



**UNDP/GEF PROJECT ENTITLED “REDUCING ENVIRONMENTAL STRESS IN THE
YELLOW SEA LARGE MARINE ECOSYSTEM”**

UNDP/GEF/YS/RWG-E.4/3
Date: 5 October 2007
English only

**Fourth Meeting of the Regional Working Group
for the Ecosystem Component**
Ningbo, China, 3 – 5 October 2007

Meeting Report

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1 OPENING OF THE MEETING

1.1 Welcome addresses

- 1.1.1 On behalf of the UNDP/GEF Yellow Sea Project, Mr. Yihang Jiang, Project Manager, opened the meeting and welcomed the members of the Regional Working Group-Ecosystem (RWG-E) to Ningbo, China. He expressed appreciation to the participants for their generous agreement in working during their holidays.
- 1.1.2 Mr. Jiang stated that the project was now focusing on its next milestone - the SAP. He mentioned that SAP Consultation and Ad-hoc Working Group Meetings had been held to produce regional targets and management actions. He also mentioned that this group was slightly different from other groups in their proposed management actions, and perhaps estimating carrying capacity would be something to demonstrate.
- 1.1.3 Finally, Mr. Jiang mentioned that GEF IW 4 Conference was recently held, where he had a discussion with GEF and UNDP/GEF who stated their intention to support the second phase of the project. Starting from next year, the documents for the project's second phase would need to be prepared, and this meeting could provide some guidelines on ecosystem-based management for the future.
- 1.1.4 Mr. Yoo Sinjae commented that the YSLME Project had already completed many of its objectives, with the SAP and demonstrations remaining. In this fourth meeting, there are still some important tasks to consider and accomplish, such as guiding the SAP completion and demonstration activities.
- 1.1.5 Mr. Zhu Mingyuan welcomed all participants to Ningbo and gave some highlights on Ningbo's history. He wished all participants a pleasant stay and wished the meeting full success.

1.2 Introduction of members

- 1.2.1 Members and other participants were invited to introduce themselves, and gave a brief introduction on their background and roles in the Project. The list of participants is attached to this report as [Annex I](#).

2 ORGANISATION OF THE MEETING

2.1 Documents Available to the Meeting

- 2.1.1 Mr. Yoo invited the Secretariat (Project Management Office) to introduce this agenda item. Ms. Connie Chiang introduced the meeting's working and information documents prepared by the PMO (Document UNDP/GEF/YS/RWG-E.4/inf.1). Ms. Chiang stated that most documents were sent to participants or were available online for review before the meeting. The list of documents is attached as [Annex II](#).

2.2 Organisation of Work

- 2.2.1 Ms. Chiang presented the provisional working programme for the meeting (Document UNDP/GEF/YS/RWG-E.4/inf.3), and informed the meeting about the organisation of work. Due to the nature of the agenda items to be discussed, the meeting would be

organised in plenary as far as possible. Sessional working groups would be formed if deemed necessary.

2.2.2 The meeting was conducted in English.

3 ADOPTION OF THE MEETING AGENDA

3.1 The Chairperson introduced the Provisional Agenda (Document UNDP/GEF/YS/RWG-E.4/1) and Provisional Annotated Agenda (Document UNDP/GEF/YS/RWG-E.4/2) prepared by the PMO.

3.2 It was suggested that Mr. Cui Tingwei present his work on ocean colour in the Bohai Sea during Agenda 5. Mr. Zhu would also present his co-operative work with Plymouth Marine Laboratory on remote sensing in the Yellow Sea.

3.3 Mr. Yoo requested to discuss the benthos survey in the co-operative cruise during Agenda 7, after having had informal consultations on this issue with the PMO and Chinese and Korean colleagues.

3.4 Mr. Zhu suggested that carrying capacity activities should consider carbon biomass.

3.5 Members noted these additions, and adopted the agenda which is attached as [Annex III](#) to this report.

4 EXPECTED OUTPUTS FROM THE 4TH RWG-E MEETING

4.1 The Chairperson invited the PMO to present the expected outputs of the meeting (Document UNDP/GEF/YS/RWG-E.4/4). Ms. Chiang presented the list of expected outputs to be achieved by the meeting, provided some details for each agenda item's objective, and alerted the participants to the meeting's focus on considering the actions needed to finalise the SAP.

4.2 The members noted the expected outputs.

5 REVIEW OF COMPLETED AND ON-GOING ECOSYSTEM COMPONENT ACTIVITIES

5.1 First Yellow Sea Regional Science Conference

5.1.1 The Chairperson invited Ms. Chiang to report on this event that took place in August this year, providing a summary of the conference, the topics contained in the presentations, the poster session, and the Conference Summary given at the end of the conference. She mentioned that participants were asked to contribute ideas for:

- future directions in management of the physical, chemical and biological environments;
- enhancement of cultural services; and
- incorporation of legislative, political and institutional issues into management.

Some of these ideas were considered and incorporated by the SAP Ad-hoc Working Group as possible management actions to be included in the SAP, which members were requested to review in Agenda 6.

- 5.1.2 Mr. Jiang stated that new knowledge was displayed through the various presentations, e.g. jellyfish bloom and economic valuation. He mentioned that the Conference Chairperson had kindly agreed to summarise the outcomes as a supplement to the TDA, but there was a need to discuss the details. Mr. Yoo asked members to re-consider this issue after the agenda on SAP, when everyone had a better picture of the project and its future direction.
- 5.1.3 Participants noted the outcomes of the conference and requested whether some of the missing presentations¹ could be provided. **The PMO agreed to contact the authors to obtain their presentations. If successful, the presentations will be made available to participants for knowledge exchange purposes.**

5.2 CPR Survey

- 5.2.1 The Chairperson invited Mr. Pu Xinming to present the results of this activity that used the Nv-shuttle for the survey that took place in April 2007, including the background, rationale for methods used, survey transects, and measured variables. He showed data on temperature, salinity, DO, pH, fluorescence, and phytoplankton & zooplankton abundance. Finally, Mr. Pu gave some thoughts on the further use of undulating vehicles in marine research.
- 5.2.2 During the discussion, members talked about the potential for regular surveys in the future and also as an SAP demonstration activity.
- 5.2.3 Members mentioned that despite the risk of losing the equipment, financial and ship time constraints, they recognised that further regular surveys are required. Members provided some ideas such as:
- surveying several times a year in specific seasons and/or areas of scientific meaning; and
 - undulating the vehicle would provide more meaningful data from different depths rather than pumping water into the equipment from just one depth.
- 5.2.4 PMO was requested to examine the project's policy should the equipment be lost, while members were asked to consider regular monitoring as a demonstration activity and/or as an activity during the project's second phase.
- 5.2.5 This issue was further discussed in Agenda 6, and the outcomes are stated therein.

5.3 Ocean Colour Algorithm

- 5.3.1 Mr. Yoo updated the meeting on this activity, providing the rationale for OC algorithm development and how to use satellite data to estimate primary productivity. He updated the meeting on the OC activity's progress-to-date: establishment of database, data variables submitted, 2 meetings already held to discuss the data and next steps to work towards the activity's objective, missing data, and future work. Mr.

¹ Participants from Yellow Sea Fisheries Research Institute were unable to attend due to a last minute-planned evaluation at the institute.

Yoo reported that TSM results generated from the activity were decent, but the results of chlorophyll-a needed some improvement. The activity aimed to provide the best algorithm-to-date that can then be used for primary production estimation. As the algorithm would likely have some errors, there would be a need to improve it in the future.

- 5.3.2 Mr. Yoo emphasised that uncertainty in estimating Yellow Sea's primary productivity is quite significant. While some variables needed to make this estimation can be retrieved from satellite data, other variables must then be calculated to obtain the primary production algorithm. Thus, the meeting was alerted to 2 problems that need to be solved: 1) retrieval of chlorophyll-a from satellite data; and 2) estimation of depth-integrated daily primary production given the data of surface chlorophyll-a, PAR, turbidity, SST, etc. In this context, there is a need for 2 activities on developing an algorithm for ocean colour and also for primary production.
- 5.3.3 Following the presentation on OC, Mr. Jiang emphasised that the shared data and distribution of data covering the Yellow and East China Seas showed the regional co-operative spirit of the countries within and beyond this region.
- 5.3.4 The presentation continued to the next sub-agenda with the introduction of the primary productivity estimation activity, and discussion on both activities occurring together afterwards.

5.4 Primary Productivity Estimation

- 5.4.1 Mr. Yoo reported on the initiation of this activity which had been introduced at the last RWG-E Meeting, but not implemented yet, as the FRRF was still being built. The proposed activity would estimate primary productivity as a potential baseline figure, and develop a regional algorithm for long-term monitoring. The variables to measure, geographic area of study, suggested outputs of the activity (monthly and annual primary productivity maps, inter-annual variability of primary productivity in the Yellow Sea), and the workplan were shown.
- 5.4.2 Mr. Cui then presented some on-going research activities in China dealing with ocean optics. The presentation covered OC research and monitoring in the Bohai Sea, statistical and semi-analytical models used in data analysis, satellite images, survey areas, variables measured, and suggestions on further OC research in the Yellow Sea. It was also mentioned that the data collected from this project covering the Chinese coastline from Bohai to Yellow Seas are currently being processed, but was unlikely to be available to the public.
- 5.4.3 Mr. Zhu briefly introduced the co-operative remote sensing research between FIO and Plymouth Marine Laboratory. He showed the weekly Yellow Sea chlorophyll information which was available from the Plymouth Lab's website, containing remote sensing images and data from the Sunggou Bay study area. Some data on primary productivity estimates offshore of Sanggou Bay and HABs were also shown.
- 5.4.4 During the discussion on the OC and primary productivity estimation activities, the following topics were mentioned:
- Equipment details and limitations to combine the use of the FRRF with the Nv-shuttle.
 - Atmospheric correction for the OC algorithm was considered, but recognised as difficult, thus the activity will solve the in-water problems first.

- The OC algorithm was mostly based on data from the southern Yellow Sea, but perhaps the algorithm can be used for validation in the northern waters.
- It was a good start to first work with available data for primary productivity, even if limited, and then see how to proceed in the future.
- A need for further co-operation amongst other researchers in the same field.

5.4.5 The Meeting was pleased to know that there are quite a few other researchers working on similar issues in a wider area of the Yellow Sea, and hoped that in the future, these efforts could collaborate with the current one by sharing all data.

5.4.6 Members took note of the two activities, and revisited them during Agenda 7.

6 PREPARATION OF THE SAP

6.1 SAP Consultation & SAP Ad-hoc Meetings

6.1.1 The Chairperson invited Mr. Jiang to introduce the purpose of the SAP. Mr. Jiang reported that the project had completed the TDA and was now moving on to prepare the next major milestone - the SAP, that would draw upon the scientific data contained in the TDA to assist in defining the required management actions. He briefly explained the steps to complete the SAP, the theme of the SAP focusing on ecosystem services, and the regional targets that management actions should aim at.

6.1.2 Ms. Chiang reported on the progress of SAP development that started with a Consultation Meeting in February 2007, and two Ad-hoc Working Group meetings throughout 2007, consisting of some regional experts and the PMO. She reported on the outcomes from these meetings, and explained what the RWG members should produce from this agenda:

- clarification of the regional targets;
- finalisation of management actions;
- technical feasibility studies; and
- suggestions for potential demonstration activities.

6.1.3 Finally, Ms. Chiang informed the meeting that NYSAPs are the responsibility of the countries, and would be co-ordinated by the NPCs; thus it would not be discussed here. However, members should be prepared to be called upon to contribute their expertise to the activity.

6.2 Regional Targets & Proposed Management Actions

6.2.1 Before embarking on reviewing the target and actions, Mr. Yoo reminded the meeting that it should consider realistic solutions within the ecosystem component's focus and responsibility.

6.2.2 There was some discussion on how to clarify the wording of the target currently stated as, "provide relevant information to understand and predict ecosystem status". Mr. Kang Daeseok suggested that the regional targets should be the goal that we are aiming to achieve, and the current statement read more like an action.

- 6.2.3 Members were in agreement on the context of the target, that further information was needed on ecosystem status, proposed that the action should be something that is measurable, and gave some suggestions to improve the meaning. After reviewing several suggestions, **it was agreed that the target should be re-worded as, “better understanding and prediction of ecosystem changes for adaptive management.”**
- 6.2.4 The target on HABs also came under some discussion as to how to justify and clarify it. After extensive discussion, **it was agreed to revise the target to, “< 5 events (late 1980s condition) (HAB includes high biomass algal bloom).”**
- 6.2.5 Members then reviewed the management action table produced during the 2nd SAP Ad-hoc Working Group Meeting, provided additional input to finalise the table, and re-worded some of the actions to make them clearer to all readers. There was some discussion on assessing and monitoring the impacts of climate change, the institutional limitations related to this action, and HABs.
- 6.2.6 **Members agreed that the actions related to nitrogen enrichment causing HABs should be deferred to the Pollution RWG.**
- 6.2.7 **Members also agreed to add “establish Yellow Sea ecosystem database” as an additional general action, and agreed that the GIS database developed by the project will serve this purpose. The specific actions were deferred to the RWG-I to consider, as that group was responsible for the operation and maintenance of the database.**
- 6.2.8 **The agreed management action table for the Ecosystem Component is attached as [Annex IV](#).**

6.3 Feasibility Studies

- 6.3.1 The technical feasibility for the management actions was carefully studied, and the result of the “Feasible Management Actions” is shown in [Annex IV](#).

6.4 Potential Demonstration Activities

- 6.4.1 The Chairperson invited the Secretariat to explain the tasks of this agenda. Ms. Chiang explained that the group should provide guidance on the actions that they wish to demonstrate. She also informed the meeting of the timeline for the demonstration activities and the procedure in which the activities would be selected and implemented.
- 6.4.2 Following questions from the participants, Mr. Jiang clarified that the members should provide a prioritised list of activities to demonstrate usefulness and effectiveness of the identified management actions. The activities should address the target and show that better prediction/understanding can result in improved ecosystem management. Furthermore, a brief description of each activity, and the associated actions should be provided. Mr. Jiang finally gave some information on available budget, and suggested that this group might need to consider co-ordinating their demonstration activities with other groups, as it was likely that all the proposals for these activities would be evaluated together.

- 6.4.3 Mr. Zhu proposed that the Yellow Sea Cold Water Mass would be a good topic for a demonstration activity related to impacts of climate change and impacts of N, P, Si ratio change. Mr. Kang recommended that the activity should show some causal relationship between climate change and impact on ecosystem.
- 6.4.4 Participants reviewed the management action table and shortlisted three actions to demonstrate, gave details on the expected outputs and methodology to implement each activity, and prioritised the actions. **The agreed proposed shortlisted actions to demonstrate are attached as Annex V.**

6.5 Remaining Tasks, Including National Yellow Sea Action Plan (NYSAP) Preparation

- 6.5.1 Ms. Chiang reported on the relevant activities for NYSAP preparation when introducing this agenda. The meeting noted the information provided.

7 ACTIVITIES TO BE IMPLEMENTED FROM 2008 ONWARDS

7.1 CPR Survey 2

- 7.1.1 Mr. Zhu stated that CPR survey should be carried out on both winter and summer co-operative cruises following the formal approval from the governments of the participating countries.
- 7.1.2 Mr. Jiang informed the meeting that if the co-operative cruises are approved, the project would organise a technical meeting to discuss the technical and logistical details.
- 7.1.3 **Members agreed to discuss the details of the CPR survey during the cruise technical planning meeting.**

7.2 OC Validation

- 7.2.1 Mr. Yoo reiterated that the OC algorithm results would be available in January 2008; however, Mr. Cui said that his results would not be ready by then. He expressed his willingness to use the data collected in his project to assist in validating the regional algorithm. **The meeting felt that it would be helpful if relevant activities would be incorporated into the current project, and agreed that an expert from FIO should be invited to attend the 3rd OC Meeting in January 2008.**
- 7.2.2 **The PMO agreed to examine the project budget and make accommodations for one expert from FIO to attend the 3rd OC Meeting.**

7.3 Other Activities

Benthic study

- 7.3.1 The Chairperson invited Mr. Song Sung Joon and Mr. Zhu to present their ideas on benthos work during the co-operative study cruises. Mr. Song presented:
- The importance of studying benthic animals;

- Materials and methods;
- Variables for analysis;
- Need for standardisation of methods; and
- Recommendations on how to standardise methods.

7.3.2 Mr. Zhu proposed that the stations between the north and south Yellow Sea water limits should be used for the benthic study. He also showed the proposed study's goals, sampling stations, gears, validation of sampling efficiency, and workplan.

7.3.3 The discussion mainly focused on the different sampling gears used and how to carry out inter-comparison. It was concluded that the type of equipment used was not so important, but that the sampling success rate should be ensured.

7.3.4 **Members agreed that the technical details should be discussed among benthic scientists from China and Korea, who should communicate with each other about analytical methods. Meanwhile, the Chairperson will also discuss the technical issues with the PMO. Members also agreed that the details of this study should be discussed again during the co-operative cruise technical meeting.**

Guidelines for ecosystem monitoring

7.3.5 Ms. Chiang reminded members about the history of this activity where guidelines should be developed on where, when, and what to measure to help assess ecosystem change, and that after two rounds of advertising, no proposals were submitted.

7.3.6 **Members agreed that this is an important activity and requested the PMO to re-advertise the consultancy, noting the importance of a regional focus.**

Estimation of phytoplankton carbon biomass

7.3.7 Mr. Zhu presented a proposal for this activity, noting that carbon biomass can be useful for estimating carrying capacity of the ecosystem. The presentation mentioned that phytoplankton biomass estimation from cell volume had already been carried out by various scientists, and could be correlated to carbon biomass.

7.3.8 As there was not enough information for members to make further decisions on this activity, Mr. Zhu was requested to provide a proposal with more details on how carbon biomass can contribute to estimating carrying capacity of the ecosystem. The proposal should include objectives, more details on the methods, and an estimated budget. Following the receipt of the information, members would then review the activity again.

8 WORKPLAN FOR 2008

8.1 **Based on the discussions during the course of the meeting, members created and agreed on a workplan for 2008 for submission to the next PSC Meeting ([Annex VI](#)).**

9 OTHER BUSINESS

- 9.1 The Chairperson invited members to raise any other issues that needed to be considered by this meeting.
- 9.2 Members did not raise anymore issues to discuss.

10 DATE AND PLACE FOR 5TH RWG-ECOSYSTEM MEETING

- 10.1 The Chairperson invited members to consider the date and place for the 5th RWG-E Meeting.
- 10.2 **Members agreed to have the Fifth RWG-E Meeting in Taean, ROK, from 23-25 September 2008.**

11 ADOPTION OF THE MEETING REPORT

- 11.1 The Chairperson led the discussion of the draft meeting report. The report was reviewed, amended, and adopted by the Meeting.

12 CLOSURE OF THE MEETING

- 12.1 In closing, Mr. Jiang thanked the Chairperson for his excellent leadership in enabling the meeting to achieve its objectives efficiently. Mr. Zhu and his team were thanked for their excellent and efficient arrangements and hospitality to organise the meeting during the long holiday season. Mr. Jiang then expressed his appreciation to all participants for their hard work during each country's public holiday season. Finally, he complimented the members for their exemplary working and co-operative spirit.
- 12.2 Mr. Yoo thanked the members for their contribution to the meeting, and the PMO for arranging the meeting.
- 12.3 Following the closing statements, the Chairperson declared the meeting closed on 5th October 2007.

Annex I

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Annex II

List of Documents

Working Documents

UNDP/GEF/YS/RWG-E.4/1	Provisional Agenda
UNDP/GEF/YS/RWG-E.4/2	Annotated Provisional Agenda
UNDP/GEF/YS/RWG-E.4/3	Report of the Meeting (<i>to be prepared at the meeting</i>)
UNDP/GEF/YS/RWG-E.4/4	Expected Outputs From the 4 th RWG-E Meeting
UNDP/GEF/YS/RWG-E.4/5	Completed Activities of the Ecosystem Component in the Past Year
UNDP/GEF/YS/RWG-E.4/6	Strategic Action Programme (SAP) Preparation
UNDP/GEF/YS/RWG-E.4/7	Ecosystem Component Activities for 2008 and Onwards
UNDP/GEF/YS/RWG-E.4/8	Ecosystem Component's Workplan for 2008

Information Documents

UNDP/GEF/YS/RWG-E.4/inf.1	Provisional List of Documents
UNDP/GEF/YS/RWG-E.4/inf.2	Provisional List of Participants
UNDP/GEF/YS/RWG-E.4/inf.3	Provisional Working Programme for the Meeting
UNDP/GEF/YS/RWG-E.3/3	Report of "Third Meeting of the Regional Working Group for the Ecosystem Component"
UNDP/GEF/YS/RSP.3/3	Report of the "Third Meeting of the Regional Scientific and Technical Panel"
UNDP/GEF/YS/PSC.3/3	Report of the "Third Meeting of the Project Steering Committee"
UNDP/GEF/YS/SAP.1/2 rev4	Conceptual Procedure for SAP Preparation
UNDP/GEF/YS/AWG.1/3	Report of the "First Meeting of the Strategic Action Programme <i>Ad-hoc</i> Working Group for the UNDP/GEF Yellow Sea Project"
UNDP/GEF/YS/AWG.2/3	Report of the "Second Meeting of the Strategic Action Programme <i>Ad-hoc</i> Working Group for the UNDP/GEF Yellow Sea Project"

Annex III

Agenda

1. OPENING OF THE MEETING

- 1.1 Welcome Addresses
- 1.2 Introduction of Members

2. ORGANISATION OF THE MEETING

- 2.1 Documents Available to the Meeting
- 2.2 Organisation of Work

3. ADOPTION OF THE MEETING AGENDA

4. EXPECTED OUTPUTS FROM THE 4TH RWG-E MEETING

5. REVIEW OF COMPLETED AND ON-GOING ECOSYSTEM COMPONENT ACTIVITIES

- 5.1 First Yellow Sea Regional Science Conference
- 5.2 CPR Survey
- 5.3 Ocean Colour Algorithm
- 5.4 Primary Productivity Estimation

6. PREPARATION OF THE SAP

- 6.1 SAP Consultation & SAP Ad-hoc Meetings
- 6.2 Regional Targets & Proposed Management Actions
- 6.3 Feasibility Studies
- 6.4 Potential Demonstration Activities
- 6.5 Remaining Tasks, Including National Yellow Sea Action Plan (NYSAP) Preparation

7. ACTIVITIES TO BE IMPLEMENTED FROM 2008 ONWARDS

- 7.1 CPR Survey 2
- 7.2 OC Validation
- 7.3 Other Activities

8. WORKPLAN FOR 2008

9. OTHER BUSINESS

10. DATE AND PLACE FOR 5TH RWG-ECOSYSTEM MEETING

11. ADOPTION OF THE MEETING REPORT

12. CLOSURE OF THE MEETING

Ecosystem Component's Management Actions Table

Problems identified in CCA	"Problem Issue"	Regional target (2020)	General action	Ideal Management Action			Analysis of Planned & On-going Management Actions			Feasible Management Actions by 2020			Technical Feasibility	Remark	Demo acts
				Technical	Institutional	Legislative	Technical	Institutional	Legislative	Technical	Institutional	Legislative			
				Ecosystem changes (lower trophic level and benthos)	better understanding and prediction of ecosystem changes for adaptive management	Assess and monitor the impact of N/P/Si ratio change	harmonise monitoring methodologies and assess impacts	Establish cross-basin monitoring network & implement monitoring activities	develop a regional protocol for marine survey & monitoring; develop regional framework to incorporate the assessment into management policy	countries have different sampling methods and timing; regular surveys only cover limited area; not designed to reveal basin-scale changes; limited assessments	no cross-basin monitoring network due to lack of co-ordination among different agencies	non-harmonised existing national protocol between countries for marine survey & monitoring			
Assess and monitor the impact of climate change	develop and/or harmonise monitoring methodologies and assess impacts	Establish basin-scale monitoring network & implement monitoring activities	develop a regional protocol for marine survey & monitoring; develop regional framework to incorporate the assessment into management policy	ditto	no basin-scale monitoring network due to lack of co-ordination among different agencies; insufficient national programmes to train and support taxonomists	non-harmonised existing national protocol between countries for marine survey & monitoring; no regional protocol exists	develop and/or harmonise monitoring methodologies and assessment of impacts	Establish basin-scale monitoring network & implement monitoring activities; convince relevant government agencies to increase investment on taxonomical research	harmonise national protocol for marine survey & monitoring; develop regional framework to incorporate the assessment into management policy	3	national monitoring network exists, but limited geographical scope & variables	2			
Predict ecosystem change in the long run	develop comprehensive models to predict ecosystem change and its impact on fisheries	establish regional science committee to co-ordinate modelling activities	develop framework to incorporate the prediction into management policy; develop regional framework to incorporate the assessment into management policy	no comprehensive, co-ordinated modelling	no regional body to co-ordinate modelling activities	no existing framework to incorporate prediction into management policy	develop comprehensive models to predict ecosystem change and its impact on fisheries	establish regional science committee to co-ordinate modelling activities	develop framework to incorporate the prediction into management policy	4	basic modelling technology exist				
Monitor the tranboundary impact of jellyfish blooms	develop nat'l and reg'l monitoring methodologies	Establish international monitoring network	not relevant	no common monitoring methodologies	no international monitoring network	not relevant	develop nat'l and reg'l monitoring methodologies	Establish international monitoring network	not relevant	4	Kor - has monitoring programmes; CHN - increasing damage; int'l interest is high	1			

Ecosystem Component's Management Actions Table

Problems identified in CCA	"Problem Issue"	Regional target (2020)	General action	Ideal Management Action			Analysis of Planned & On-going Management Actions			Feasible Management Actions by 2020			Technical Feasibility	Remark	Demo acts
				Technical	Institutional	Legislative	Technical	Institutional	Legislative	Technical	Institutional	Legislative			
							Monitor HAB occurrences	improve capability in HAB monitoring, prediction and mitigation	establish regional HAB committee to co-ordinate assessment activities	develop regional framework to incorporate the assessment into management policy	monitoring programmes only at national level and scattered among responsible agencies	no regional HAB committee			
			establish Yellow Sea ecosystem database	Refer to RWG-I	Refer to RWG-I	Refer to RWG-I	Refer to RWG-I	Refer to RWG-I	Refer to RWG-I	Refer to RWG-I	Refer to RWG-I	Refer to RWG-I	4	DB under construction	
Increased frequency of HABs	See Nitrogen enrichment and eutrophication	< 5 events (late 1980s condition) (HAB includes high biomass algal bloom)	See Nitrogen enrichment and eutrophication	See Nitrogen enrichment and eutrophication	See Nitrogen enrichment and eutrophication	See Nitrogen enrichment and eutrophication	See Nitrogen enrichment and eutrophication	See Nitrogen enrichment and eutrophication	See Nitrogen enrichment and eutrophication	See Nitrogen enrichment and eutrophication	See Nitrogen enrichment and eutrophication	See Nitrogen enrichment and eutrophication	Refer RWG-P	Refer RWG-P	

Annex V

Shortlist of Ecosystem Component's Demonstration Activities

A. Impact of N:P:Si ratio change on ecosystem (3)²

- 36 latitude
- 2 co-operative cruises + additional monitoring
- Measure nutrients, plankton (community structure and productivity)

Expected outputs:

- To assess the current status of long-term trend reported by Lin et al. (2005)
- To assess impact on ecosystem at lower trophic levels

B. Impacts of climate change on ecosystem (2)

- 2 co-operative cruises + additional monitoring
- Retrospective analysis (historical information)
- Remote sensing
- modelling

Expected outputs:

- Signal of climate change in Cold Water Mass (volume of water mass, intensity of stratification, range and average temperature)
- Signal of climate change from plankton and benthos communities

C. Monitor jellyfish bloom (1)

- summer co-operative cruise + additional monitoring
- ship of opportunities

Expected outputs:

- Origination, composition, propagation, transport route of jellyfish bloom
- Reviews of and recommendations for monitoring methodology

² Number denotes ranking of priority, with 1 being highest.

ANNEX VI

ECOSYSTEM COMPONENT'S WORKPLAN FOR 2008

Activity	Action	Timeline / Deadline
CPR 2	survey with co-operative cruises	Jan. and July/Aug. 2008
Co-operative cruises	technical planning meeting	Nov/Dec. 2007
	cruises	Jan. and July/Aug. 2008
OC	support participation of expert from FIO to participate in OC-3 Meeting	Jan. 2008
Primary productivity estimation	move from 2007 to 2008	Jul-08
Guidelines on ecosystem monitoring	PMO advertise and solicit proposals	Oct - Nov. 07
	drafting guidelines	Dec. 07 - Mar. 08
SAP Finalisation		
Feasibility Studies (political and social acceptance)		Sept - Dec. 2007
SAP drafting	Drafting Group to liaise through e-mail and 3 working meetings	Jan. to May 2008
SAP review by RSTP and PSC	Special RSTP/PSC	Apr-08
SAP approval	govts	Jun-08
Demo Activities	Demo site implementation	Sept. 2008 to Dec. 2009
NYSAP		
drafting NYSAP	NPC and national members	2008
govt approval of NYSAP	govt	late 2008
5th RWG-E Meeting	PMO will arrange	23-25 Sept.

ID	Task Name	Duration	Start	Finish	2005				2006				2007				2008				2009			
					Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1	OBJECTIVE III: ECOSYSTEM	1227 days?	Mon 1/3/05	Mon 9/14/09																				
2	IIIA: STATUS OF ECOSYSTEM	781 days?	Mon 1/3/05	Mon 12/31/07																				
3	ACT 1: Prepare state-of-ecosystem reviews and reports (incl. long-term and recent changes)	254 days?	Mon 10/3/05	Thu 9/21/06																				
4	Contract (1) to relevant national institution(s) - collect data & info	130 days	Mon 10/3/05	Fri 3/31/06																				
5	Processing existing raw data	65 days?	Mon 1/2/06	Fri 3/31/06																				
6	Establish a regional editorial group /or use the WG	4 days?	Tue 11/29/05	Fri 12/2/05																				
7	Prepare a draft report (consultant 1)	151 days?	Mon 1/2/06	Mon 7/31/06																				
8	Discuss the draft (WG meeting 2)	4 days?	Tue 11/29/05	Fri 12/2/05																				
9	Revise the draft report (consultant 1)	151 days?	Mon 1/2/06	Mon 7/31/06																				
10	Finalise the draft report (WG meeting 3)	4 days?	Mon 9/18/06	Thu 9/21/06																				
11	ACT 2: Identify data and information gaps and develop strategies for monitoring changing status of ecosystem and its	349 days?	Wed 2/1/06	Mon 6/4/07																				
12	Prepare synthesis of the national assessment, and identify the info gaps (consultant 1)	152 days?	Wed 2/1/06	Thu 8/31/06																				
13	Prepare draft strategy, including: parameters, analysis, intercalibration, data exchange etc. (consultant 1)	152 days?	Wed 2/1/06	Thu 8/31/06																				
14	Discuss the draft (WG meeting 3)	4 days?	Mon 9/18/06	Thu 9/21/06																				
15	Revise the draft	22 days?	Mon 10/2/06	Tue 10/31/06																				
16	Finalise the strategy (WG meeting 4)	2 days	Fri 6/1/07	Mon 6/4/07																				
17	ACT 3: Demonstration of new and innovative technologies for monit	781 days?	Mon 1/3/05	Mon 12/31/07																				
18	Contract (2) to relevant national institution(s)	261 days?	Mon 1/1/07	Mon 12/31/07																				
19	Application of remote sensing	261 days?	Mon 1/1/07	Mon 12/31/07																				
20	Ship-of-opportunities monitoring.	261 days?	Mon 1/1/07	Mon 12/31/07																				
21	<i>Molecular probes - low priority</i>	1 day?	Mon 1/3/05	Mon 1/3/05																				
22	IIIB: CARRYING CAPACITY OF ECOSYSTEM	415 days?	Mon 1/1/07	Thu 7/31/08																				
23	ACT 1: Establish the logistical and data requirements of estimating carrying capacity	198 days?	Wed 10/31/07	Thu 7/31/08																				
24	Contract (1) to relevant national institution(s)	198 days?	Wed 10/31/07	Thu 7/31/08																				
25	Discuss and coordinate with fisheries WG (joint workshop) - already decided to keep separate	3 days?	Wed 10/31/07	Fri 11/2/07																				
26	Decide on the assessment methods of carrying capacity	152 days?	Thu 1/3/08	Thu 7/31/08																				
27	Training on carrying capacity (Estimation of carrying capacity)	152 days?	Thu 1/3/08	Thu 7/31/08																				
28	ACT 2: Conduct a basin-scale survey on lower-trophic level ecosyst	16 days?	Sat 1/5/08	Fri 1/25/08																				
29	Conduct a basin-scale survey on lower-trophic level ecosystem (contract 4)	13 days?	Sat 1/5/08	Fri 1/25/08																				
30	ACT 3: Assess the carrying capacities of the ecosystem under changing human-induced and natural variability	261 days?	Mon 1/1/07	Mon 12/31/07																				
31	Prepare a regional synthesis (consultant 2)	261 days?	Mon 1/1/07	Mon 12/31/07																				
32	Finalisation national outputs and synthesis	261 days?	Mon 1/1/07	Mon 12/31/07																				
33	IIIC: STRESSORS TO THE ECOSYSTEM	1032 days?	Mon 10/3/05	Mon 9/14/09																				
34	ACT 1: Identify and rank stresses on the ecosystem; identify data and information gaps	586 days?	Mon 10/3/05	Mon 12/31/07																				
35	Contract (1) to relevant national institution(s)	130 days?	Mon 10/3/05	Fri 3/31/06																				
36	Present outcomes of ranking, data and info in WG meeting 2	4 days?	Tue 11/29/05	Fri 12/2/05																				
37	Prepare a regional synthesis (consultant 3)	152 days?	Wed 2/1/06	Thu 8/31/06																				
38	Finalization of national outputs and synthesis (WG Meeting 3)	4 days?	Mon 9/18/06	Thu 9/21/06																				
39	Publish the outcomes (printing)	66 days?	Mon 10/1/07	Mon 12/31/07																				
40	Inputs to final TDA	110 days?	Mon 7/31/06	Fri 12/29/06																				
41	ACT 2: Identify corrective measures to minimize human-induced str	238 days?	Wed 2/1/06	Fri 12/29/06																				
42	Identify major human induced stresses (contract)	152 days?	Wed 2/1/06	Thu 8/31/06																				
43	Causal chain analysis (contract 1)	110 days?	Mon 7/31/06	Fri 12/29/06																				
44	Identify measures to address the root causes (WG meeting 3)	4 days?	Mon 9/18/06	Thu 9/21/06																				
45	Inputs to final TDA	110 days?	Mon 7/31/06	Fri 12/29/06																				
46	ACT 3: Develop strategy for intercalibration and data exchange (together with co-op cruise)	172 days?	Fri 6/1/07	Fri 1/25/08																				
47	Prepare draft strategy, including: parameters, analysis, intercalibration, data exchange etc.	16 days?	Sat 1/5/08	Fri 1/25/08																				
48	Discussion the draft (WG meeting 4)	2 days	Fri 6/1/07	Mon 6/4/07																				
49	Revise the draft	45 days?	Mon 7/2/07	Fri 8/31/07																				
50	Finalise the strategy (WG meeting4)	2 days?	Fri 6/1/07	Mon 6/4/07																				
51	ACT 4: Develop strategy to identify long-term sustainable investments to improve the YSLME	684 days?	Thu 2/1/07	Mon 9/14/09																				
52	Prepare a format for nat'l strategy-PMO	143 days?	Thu 2/1/07	Mon 8/20/07																				
53	Prepare national strategy (contract 3)	143 days?	Thu 2/1/07	Mon 8/20/07																				
54	Discussing national strategy (WG Meeting 5)	3 days	Tue 9/23/08	Thu 9/25/08																				
55	Revise national strategy (contract 3)	143 days?	Thu 2/1/07	Mon 8/20/07																				
56	Prepare regional draft strategy (consultant 3)	143 days?	Thu 2/1/07	Mon 8/20/07																				
57	Finalise natl strategy (WG mtg 5)	3 days	Tue 9/23/08	Thu 9/25/08																				
58	Discuss reg. strategy (WG mtg 5)	3 days	Tue 9/23/08	Thu 9/25/08																				
59	Finalise reg strategy (WG mtg 6)	177 days	Thu 2/1/07	Fri 10/5/07																				
60	Inputs to natl & reg SAP	500 days?	Thu 2/1/07	Tue 12/30/08																				
61	Implement SAP (PILOT PROJECTS)	446 days?	Tue 1/1/08	Mon 9/14/09																				
62																								
63	New Activities	18 days?	Thu 1/3/08	Fri 1/25/08																				
64	CPR Survey 2 with cruise	16 days?	Sat 1/5/08	Fri 1/25/08																				
65	CPR Survey 2 with cruise	24 days?	Tue 7/1/08	Fri 8/1/08																				
66	Primary productivity estimation	152 days?	Thu 1/3/08	Thu 7/31/08																				
67	Drafting Guidelines for Ecosystem monitoring	117 days?	Mon 10/22/07	Mon 3/31/08																				

List of Acronyms

CPR	continuous plankton recorder
DO	dissolved oxygen
FIO	First Institute of Oceanography (China)
FRFF	fast repetition rate fluorimeter
GEF IW	Global Environment Facility International Waters
HAB	harmful algal bloom
NPC	National Project Co-ordinator
NYSAPs	National Yellow Sea Action Plans
OC	ocean colour
PAR	photosynthetically active radiation
PMO	Project Management Office
PSC	Project Steering Committee
ROK	Republic of Korea
RWG	Regional Working Group
RWG-I	Regional Working Group – Investment
RWG-P	Regional Working Group – Pollution
RWG-E	Regional Working Group - Ecosystem
SAP	Strategic Action Programme
SST	sea surface temperature
TSM	total suspended matter
TDA	Transboundary Diagnostic Analysis
UNDP	United Nations Development Programme
YSLME	Yellow Sea Large Marine Ecosystem