



Republic of Yemen  
Sana'a University  
Water and  
Environment Centre

**Water and Environment Centre, Sana'a University, Sana'a, Yemen**

**MSc Programme on Integrated Water Resource Management**

## **Module on Integrated Coastal Zone Management Programme**



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## 1 Course objectives

After following the course students should:

- Know what the ICZM concept is about, what important ICZM issues in Yemen are and the role of the IWRM can play in the sustainable management of coastal zones in Yemen;
- Be able to identify the user functions, forces and processes in the coastal zones of Yemen and how they cause pressure on the natural system;
- Be able to apply the principles of IWRM to sustain development in the coastal zones of Yemen;
- Know which information is needed in ICZM and how to obtain this information by monitoring and research programs.

## 2 Course set-up

The study load is 106 hours divided over 8 weeks in period January – March 2007. During this period two other courses are planned. The course consists of lectures, practical training & exercises and a study tour (Table 1):

- **Lectures.** In the lectures, the theoretical background is presented and discussed. Lectures materials consist of PowerPoint's, handouts and background handbooks and papers.
- **Practical training & exercises.** In the practical training & exercises sessions, the students will work on an individual (or group) assignments leading to a (discussion) papers on the role of IWRM in ICZM in Yemen describing the opportunities and limitations for sustainable management of one of the sectors (e.g. natural ecosystems, eco-tourism, fisheries or aquaculture, agriculture, etc). For this, the participants will form 5 groups. Each group will select one of the major coastal zones in Yemen, i.e. Tihama, Tuban-Abyan, Ahwar-Maifa'ah & Al-Mukalla, Al Ghaydah or Socotra. The groups will work out, for each theme, a number of assignments, leading to the above mentioned discussion papers.
- **Excursion.** The excursion will be a one-week study tour to the coastal zones near Aden and Red Sea Coast, where projects and organizations involved in coastal zone management will be visited.

The course will be concluded with a written examination.

Table 1 Course set-up

Activity		Study load [hours]
Lectures	7 weeks x 3 lectures x 2 hours	42
Practical training & exercises	7 weeks x 3 lectures x 2 hours	42
Excursions	one-week study tour	22
Self Study		Pm
<b>Total Study Load</b>		<b>106</b>

### 3 Course schedule in 2007

Date	No	Subject	Lect. [hrs]	Assign. [hrs]	Lecturer
6-10 Jan	<b>1</b>	<b>General Introduction</b>			
	1.1	Introduction to coastal zones in Yemen	2	2	Abu-Lohom
	1.2	Coastal land forms in Yemen	2	2	Abu-Lohom
	1.3	The role of IWRM in ICZM	2	2	Babaqi
		<b>Sub-total General Introduction</b>	<b>6</b>	<b>6</b>	
13-17 Jan	<b>2</b>	<b>User Functions and Processes in Coastal Zones of Yemen</b>			
	2.1	User functions in the coastal zones of Yemen	2	3	Al-Hariri
	2.2	The relation of the user functions with IWRM in the coastal zones in Yemen	2	3	Al-Hariri
	2.3	Agricultural processes and challenges in Yemen's coastal zones	2		Al-Hibshi
20-24 Jan	2.4	Coastal forces and natural processes	2	3	Al-Hariri
	2.5	Current developments that are affecting the coastal (eco)systems	2	3	Al-Hariri
	2.6	Water desalinization: opportunities & limitations in Yemen's coastal zones	2		Babaqi
		<b>Sub-total Functions and Processes</b>	<b>12</b>	<b>12</b>	
27-31 Jan	<b>3</b>	<b>The Role of IWRM in Integrated Coastal Zone Management</b>			
	3.1	The need for an integrated approach in coastal zone management	1	1	Babaqi
	3.2	Principles and practices to integrate IWRM in ICZM	3	5	Babaqi
	3.3	Socotra: the treasure island of Yemen	2		SCDP
3-8 Feb	3.4	Policy, legal and institutional frameworks	6	6	Bahamish
		<b>Sub-total The Role of IWRM in ICZM</b>	<b>12</b>	<b>12</b>	
10-14 Feb	<b>5</b>	<b>Excursion to Aden and Red Sea Coast</b>		<b>22</b>	Al-Hariri / Abu-Lohom /Ritzema
17-22 Feb	<b>4</b>	<b>Sustainable Development of Coastal Zones in Yemen</b>			
	4.1	Management strategies & instruments	6	6	Abu-Lohom /Ritzema
24 Feb - 1 Mar	4.2	Information needs, monitoring and indicators	6	6	Abu-Lohom
		<b>Sub-total Sustainable Development of Coastal Zones in Yemen</b>	<b>12</b>	<b>12</b>	
		<b>Grand total</b>	<b>42</b>	<b>64</b>	

## 4 Course Content

### 4.1 Theme 1: General introduction

#### 1.1 Introduction:

#### 1.1 Introduction to Coastal Zone Management (2 hours):

- Why integrated coastal zone management?
- Concept and definitions: IWRM, ICZM, ICARM, coastal waters, marine waters, wadi's, groundwater bodies.
- Linkage between and managing river basins and the coastal zone.
- The need for and benefits of an integrated approach.
- How does ICZM work?

#### 1.2 Coastal Zones in Yemen (2 hours):

- Brief description of the coastal zones in Yemen:
  - *Tihama Coastal Zone*, between the Western Highlands and the sea from the international border with Saudi Arabia about 400 km towards the south. The Tihama Coastal Zone is the main agricultural region in the country, water supply for irrigation comes from spate and base flow and groundwater abstraction.
  - *Tuban-Abyan Coastal Zone*, situated 250 km along the Gulf of Aden between the escarpment of the Southern Mountains and the sea from Bab Al Mandab in the west to Shuqrah in the east.
  - *Ahwar-Maifa'ah* and *Al-Mukalla Coastal Zones* extend over 400 km along the Gulf of Aden from Al Kabr in the west to Qusayir between the escarpment of the Southern Mountains and the sea.
  - *Al Ghaydah Coastal Zone* is in the extreme east of the country. This region is the most arid and remote parts of the country and receives limited and infrequent recharge.
  - *Socotra*. The Socotra archipelago is located in the north-western Indian Ocean, some 400 km south of the Arabian Peninsula. The archipelago consists of the main island of Socotra (3625km<sup>2</sup>) and three smaller islands, Abd Al Kuri, Samha and Darsa. The archipelago is considered a special conservation area of high importance.
- Current developments in the coastal zones in Yemen.
- What are the challenges faced to sustain these developments.

#### 1.3 The role of IWRM in ICZM (2 hours)?

- Introduction and explanations of the (f)actors in IWRM.
- The need for adopting IWRM principles in ICZM.

#### 1.4 Practical & exercises (6 hours):

The participants will form five groups; each group will select one coastal zone, i.e. Tihama, Tuban-Abyan, Ahwar-Maifa'ah & Al-Mukalla, Al Ghaydah or Socotra. Each group will work on a number of assignments for each theme, leading to a discussion paper on the role of IWRM in ICZM in Yemen describing the opportunities and limitations for sustainable management of one of the sectors, e.g. natural ecosystems, eco-tourism, fisheries or aquaculture, agriculture, etc. (for more information see Chapter 3.4.5 Overall assignment). For this theme, each group will make the following assignment:

- **Assignment no. 1:**
  - Make an inventory of the literature/background information that is available for the coastal zone you have selected. This inventory will be used as resource material for all assignments. Update it whenever you obtain new information.

- Make a brief description of the selected zone: describe the climate, land use, (geo)-hydrology (upstream, in the area and downstream), main activities, main actors (users), main constraints and foreseen developments.
- Explain why ICZM is needed?
- Is there a need/role for IWRM?

The results of this assignment will be used in the next theme.

<b>Lect.</b>	<b>Materials/papers</b>
1.1	<ul style="list-style-type: none"> <li>• UNEP (1999): Chapter 1 Introducing Integrated Coastal Area and River Basin Management, p: 4-7</li> <li>• Beatley et al (2002): Chapter 1 Introduction, pp: 1-12</li> <li>• Beatley et al (2002): Chapter 2 Defining the Coastal Zone, pp: 13-14</li> <li>• UNEP (1999): Appendix 2 Coastal Classification, pp: 71-72</li> <li>• Clark (1996): Glossary, pp:651-664</li> </ul>
1.2	<ul style="list-style-type: none"> <li>• Rybakov (1999) Tihama (pp: 41-48), Tuban-Abyan (pp:94-101), Ahwar-Mayfa'ah and Al Mukalla (pp: 1002-108) and Al Ghayday (pp: 109-112)</li> <li>• PERSGA (2001): Republic of Yemen, pp: 149-181</li> <li>• Beatley et al (2002): Chapter 2 Types of Coastal Land Forms and Coastal Ecosystems</li> </ul>
1.3	<ul style="list-style-type: none"> <li>• GWP (2003): Introduction, Policy Choices And Challenges pp: 1-11</li> <li>• Babaqi (2006): Integrated Water Management – Introduction to IWRM</li> <li>• Rasch et al (2005): Linking integrated water resources management and integrated coastal zone management.</li> </ul>
1.4 Practical & Exercises	<p>In addition to the above mentioned literature:</p> <ul style="list-style-type: none"> <li>• GWP (2006): Toolbox</li> <li>• MPD (1998) Human Development Report</li> </ul>

#### **4.2 Theme 2: User functions and processes in coastal zones of Yemen**

- 2.1 User functions and resources in the coastal zones of Yemen (2 hours):
- Natural ecosystems/habitats: coastal reefs, mangroves, wetlands, soft sediments, sea grass beds, turtle nesting zones, etc.
  - Agriculture: irrigation practices, use of groundwater, etc.
  - Fisheries: commercial fishing off shore and inshore, aquaculture, etc.
  - Commercial: (oil) industry, harbours, urbanization, etc.
  - Water supply and sanitation: use of groundwater, sewage, etc.
  - Transport: shipping, oil pipelines, etc.
  - Tourism
- 2.2 The relation between the user functions and IWRM in the coastal zones in Yemen (2 hours):
- How do these functions use or affect the water resources?
  - How do these functions affect each other?
  - Benefits of applying the IWRM principles for the sustainable management of these functions.
- 2.3 Agricultural processes and challenges in Yemen's coastal zones (2 hours)
- 2.4 Coastal forces and natural processes (2 hours):
- Wind
  - Waves

- Currents
  - Tides
  - Storms
  - Sea Level Rise
  - Erosion and accretion
  - River flows
  - Salt water intrusion
  - Surface and groundwater flows
  - Geo-hydrological conditions
  - Water quality
- 2.5 Current developments that are affecting the coastal (eco)systems in Yemen (2 hours):
- Water use in the upstream watersheds: reduction of river flows, water quality
  - Groundwater extraction
  - Water supply and sanitation, including the disposal of sewage water
  - Harbour developments
  - Aquaculture: Shrimp farming
  - Eco-tourism
  - Land use changes: crop diversification, improved/changing irrigation practices, etc.
- 2.6 Water desalinization: opportunities & limitations in Yemen's coastal zones (2 hours)
- 2.7 Practical & exercises (12 hours):
- **Calculation exercise:** salt-fresh water dynamics.
- Per group make the following assignments:
- **Assignment no. 2:** Describe the user functions and natural processes in “your” coastal zone: put emphasis on the water-related functions: rain water, surface water, groundwater (fresh or saline) and the related biological and ecological aspects. How do human activities affects these functions?
  - **Assignment no. 3:** Describe how these functions and processes affect each other. How do human activities affects these interrelations?
  - **Assignment no. 4:** Describe how these functions and processes affect the water resources. Differentiate between the water resources inside and outside the coastal zone. Use the SWOT (**S**trengths, **W**eaknesses, **O**pportunities and **T**hreats) analysis for this assignment.

Lecture	Materials/papers
2.1	<ul style="list-style-type: none"> <li>• UNEP (1999): Chapter 2 Natural Systems in River Basin and Coastal Zones, pp: 9 – 18</li> <li>• UNEP (1999): Chapter 3 River Basins, Coastal Zones and Human Usage, pp: 19-34</li> <li>• PERSGA (2001): Republic of Yemen, pp: 149-181</li> <li>• Clark (1999): Part 3 Management Information, pp: 221-478</li> </ul>
2.2	<ul style="list-style-type: none"> <li>• GWP (2006): Toolbox</li> </ul>
2.3	Literature/background information: to be added
2.4	<p>In addition to the above mentions literature:</p> <ul style="list-style-type: none"> <li>• Beatley et al (2002): Chapter 2 Understanding the Coastal Environment, Coastal Forces and Process, pp: 30-44.</li> <li>• Clark (1999): Part 3 Management Information, pp: 221-478</li> <li>• Todd (1980): Chapter 14 Saline Water Intrusion in Aquifers, pp: 494-520</li> </ul>
2.5	<ul style="list-style-type: none"> <li>• PERSGA (2001): Republic of Yemen, pp: 149-181</li> <li>• Clark (1996), Part 1 Chapter 3 Development Impacts, pp: 8-19</li> </ul>

	<ul style="list-style-type: none"> <li>• Beatley et al (2002): Chapter 3 Coastal Pressures and Critical Management Issues, pp: 53-90.</li> </ul>
2.6	<ul style="list-style-type: none"> <li>• Literature/background information: to be added</li> </ul>
2.7 Practical & Exercises	<p>In addition to the above mentioned literature:</p> <ul style="list-style-type: none"> <li>• GWP (2006): Toolbox</li> <li>• Phillips and Jones (2006)</li> <li>• PERSGA (2001): Republic of Yemen, pp: 149-181</li> <li>• Clark (1999): Part 3 Management Information, pp: 221-478</li> <li>• Newman (2000) Applied Ecology &amp; Environmental Management, Chapter 3 Water (pp: 48-78), Chapter 4 Soil (pp: 79-116), Chapter 5 Fish from the Sea (pp 117-144), Chapter 9 Pollution (pp: 245-280)</li> <li>• Phillips and Jones (2006): Erosion and tourism infrastructure in the coastal zone: Problems, consequences and management.</li> <li>• Background on SWOT (to be added).</li> </ul>

### 4.3 Theme 3: The role of IWRM in integrated coastal zone management

- 3.1 The need for an integrated approach in coastal zone management
- Solutions through management
  - Integrated approach
- 3.2 Principles and practices to integrate IWRM in ICZM:
- How to apply the water management principles (economic efficiency, equity and environmental sustainability) to the user function in the coastal zones in Yemen?
  - Implementation tools: (i) enabling environment; (ii) institutional roles and functions, and (iii) management instruments
  - Cross-sectoral integration
- 3.3 Socotra: the treasure island of Yemen
- The Socotra Archipelago
  - Zoning plan for Socotra: criteria for matching functions (activities) with resources.
- 3.4 Policy, Legal and Institutional Frameworks:
- Relevant international conventions/guidelines, national laws and regulations [water quantity, water quality and ecology, user functions & water abstractions, land use, traditional water rights].
  - Overview of relevant agencies and institutions related to coastal zone management of Yemen
  - Financial arrangements for coastal zone management.
  - Control mechanisms/issues – strengths and weaknesses of available tools.
- 3.5 Practical & exercises (12 hours):  
Per group make the following assignments:
- **Assignment no. 5:** Who are the actors in ICZM: organisations, individual stakeholders, etc?
  - **Assignment no. 6:** Briefly describe the relevant national and region laws and regulations.
  - **Assignment no. 7:** Make a SWOT analysis of the existing IWRM implementation tools, i.e. enabling environment, institutions and management instruments. Use the GWP Toolbox to look for similar cases and tools that can be used.

Lecture	Materials/papers
3.1	<ul style="list-style-type: none"> <li>• UNEP (1999): Chapter 1 Introducing Integrated Coastal Area and River Basin Management, p: 4-7</li> <li>• Clark (1996), Chapter 1.4 Solutions through management (pp: 19-27)</li> <li>• Beatley et al (2002): Chapter 2 Coastal pressures and critical management issues, pp: 53-89</li> </ul>
3.2	<ul style="list-style-type: none"> <li>• GWP (2003): Introduction, Policy Choices And Challenges pp: 1-11</li> <li>• Rasch et al (2005): Linking integrated water resources management and integrated coastal zone management.</li> <li>• UNEP (1999): Chapter 4 Towards a Strategy for Integrated Coastal Area and River Basin Management, pp: 35-40.</li> <li>• UNEP (1999), Part II Planning Guidelines, Chapter 5 The Process of Planning of Integrated Coastal Area and River Basin Management, pp: 43 – 54</li> </ul>
3.3	<ul style="list-style-type: none"> <li>• Literature/ background information on Socotra: to be added</li> </ul>
3.4	<ul style="list-style-type: none"> <li>• Beatley et al (2002): Chapter 4 The Coastal Management Framework, pp : 91-100</li> <li>• Beatley et al (2002): Chapter</li> </ul>
3.5 Practical & Exercises	<p>In addition to the above mentioned literature:</p> <ul style="list-style-type: none"> <li>• Clark (1996): Part 4 Case Histories – Oman, pp: 556- 558</li> <li>• GWP (2006): Toolbox</li> </ul>

#### 4.4 Theme 4: Sustainable development of coastal zones in Yemen

##### 4.1 Management strategies & instruments

- Towards a strategy for integrated coastal zone management.
- Steps in the process of planning of integrated coastal zone management.
- Implementation instruments and methods for integrated coastal zone management.
- Environmental impact assessments for integrated coastal zone management
- Adaptive technologies for the user functions:
  - Natural ecosystems: mitigation measures.
  - Agriculture: sustainable agricultural practices, tolerant crop patterns, etc.
  - Fisheries: opportunities for fisheries and aquaculture
  - Commercial: (oil) industry, harbours, urbanization: sea water desalinations – technologies and issues
  - Water supply and sanitation: options for salt water intrusion control, costs and benefits of recharge dams, conjunctive use of fresh water and salt water
  - Transport: shipping, oil pipelines
  - Tourism: ...

##### 4.2 Information Needs, Monitoring and Indicators

- Information requirements, monitoring programs and indicators in coastal zone management in Yemen – the gap between theory and practice.
- Recognition of saline water in ground water bodies – isotope geo-chemistry, major iron analysis and trace elements: case study Wadi Siham.

##### 4.3 Practical & exercises (12 hours):

Per group make the following assignments:

- **Assignment no. 8:** List the adaptive technologies that are available to overcome the constraints for the current user functions. Use the SWOT analysis made in

the assignments 4 & 7. Use the GWP Toolbox to look for similar cases and tools that can be used.

- **Assignment no. 9:** List the constraints and opportunities to develop a strategy for integrated coastal zone management, focus on the IWRM principles & tools. Work out these constraints & opportunities in more detail for one specific user function, i.e. agriculture, eco-tourism, water supply & sanitation, fisheries & aquaculture, transport or industries/harbours.
- **Assignment no. 10:** Make a monitoring plan for the strategy you have worked out in assignment no. 9, specifying the information needs, monitoring programmes and sustainability indicators.

Lecture	Materials/papers
4.1	<ul style="list-style-type: none"> <li>• Clark (1996), Chapter 1.5 Strategy planning (pp:28-51) and Chapter 1.6 Program development (pp:51-62)</li> <li>• Dauvin (2005)</li> <li>• Beatley at al (2002) Chapter 9 Creative Coastal Development: Building Sustainability along the Coast, pp: 250-282</li> <li>• Tiwi (2004), Improving environmental impact assessment for better integrated coastal zone management</li> <li>• UNEP (1999), Part II – Chapter 5: The Process of Planning ICZM (pp: 43-54).</li> <li>• UNEP (1999), Appendix 1 Developing a systems analogy for the natural system</li> </ul>
4.2	<ul style="list-style-type: none"> <li>• UNEP (1999): Chapter 6.1: Information management (pp:55-58).</li> <li>• Beatley at al (2002) Chapter 10 Conclusions: Future Directions in US Coastal Management, pp: 283-298</li> <li>• Huasheng and Xiongzhi (2006)</li> </ul>
4.3 Practical & Exercises	<p>In addition to the above mentioned literature:</p> <ul style="list-style-type: none"> <li>• Beatley at al (2002), Chapter 6, 7 &amp; 8 State, Regional and Local Coastal Management Plans, pp: 135-248</li> <li>• Clark (1996), Part 2 Management Methods, pp: 63 – 220</li> <li>• Clark (1996): Part 4 Case Histories, pp: 479-631</li> <li>• GWP (2006): Toolbox</li> <li>• Dauvin (2005): Expertise in coastal zone environmental impact Assessments.</li> <li>• Huasheng Hong et al (2006): Building up a training base for integrated coastal management through partnerships in Xiamen.</li> <li>• Ottens et al (1996). Selected papers of the international workshop on information strategies in water management.</li> </ul>

#### 4.5 Overall assignment

Each group will use the results of the assignments no. 1 to 10 to prepare a discussion paper on the role of IWRM in ICZM in the coastal zone the groups have selected in assignment no. 1. In these discussion papers, the opportunities and limitations for a sustainable management of the specific user functions, i.e. natural ecosystems, eco-tourism, fisheries or aquaculture, agriculture, which the groups have selected in assignment no. 9, will be described. The focus should be on the IWRM tools & principles.

Furthermore, the groups should clearly indicate the individual contributions of each group member.

## 5 Lecturers

No	Lecturer	Subject	Lect. [hrs]	Assign. [hrs]
1	Dr. Naif Abu-Lohom, Water & Environment Centre	Course coordinator		
		1.1 Introduction to coastal zones in Yemen	2	2
		1.2 Coastal land forms in Yemen	2	2
		4.1 Management strategies & instruments	6	6
		4.2 Information needs, monitoring and indicators	6	6
5	Excursion to Aden and the Red Sea Coast		22	
2	Prof. Dr. Abdulla S. Babaqi, Water & Environment Centre	1.3 The role of IWRM in ICZM	2	2
		2.6 Water desalinization: opportunities & limitations in Yemen's coastal zones	2	
		3.1 The need of an integrated approach in CZM	1	1
		3.2 Principles and practices to integrate IWRM in ICZM	3	5
3	Dr. Khaled I. Al-Hariri, Hariri & Associates	2.1 User functions in the coastal zones of Yemen	2	3
		2.2 The relation of the user functions with IWRM	2	3
		2.4 Coastal forces and natural processes	2	3
		2.5 Current developments in the coastal zones of Yemen	2	3
		5	Excursion to Aden and the Red Sea Coast	
4	Dr. Al-Hibshi, Sana'a University	2.3 Agricultural processes and challenges in Yemen's coastal zones	2	
5	SCDP (to be decided)	3.3 Socotra: the treasure island of Yemen	2	
6	Dr. Awadh A. Bahamish, Legal Consultant	3.4 Policy, legal and institutional Frameworks	6	6
7	Ir. Henk Ritzema, Wageningen UR	4.1 Management strategies & instruments	6	6
		5	Excursion to Aden and the Red Sea Coast	

## 6 Lecture notes, hand-outs and reference material

### 6.1 Lecture notes and hand-outs

The copies of the following handbooks and papers will be prepared as hand-outs for the students:

- Beatley et al (2002)
- Clark (1996): Part I and the Glossary
- Dauvin (2005)

- Huasheng Hong and Xiongzi Xue (2006)
- GWP (2003)
- Phillips and Jones (2006)
- Rasch et al (2005)
- Tiwi (2004)
- UNEP (1999)
  
- GWP (2006) - IWRM Resources CD-rom

All other literature is available in the WEC Library and can be used as reference materials for the assignments.

## 6.2 Reference Material

### Available in the WEC Library:

1. Babaqi, A.S. 2006. Integrated Water Management – Introduction to IWRM, Lecture Note, Water and Environment Centre, Yemen, 70p.
2. Beatley, T., D.J. Brower and A.K. Schwab. 2002. An Introduction to Coastal Zone Management, 2<sup>nd</sup> edition, Island Press, Washington, USA, 329 p.
3. Clark, J.R. 1996. Coastal Zone Management Handbook. CRC Press, Boca Raton, Florida, USA, 694p.
4. Global Water Partnership. 2002. Integrated Water Resources Management. TAC Background paper no. 4. Global Water Partnership, Stockholm, Sweden, 67p.
5. Ministry of Planning and Development (MPD). 1998. Yemen – Human Development Report 1998. Yemen, 142 p.
6. Newman, E.I. 2000. Applied Ecology and Environmental Management. Blackwell Science, UK, 393 p.
7. Ottens, J.J., F.A.M. Claessen, P.G. Stoks, J.G. Timmerman and R.C. Ward (Eds.). 1996. Proceedings Monitoring Tailor-made II: information strategies in water management. An international workshop on information strategies in water management. Sept. 1996, Nunspeet, The Netherlands, 489p.
8. Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA). 2001. Strategic Action Programme for the Red Sea and Gulf of Aden - Country Reports. IBRD, World Bank, Washington, USA, 205p.
9. Rybakov, V.S. 1999. Water Resources Management Regions of Yemen. Mission Report National Water Resources Authority (NWRA) and United Nations Department for Economic and Social Affairs (UN/DESA), Sana'a, Yemen, 124 p.
10. Tiwi, D.A. 2004. Improving environmental impact assessment for better integrated coastal zone management. PhD Thesis, Unesco-IHE, The Netherlands, 234p.
11. Todd, D.K. 1980. Groundwater Hydrology, second edition. John Wiley, New York, 535 p.
12. United Nations Environmental Programme. 1999. Conceptual Framework and Planning Guidelines for Integrated Coastal Area and River Basin Management, Split, Priority Programme, 79 p.

**Available on CD-Rom:**

13. Global Water Partnership. 2006. IWRM Resources CD. <http://www.gwptoolbox.org> .
14. Global Water Partnership. 2003. Sharing knowledge for equitable, efficient and sustainable water resources management. In: Tool Box Integrated Water Resources Management. CD-Rom, and Cap-Net, July 2006. Up-to-date versions of the toolbox and e-library are available on the internet, <http://www.gwptoolbox.org> .

**Available as PDF:**

15. Dauvin, J.C. 2005. Expertise in coastal zone environmental impact Assessments. Correspondence in Marine Pollution Bulletin 50 (2005) 107–110
16. Huasheng Hong and Xiongzhi Xue, 2006. Building up a training base for integrated coastal management through partnerships in Xiamen. Ocean & Coastal Management 49 (2006) 685–695
17. Phillips, M.R., A.L. Jones. 2006. Erosion and tourism infrastructure in the coastal zone: Problems, consequences and management. Tourism Management 27 (2006) 517–524
18. Rasch, P.S., N. Ipsen, A. Malmgren-Hansen and B. Mogensen. 2005. Linking integrated water resources management and integrated coastal zone management. Water Science & Technology Vol 51 No 11 pp 221–229.

**To be ordered by the project:**

19. Beatley, T., D.J. Brower and A.K. Schwab. 2002. An Introduction to Coastal Zone Management, 2<sup>nd</sup> edition, Island Press, Washington, USA, 329 p.
20. Clark, J.R. 1996. Coastal Zone Management Handbook. CRC Press, Boca Raton, Florida, USA, 694p.