrimental environmental impact throughout its introduced range and has become one of the pan-tropical species. It is one of the few species that can readily digest blue green algae and as such is of value in the control of eutrophication. It also eats detritus and can feed on small fish and fish larvae. The species is a maternal mouth brooder that constructs nests in shallow water for breeding and fertilisation. The GIFT strain of <i>O. niloticus</i> is now reared in and distributed from the Government hatchery in Khon Kaen (Thailand), which is further developing the strain to meet local conditions. Several private hatcheries are licensed to produce this fish for sale to both pond and cage culture locations. The Khon Kaen hatchery maintains the Egyptian Manzalla strain of <i>O. niloticus</i> .
17. Red tilapia	Red tilapia is in fact the variant species formed from hybrids between <i>O. niloticus</i> and <i>O. mossambicus</i> . This variant hybrid is saline tolerant and is popular in Thailand and Lao PDR for aquaculture in ponds and cages.
18. Red cheek tilapia ( <i>Oreochromis rendalli</i> )	Red cheek tilapia was introduced from Belgium into Thailand in 1955 for aquaculture. Established populations of this species exist in reservoirs around Sakon Nakhon in northeast Thailand. It is a parental guarder that lays its eggs in a series of small pit-like nests.
19. Guppy ( <i>Poecilia reticulata</i> )	This species has been introduced into Thailand as an ornamental fish for the aquarium trade as well as for mosquito control. It has established itself in the wild in small streams and ditches, rice fields and other shallow, still water habitats throughout the LMRB. The species is a live bearer and feeds mainly on surface material, including small insects.
20. Sailfin molly ( <i>Poecilia velifera</i> )	The Sailfin molly was first introduced from Taiwan into Thailand for the aquarium fish trade around 1970. The species is also found in the Mekong Delta in Vietnam. It is a live bearer and is a microphagous omnivore.
21. Apple snails ( <i>Pomacea canaliculata</i> , <i>P. gagas</i> )	These species have been introduced from various sources into Thailand for aquaculture from 1988 onwards. Apple snails have now established in the wild and have shown a major impact on aquatic habitats, including rice fields because they have the habit of destroying the bases of growing aquatic plants, causing enormous economic losses for rice farmers and the degradation of natural wetland habitats by stripping vegetation. The snails have a very broad spectrum of feeding habits, using most aquatic plants including water hyacinths. In addition, the introduced snails compete with the endemic species of snails such as <i>Pila</i> spp., which are relatively benign in their effect, since they feed only on already moribund plants. Apple snails are tolerant of salinity and are thus able to penetrate coastal habitats. This is an example of the disastrous consequences that can follow an inappropriate introduction of an alien species.
22. Louisiana crayfish ( <i>Procambarus charkii</i> )	It has been introduced into Thailand from an unknown source for aquaculture. The species has established itself in the wild where it is regarded as a nuisance.
23. Chinese soft-shell turtle ( <i>Pelodiscus chinensis</i> )	Chinese soft-shell turtle was introduced into Thailand on several occasions since 1977. It is now regularly reproduced in captivity and has formed natural populations. These have impacted on native turtle species.
24. American painted turtle ( <i>Pseudemys scripta</i> )	This turtle species was introduced to Thailand in 1975 for the aquarium trade. It is now bred in captivity and has formed natural populations in Central Thailand. It is probably found in the Mekong River watersheds because there is a tendency on the part of owners to release them when they have grown beyond an acceptable size.
25. American bullfrog ( <i>Rana catesbiana</i> )	The American bullfrog was introduced into Thailand for aquaculture in the 1980s. It has become established in the wild and its ecological impact is unknown. The species is apparently already found in the Vietnamese part of the MRB; probably having been released by farmers when it was apparent that the culture of this species was not profitable.
26. Japanese eel ( <i>Anguilla japonicus</i> )	Although the species was introduced into Thailand in 1973 for the purpose of aquaculture, commercial aquaculture of this species was not popular. There is no indication that this species has established itself in the MRB.
27. Channel catfish ( <i>Ictalurus punctatus</i> )	Channel catfish was first introduced from the United States into Thailand in 1989 for aquaculture. It was also introduced into central and northern Thailand where it was cultured experimentally. All fish escaped during the great flood of 1995 and were later found in the natural habitat. However, there are no further records of the impact of this introduction. This species is a generalised bottom feeder that can adopt predatory habits. It builds nests for its eggs, which are later guarded by the parents.
28. Rainbow trout ( <i>Onchorhynchus mykiss</i> )	This species was introduced from Canada into Thailand in 1963 for the purpose of establishing a sport fishery in the mountainous areas in the north of the country. The introduction was unsuccessful and did not affect the Mekong River system. However, similar proposals surface from time to time in the interests of tourism and some eggs have been introduced into Northern Thailand for experimental culture. It is doubtful that this species would establish in the lower reaches of the river but may do so in the high mountainous tributaries of the UMRB in Yunnan province, China.

