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## UNDP/GEF PROJECT ENTITLED "REDUCING ENVIRONMENTAL STRESS IN THE YELLOW SEA LARGE MARINE ECOSYSTEM"

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UNDP/GEF/YS/RWG-B.1/5  
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**First Meeting of the Regional Working Group  
For the Biodiversity Component of  
the UNDP/GEF Yellow Sea Project**  
*Qingdao, China, 19-22 April 2005*

### **Draft Data and Information Requirements**

The final outputs of the UNDP/GEF Yellow Sea Project are to prepare a Transboundary Diagnostic Analysis (TDA), Regional Strategic Action Programme (SAP), National Yellow Sea Action Plans, and demonstration of the SAP. Document UNDP/GEF/YS/RWG-B.1/4 described the general process to develop the TDA and the requirements from the Regional Working Groups to set a common ground for data acquisition. This document describes in more detail the last few step of the TDA development process, in particular, the causal chain analysis and governance analysis. After understanding these procedures, the Regional Working Group (RWG) should discuss and agree on the basic requirements and procedures for preparing an initial causal chain analysis, governance analysis, and propose some solutions to address the pollution-related problems in the Yellow Sea.

It should be noted that the WWF/KORDI/KEI Yellow Sea Eco-region Planning Project has collected biodiversity data and information from the Yellow Sea, and has presented this data in a GIS-database form. While considering the data and information requirements for the biodiversity component, the Regional Working Group should come up with an agreement on how the YSEPP project data should be applied in the preparation of the TDA.

#### **Causal Chain Analysis**

A causal chain analysis is a linear approach to analysing the proximate and ultimate or, root causes of observed environmental issues or problems in a specific location. Whilst such an analysis can be conducted for a wide geographic area, the end results do little more than identify areas of intervention either at the level of issue or problem or the level of cause.

When such an analysis is conducted at the scale of a specific intervention, it provides information regarding the best point of intervention along the chain, and at which point maximum benefit can be derived for minimum cost. Future corrective actions can only be proposed with confidence if the whole chain of symptoms, causes and effects is understood. Such a causal chain analysis has to be carried out for each priority problem. The completed causal chain analysis should help to locate potential areas of intervention for the GEF, and is an important basis for the design of the practical actions that will be included in the SAP.

The causal chain relates the problems to their immediate physical causes and their social and economic underlying causes. However, there is a danger here of confusing problems and immediate causes. For example, take the question of 'Pollution hot spots'. Should the existence of hot spots be described as the problem to be dealt with, or is it the impact or cause of another problem? The outlined causal chain diagram in Figure 1 shows that the hot spot is the immediate cause of the problem.

During the TDA, the interaction between causes and effects of key transboundary problems has to take into account the **geographical scale** of the environmental and social impacts of a problem. Remember: the problem itself and the causes of the problem may be different.

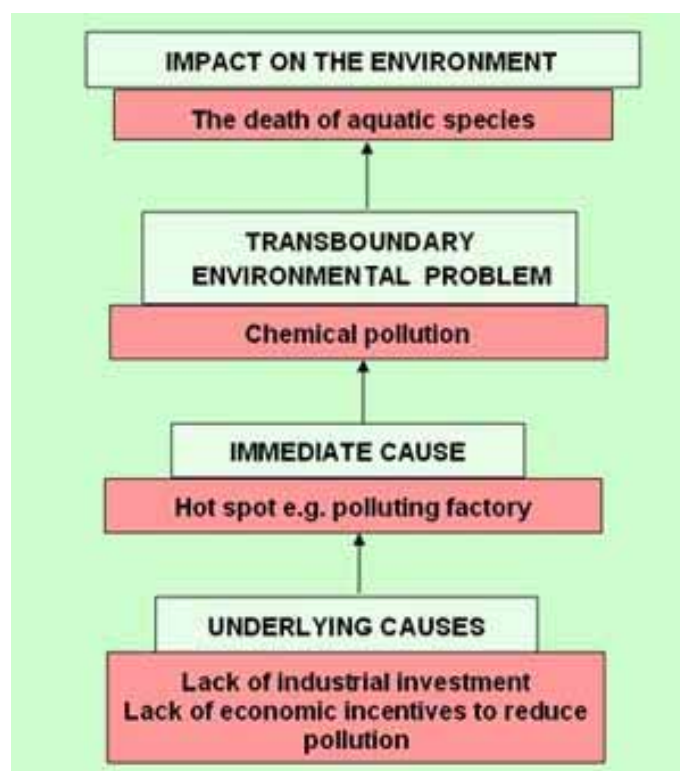


Figure 1. Sample of causal chain diagram.

Completion of a causal chain analysis for each of the priority problems requires a mixture of expertise: scientific for the immediate causes, and social and economic for the underlying and root causes.

**Immediate causes** are usually technical in nature and should be quantified, prioritised and geographically located. **Underlying causes** are those that contribute to the immediate causes. They can broadly be defined as **sectoral** resource uses and practices, and their related social and economic causes.

Beyond the sectoral causes however, are deeper **root causes** of the problems, often macroeconomy, demography, consumption patterns, environmental values and access to information and democratic processes. Most of these are beyond the scope of GEF's intervention but it is necessary to document them. The reason for this is that some proposed solutions may be unworkable if the root causes of the problem in question are overwhelming. Furthermore, actions taken nearer to the root causes are more likely to have a lasting impact on solving the problem.

To carry out the causal chain analysis in a specific location, and for a specific environmental problem, in most cases the environmental and socio-economic data and information required to support the causal chain statements will be developed in the analysis. Only with a strong scientific backing, will the causal chain analysis be persuasive

### **Governance Analysis**

The term 'governance' is short for the whole political environment: institutions, laws, policies and projected investments that affect environmental problems. The analysis of these is known as **governance analysis**.

The existence of a problem implies that some parts of the current mechanisms or their implementation are insufficient, otherwise the problem would not exist. Therefore, these mechanisms and the reasons for any failure must be documented in order that appropriate interventions can be suggested.

An important characteristic of governance analysis is to find out where decision-making power really sits, and how the mechanisms actually work, as opposed to how they are supposed to work.

Governance analysis should describe the dynamic relations within the political and social structures that underpin such aspects as legislative and regulatory frameworks, decision-making processes and budgetary allocations. In carrying out the causal chain analysis, many cross-cutting underlying causes will be found to be governance issues.

The governance analysis should be conducted by regional experts, and there should be regular feedback between all groups in order to understand the dynamics and synergies between the causes of transboundary problems and possible failures in governance.

The example below shows the causal chain and governance analysis for the problem of algal blooms in the Adriatic Sea.

#### **Example 1. Algal blooms in the Adriatic Sea.**

Algal blooms in the Adriatic Sea result in unsightly algal deposits on tourist beaches, which in turn result in reduced tourist income. A secondary effect resulting from increased nutrients is eutrophication, increased BOD and reduced availability of dissolved oxygen in the water column, which results in wide-spread fish and invertebrate kills resulting in loss of fisheries income and changes in biological diversity.

The **immediate cause** of the problem is increased nutrient availability in the water column derived from two sources, agricultural fertiliser run-off and discharge of untreated domestic wastes including sewage. Of the two, run-off of fertiliser from the intensive rice production of the Po valley is the dominant source of nutrient input. This in turn reflects excessive fertiliser use, poor agricultural practices and the artificially low price of fertiliser due to government subsidy and the common agricultural policy of the European Union. Whilst some environmental improvement could be effected via changes in fertiliser use and agricultural practices, the key to effecting change in this instance involves a change in government policies, which remove the subsidy on fertilisers, which in turn requires a change to the common agricultural policy of the European Union. Effecting change at the level of policy within the European Union requires changes involving all member states of the Union not merely the ones impacted by the observed loss of environmental quality.

The discharge of untreated sewage whilst it represents a significant source of nutrient input which is widespread along the coast of the Adriatic is less significant than agricultural run-off; hence intervention in this chain of cause and effect will have less impact in terms of reducing nutrient loads than intervention in the agricultural sector.

This example illustrates three significant points: 1) firstly, the need to identify the primary causes and rank their importance where more than one source is involved; 2) secondly, the need to identify the precise points of intervention that will have the greatest effect; and, 3) thirdly, that some causes may be beyond the capacity of the involved countries to address, since they involve countries outside the area of impact, i.e. they are transboundary at the policy level.

	<b>Causes of observed problem</b>						
<b>Issue or Problem</b>	<b>Immediate Cause</b>	<b>Level 2 Cause</b>	<b>Level 3</b>	<b>Level 4</b>	<b>Level 5</b>	<b>Level 6</b>	<b>Ultimate or root cause</b>
Algal blooms (Adriatic sea)	Increased nutrients	Agricultural runoff (Po River)	Excessive fertiliser use	Poor agricultural practices	Low price	Govt. subsidy	Common Agricultural policy of the EU
		Discharge of sewage	No treatment	Lack of capital	Political will		

Once the characterisation has been completed, a causal chain analysis needs to be completed for each site that identifies the key environmental issues, problems or threats and their causes prior to conducting a cost benefit analysis for each potential intervention. Then a clear identification of the relative importance of each identified problem and the comparative importance of each cause in the case of problems with multiple-cause choices regarding the priority interventions can be made.

### **Solution Guideline**

At a later stage, when the causal chain and governance analysis have been completed, one must formulate solutions to address the problems. The solutions and actions will contribute to the SAP. While it is beyond the scope of the First RWG Meeting to start formulating solutions, Example 2 provided below is for future reference, and to give an idea of the RWG's task ahead when the Project reaches the SAP development stage.

At the right hand end is the problem to address. In this example, it is loss of seagrass beds and aquatic organisms in Thailand. In the case for the RWG-B, it may be the decline of biodiversity of reef-associated organisms in the vicinity of Mariculture farms.

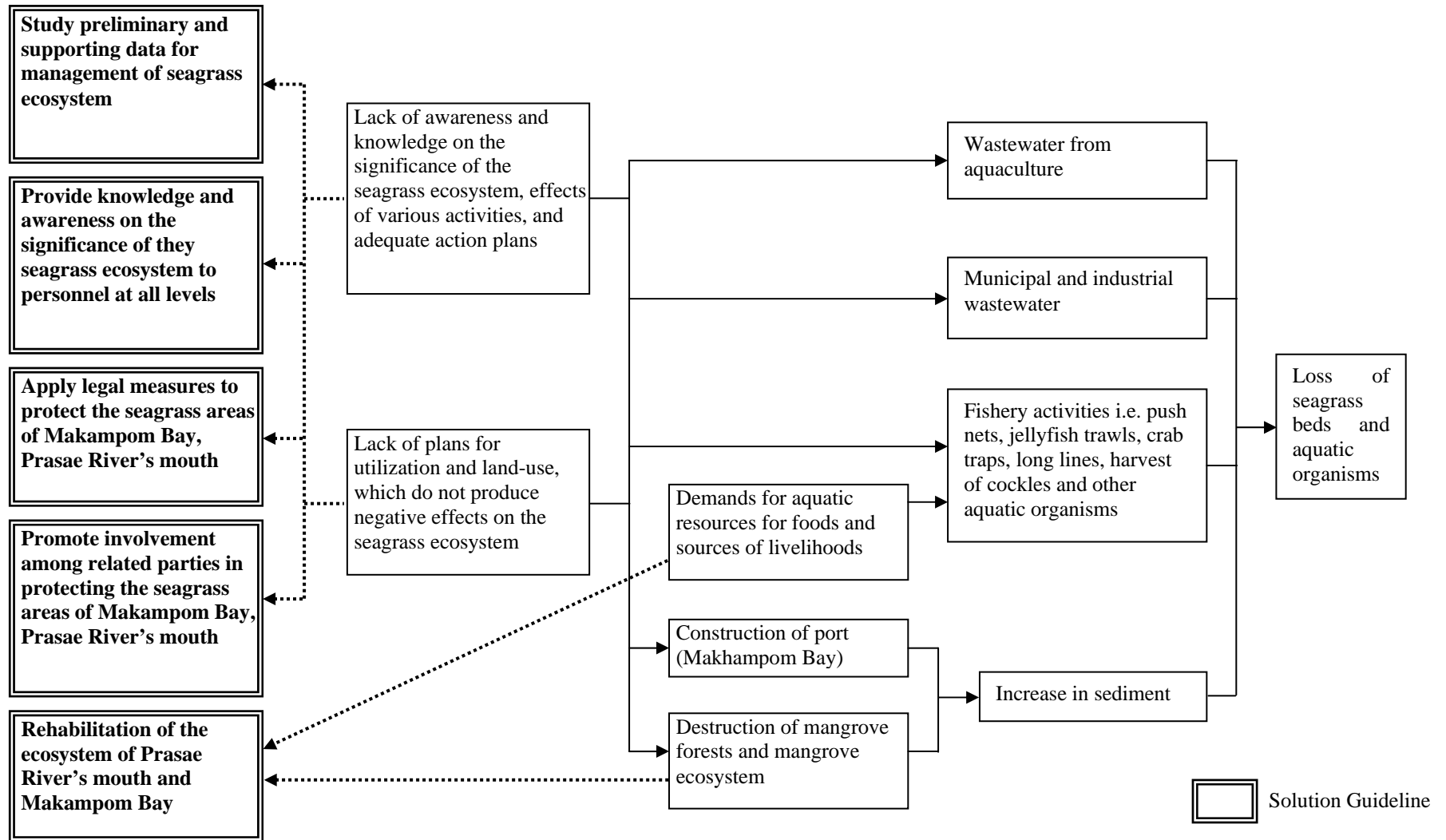
Immediately beside the problem, is the first level cause of the problem, and to the left of that, the second level, etc, until the root cause of the problem (second column from left). In this example, the root cause was sometimes a lack of awareness of the impacts of these activities on the ecosystems, and lack of land use planning leading to sedimentation getting to the reefs and seagrasses, etc.

At the far left, are the interventions needed to address the root causes of the problem. Not all interventions may be possible to address, as mentioned in Example 1. However, the interventions will be listed in the SAP, and where possible, tested at demonstration sites. In the longer-term, the proposed interventions will serve as guidelines for regional actions to manage the Yellow Sea ecosystem.

### **RWG Tasks at Hand**

The First RWG-B Meeting will begin the initial steps for TDA/SAP development. The two spreadsheets annexed in this document are a starting point for agreeing on the data requirements for TDA, and a working example for the causal chain and governance analysis. During the Meeting, participants will finalise the table of data requirements, and go through an exercise to develop a causal chain analysis.

Example 2. Site-specific causal chain analysis for Makhampom Bay, Thailand.



## Annex I

## WORKING DOCUMENTS

Table 1: Draft Table - Availability and Required Format of Data for Major Biodiversity Issues.

Problem	Indicators/Information needed to detect problem:	Type, Unit and Frequency:	Temporal Requirements:	Spatial Requirements:	Available: ROK?	Available: CHINA?	Priority:	Transboundary?:
<b>Degradation of Biodiversity</b>	Biodiversity Condition Index of selected marine habitats and communities	Index per habitat per region per annum	Last 50 years	Yellow Sea				
	Biomass by trophic levels inside fished and non-fished areas		Min 10 yrs Ideal 30 yrs	Yellow Sea				
<b>Loss or imminent loss of endangered species and their genomes</b>	No. of different fish, non-fish and protected species caught, by species, per fishery, by area, by year	No. species per fishery per area per annum	Min 15 yrs Ideal 50 yrs	Yellow Sea				
	Number of taxa in IUCN threat categories	No. taxa/threat category per annum	25 yrs	Yellow Sea				
	Level of genetic degradation of important bio-resources	Gene pool analysis per stock per region	Min 10 yrs	Yellow Sea				
	Rate of Displacement and/or extinction of native and endemic species	No. species per area per annum	50 yrs	Yellow Sea				
	Current Trophic model and ID of vulnerable linkages		Min 10 yrs Ideal 30 yrs	Yellow Sea				
	Extent and condition of benthic communities sensitive to being damaged by bottom fishing methods or other unsustainable fishing methods		Min 10 yrs Ideal 30 yrs	Yellow Sea				
<b>Loss of coastal habitats</b>	Percentage change in extent and condition of selected marine and coastal habitats compared to current and historic baselines	% per region per annum	50 yrs	Yellow Sea				
	Change in percentage area of each marine/coastal environments, ecosystems and habitats under protection	% size km <sup>2</sup> per area per annum	25 yrs	Yellow Sea, All near shore areas				
<b>Introduction of foreign species</b>	Abundance/distribution of adventive marine species and pathways	No./m <sup>2</sup> and m-km per region per annum	Min 50 yr	Yellow Sea				
	Change in density of selected alien species	No./m <sup>2</sup> per region per annum	Min 50 yr	Yellow Sea				
	Change in distribution (range) of selected alien species	m-km per region per annum	Min 50 yr	Yellow Sea				

**Table 2: Example Causal Chain Analysis for Major Biodiversity Issues**

Problem	Impact	Immediate cause	Underlying cause	Root cause	Governance analysis	Priority rank (H, M, L)	Trans-boundary?	If yes, priority rank (H, M, L)
<b>Biodiversity Issues</b>								
<b>Loss of Species</b>	<i>Reduction in species diversity</i>	<i>Over-exploitation of selected species in localized region, Displacement by adventive and dominant species</i>	Improperly managed and controlled fisheries systems			H	Y	H
<b>Genome 'narrowing'</b>	<i>Reduction in genetic diversity</i>	<i>Over-exploitation of select species in localized region</i>	Improperly managed and controlled fisheries systems		Poor or unsatisfactory legal instruments at the regional level,	L	Y	L
<b>Loss of endangered and/or endemic species</b>	<i>Reduction in number of endemic species</i>	<i>Exploitation of endangered species, Displacement by adventive and dominant species</i>	Improperly managed and controlled fisheries systems	Inadequate knowledge and infrastructure base	Inadequate implementation of national regulatory instruments;	M	Y	M
<b>Ecological imbalance</b>	<i>Reduction in trophic diversity</i>	<i>Over-exploitation of selected species in localized region</i>	Improperly managed and controlled fisheries systems		Lack of regional harmonization of regulations.	M	Y	M
<b>Damage and Loss of Coastal Habitat</b>	<i>Reduction in habitat quality and diversity</i>	<i>Use of coastal waters and land for human activities and developments, non-sustainable fishing methods (Trawling, dynamite fishing, etc)</i>	Increase demand for marine and coastal (land) resources due to rapid population expansion and urbanization	Inadequate planning, management practices and coastal development systems		H	N	