

## **Report Summary**

### **The Environmental Effects of Red Tide Phenomenon Assessment**

The concentration of algae and microorganisms in the water is the main compound that supports benthic nutrient texture in marine environment. As its life circle is relatively short, it reacts rapidly to the environmental changes hence it is considered to be a valuable indicator to the quality of water. When conditions are well suited ( i.e. certain heat, high nutrients , low wind then the blend of water bodies) Red Tide occurs. The phenomenon took place in a number of regional countries including Kuwait in May 1997. it caused the mortality of large quantities of fish in 1999. Generally speaking, microscopic planktons may lead to the discoloration of the water, also known as the Red Tide which causes the death of fish, birds and other marine mammals.

Environment Public Authority (EPA) is responsible for monitoring waters in Kuwait. It operates an intensive monitoring program through the use of environmental testing equipments to observe algae and other planktons. The program includes monitoring stations distributed at the Kuwaiti coasts. EPA cooperates along with Kuwait Institute for Scientific Research Center (KISR) in the execution of this program.

In light of the State Audit Bureau concern with environmental review process, SAB conducted an environmental audit program related to Red Tide. The program reassures the compliance to the stipulations and standards related to the waste disposal in seawater issued by EPA according to 210/2001 resolution of EPA establishment law. It also evaluates the efficiency of the controlling systems used to monitor the

validity of the treated sewage water and other wastes discharged to seawater. The program also tests the capacity of entities in relation to controlling Red Tide causes.

SAB reached a number of conclusions such as:

1. Departments dealing with Red Tide face obstacles and problems that negatively effect work quality, they are:

1/1 Weakness of the allocated reliabilities related to chemical substances, glassware and lab apparatus to perform main tasks.

1/2 Inability to fully collect routine samples especially in south locations because of the deterioration of equipments and marine transportation systems.

1/3 Lack of trained technical workforce specifically in chemistry as well as the lack of lab technicians led to postponing work plans in different departments. In addition, there is a lack in technical expertise (e.g. Marine Science – Marine Biology) and other specializations related to collection of samples from shores and seawater.

1/4 Damages in apparatus resulting from lack of spare parts by suppliers lead to the delay of some tests or deterioration of results.

1/5 Lack of modern equipments to monitor and observe marine environment.

1/6 Lack of allocated budget for external training programs or conferences .

1/7 Lack of required scientific references and the absence of lab performance development as well as technical capacity enhancement .

1/8 Absence of defined job description that accurately assign tasks

1/9 Absence of coordination between natural reserve governmental entities and the related department of EPA.

2. The result analysis of the Water Pollution Detection department in EPA of 2009 assessments in comparison to annex 12 of resolution no.210 of 2001, "Quality of Kuwait Seawater" regarding Red Tide phenomenon showed:

2/1 Sample results show that salinity concentration exceeded the maximum acceptable limit which goes between %33 - %42 in some locations most time of the year.

2/2 Sample results show an exceeded concentration of phosphate (P-P04) to the acceptable level ( $\mu\text{g/I}$  33.7) in some locations for months

2/3 Sample results show an exceeded concentration of ammonia (N-NH3) than maximum acceptable level of ( $\mu\text{g/I}$  60) in February 2009 in managing locations, Al Doha. It is worth mentioning that results for other locations have not been submitted during this month.

2/4 Sample results show an exceeded concentration of Silicate (Si-SiO3) to maximum acceptable level of( $\mu\text{g/I}$  893.2) during the months of February and March 2009 in Bide'e location.

The sample results exceeded the normal range during March 2009 in the location of Ra'as Al-Ajouza.

3. Sample results of chemical and microbiological tests conducted on swage wastewater discharged to seawater via main ditch of Sulaibiya Wastewater Treatment and Reclamation Plant using reverse osmosis showed:

1/3 A high level of coliform bacteria indicate an exceeding range of pollutants to (C.F.U/100ml 1000) and a high level of fecal coliform bacteria and faecal streptococci bacteria that indicate high range of organic resources pollutants.

2/3 High levels of total dissolved salt (T.D.S) indicating an exceeding range of pollution (mg/L for per 1500), high level of boron (B) that exceeds the normal range of(mg/L 75), high level of Nitrate indicating pollution (mg.L 30) and high levels of Phosphates (mg/L 2) exceeding the acceptable range.

4. The absence of an effective plan to overcome Red Tide and reduce its severity in line with the increasing number of pollutants since the mission of EPA's Biology department is limited to assessing and observing the phenomenon. Its tasks did not include any required measurements to deal with the phenomenon along with the cooperative entities aiming to overcome or address the problem.

After reviewing the results, SAB concluded that it is important to consider the following:

## **A. High risks**

1. It is important that EPA develop a defined plan to face the red tide phenomenon and set methods to deal with its risks and effects.
2. Taking necessary actions toward the shown results by
3. EPA Department of water pollution detection should take necessary actions toward the given results concerning the discharged wastewater to the sea via main ditch of Sulaibiya Wastewater Treatment and Reclamation Plant of reverse osmosis. The tests show lack of compliance to the approved wastewater discharge standards with accordance to annex no. 13 of 210 of 2001 resolution. It defines wastewater industrial pollutants to be discharged into Kuwait seawater and the estimated effects on marine environment and humans.
4. Defining EPA role in facing instable analytical results based on seawater quality standards with accordance to annex 12 of resolution no.210 of 2001. Setting comprehensive solutions to decrease pollution and improve the quality of seawater.

## **B. Moderate risks**

5. develop more cooperation and coordination between EPA and its various departments with KISR and Kuwait University to prevent the growth of harmful algae
6. Seeking sufficient liabilities of chemical substances, glassware and lab apparatus to aid departments on carrying out their tasks. Provide latest equipments related to collection of samples and marine environment monitoring and observational tools.
7. Overcoming lack of technical work force especially in chemistry ,lab technology, and other technical expertise ( e.g. marine science-

marine biology) in addition to experts in collecting samples from shores and beaches.

8. Developing job description to accurately assign tasks.
9. Developing internal and external training, information exchange methods, providing scholarships, and scientific references to enhance technical skills.