

# Oil Spills - Avoiding disaster through pollution prevention, preparedness and response

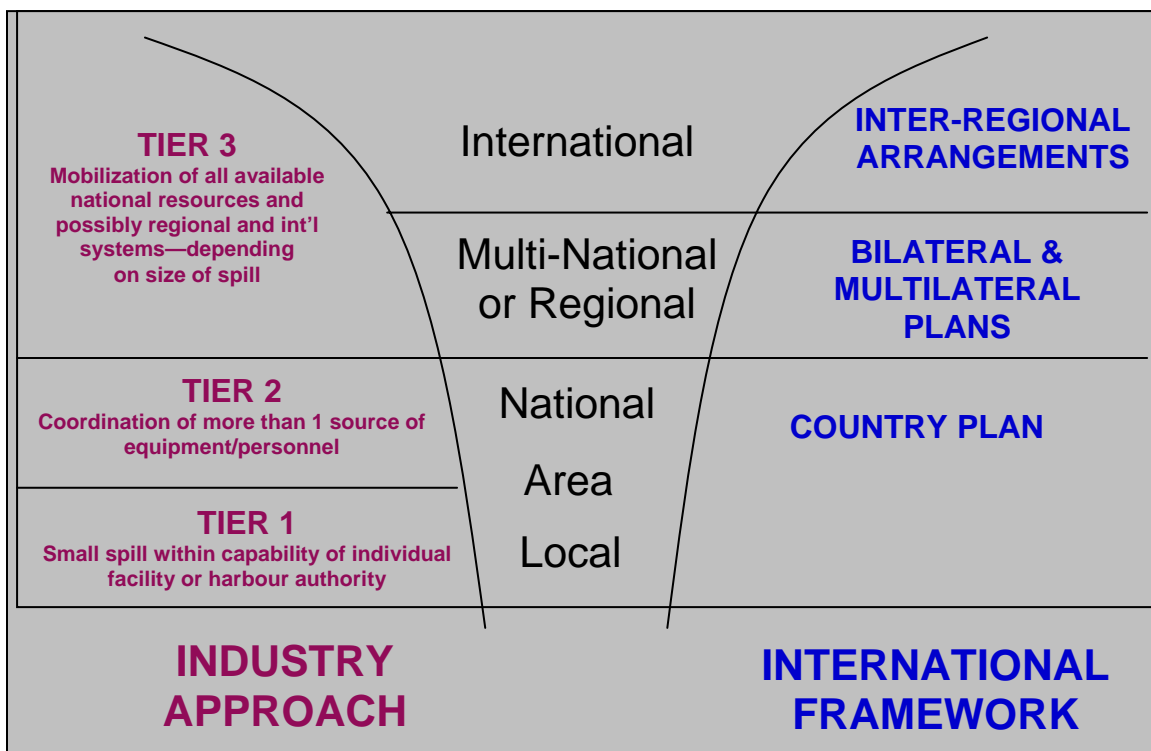
Presented by PESCo  
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## Introduction

Oil is, and will continue to be for a long time, the main source of energy for both the developed and developing countries all over the world. Sea transport will continue to be the main transportation mean to move oil and oil products from producing countries to consumers all over the world. In spite of continuous improvement in safety of maritime transportation, tankers industry and ports facilities, oil spills incidents and vessels accidents will continue to occur. Therefore, countries should have in place effective and integrated National Oil Spill Contingency Plans that can promptly respond to these incidents and deal with preventable consequences.

There is an international recognized system of response to oil spills, where the differing degrees of oil spills are addressed through the application of a tiered system.

### International Oil Spill Response Framework OPRC 90 Conventions



Typically resources required for each response structure can be provided in two ways:

1. Either by the development of individual stockpiles; or
2. Through mutual aid and sharing.

Each has their practical and political strengths and weaknesses.

In the event of a major oil spill incident, there is a great potential for difficulties and stresses to arise as the result of uncoordinated communications, differing lines of authority and responsibility, an absence of long-term familiarity with personnel, equipment and techniques employed by other companies and agencies and this is often compounded to unclear answers to the question, "Who's in charge of What?"

Pressures from the media and others, coupled with the need to act quickly, may result in conflicts and in disorganized leadership that may and often do negatively impact both operations and the public's perception of the event.

## **Considerations**

Buying equipment can be relatively easy; capital budgets whilst difficult to come by can be achieved. What is more difficult is the ongoing annual cost of storing, maintaining the equipment and training personnel in its use, particularly as the frequency of oil spills are so low.

History is littered with the debris of well meant initiatives to establish grand equipment stockpiles that have been reduced to poorly maintained and stored equipment inventories.

The logistics and deployment systems for the equipment need to be tested and exercised frequently to ensure their ongoing effectiveness.

The problem is that to adopt such an approach and not see it through to conclusion leads to a false sense of security in the ability to respond. This problem will become evident only when an event occurs.

## **The Tiered System**

The 3 tiers are applied in various forms; however, reliance and expectation of each level of response needs careful consideration. The expectation of the tiered response system in simplest terms can be defined as:

- **Tier 3**  
Industry Tier 3 centres are capable to provide effective stockpiles of equipment with well trained and experienced personnel.

However, in practical terms to be effective and complement the Government response, the resources provided by these centres need to be integrated into the response structure at all levels from the temporary import of equipment, visas for personnel and the ability to provide the resources into the overall operational plan.

Permits for communication and electronic equipment require careful consideration; this is up to those requesting the support to provide required clearance.

- **Tier 2**

The mutual aid approach is particularly relevant in the context of the Tier 2 response. Whilst this is a very cost effective approach, there is a need to ensure that the equipment will be released on upon request.

The contractual arrangements on how to compensate, rehabilitate, repair or replace equipment in the event of equipment use or damage must be well documented and all parties in agreement with the protocols.

Most importantly, from an operational point of view, the equipment must be stored and packaged in a way that it can be effectively mobilized. Mutual aid can overstretch resources.

- **Tier 1**

In many facilities, the Tier 1 operational equipment is stored in such a way that it can be mobilized to a spill site. Additionally, the equipment must be suited to the spilled oil type in question.

The common theme throughout any of the methods of approaching oil spill response is that of cooperation and communication. Whichever strategy for providing equipment is adopted, the operational response will be made most effective through:

1. Pre-planning cooperation and communication between all of the parties involved, government and industry alike; and
2. A recognition of their contribution and ability to provide constructive input.

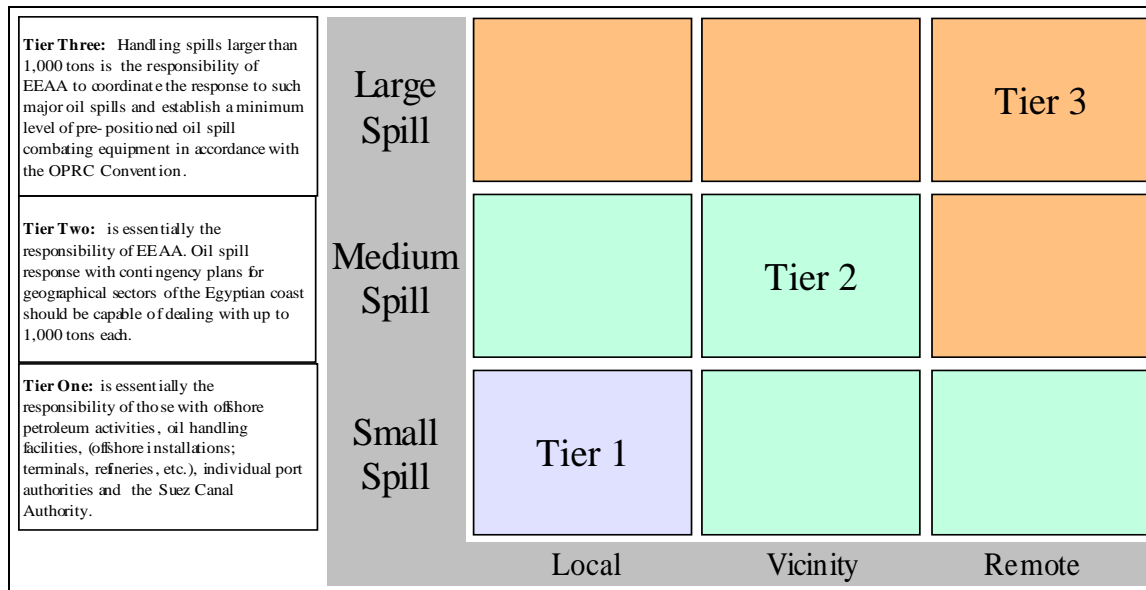
These management and planning aspects have a massive impact on the operational outcome of a spill, there are five fundamental elements for consideration when establishing or reviewing a response system:

1. Management – What are we going to do?
2. Plans/Intel – What do we need to do? What is happening now?
3. Operations – How are we going to do it?
4. Logistics – How are we going to support it?
5. Finance/Admin – How are we going to document it and who is going to pay for it?

## **The Egyptian Experience**

Egypt, with its long and sensitive coastline which is situated in the centre of the marine transpiration lanes of oil from east to west, has had a National Oil Spill Contingency Plan "NOSCP" in place since 1986. However, in as much as the NOSCP is an essential requirement, the effective integration of its components is crucial for its successful implementation when activated.

Figure 1 - Egypt's Adaptation of the Tiered Response System into the "NOSCP"



Egypt already has signed almost all the IMO Conventions including MARPOL 73/78 and the OPRC 90. In compliance with the latter:

Egypt has signed two sub-regional agreements:

- Mediterranean Trilateral Agreement and Sub Regional Contingency Plan with Israel and Cyprus
- Upper Aqaba Trilateral Agreement and Sub Regional Contingency Plan with Israel and Jordan

In addition to this, Egypt has signed two regional conventions; namely:

- Jeddah Convention with the States of the Red Sea and Gulf of Aden
- Barcelona Convention with the States bordering the Mediterranean

### **Background of National Oil Spill Contingency Plan “NOSCP” – Egypt**

The first Egyptian National Oil Spill Contingency Plan (NOSCP) was prepared by the petroleum sector in 1986. At that time, the Ministry of Maritime Transport (MMT) was designated as lead Agency.

Responsibility for oil spill response and the NOSCP passed to the Egyptian Environmental Affairs Agency (EEAA) in 1994 with the promulgation of the new Law for the Environment (Law No. 4 of 1994).

Article 25 (Law 4/1994) places an obligation on EEAA to prepare an Environmental Disasters Contingency Plan for approval by the Cabinet of Ministers. One component of such a Plan is the National Oil Spill Contingency Plan.

The Egyptian NOSCP is a framework for action in the event of an oil pollution incident. It sets out:

1. The respective roles and responsibilities of EEAA and all EEAA's partners in the National Contingency Plan;
2. The procedures for notifying EEAA in the event of observed oil pollution or reporting discharges of oil from ships and offshore platforms;
3. The tiered response concept and how this will operate in Egypt including responsibility for taking initial response action to an oil spill;
4. The incident command procedures which describe the ongoing management responsibilities in the case of Tier 1, Tier 2 and Tier 3 spills;
5. The national combat strategy and EEAA's policy on the use of dispersants;
6. The updating project has improved the NOSCP instrumentation where:
  - a. A legal instrument has been instituted to provide the legal basis for the NOSCP and to implement Egypt's obligations under the International Convention for Oil Pollution Preparedness, Response and Cooperation, 1990 (OPRC);
  - b. A framework was prepared to enable the Government of Egypt to claim compensation for environmental damage from polluters; and
  - c. A mechanism was established to draw upon the financial resources of the Environmental Protection Fund to enable EEAA to reimburse combating and clean-up costs, including responding to pollution from unknown sources.

Experience in dealing with oil spills in Egypt illustrates some of the difficulties that typically arise in large and/or complex oil spill response operations. In order improve the efficiency of the NOSCP and provide for its effectiveness, several actions are now being implemented through the various stakeholders.

### **Tier 1 - Oil Spill Response Plans**

These plans are the foundation pillars of the NOSCP. Without good Tier 1 plans in the petroleum sector, the Suez Canal Authority and the ports, backed up by adequate and appropriate expertise and equipment, the NOSCP is currently being enhanced through:

- EEAA evaluation and approval of the Tier 1 oil spill response plans;
- Regular review of "standing approvals" for the use of dispersants and ensure that such approvals are given only in conformity with EEAA's policy and guidelines on the use of dispersants;
- Evaluation of individual port authorities', Suez Canal Authority's and petroleum sector equipment stockpiles in light of the authorities' own risk assessments and advise on adequacy;

- Regular NOSCP training programs (IMO Levels 1 and 2 Model Courses available in Arabic and English);
- An annual exercise program in accordance with the decisions of the National Contingency Planning Committee and in consultation with all stakeholders;
- Consultation to the petroleum sector, Port Authorities, the Suez Canal Authority and other authorities, whenever requested, in order to enhance the overall oil spill response capability in Egypt.

## **Tier 2 – Oil Spill Response Plan**

Most oil spills will be dealt with in the context of the Tier 1 oil pollution emergency plans. The Tier 2 contingency plans are constantly tested in areas where:

- The oil pollution incident escalates beyond the capabilities of the Tier 1 plan; and
- EEAA is called upon to deal with an unknown source of oil pollution.

Tier 2 contingency plans are being updated to incorporate:

- knowledge of area concerned, surface currents and local wind conditions in order to better predict the likely movement of oil spills;
- information on any “sacrificial beaches” where, circumstances permitting, it is better to deflect oil ashore rather than let it pollute more sensitive coastal resources;
- determination of appropriate clean-up strategies for the different beach types in the region in accordance with the policies of the NOSCP;
- identification, in advance, local resources for beach clean-up operations;
- disposal options for recovered oil and oily wastes in close cooperation with EGPC and the local governorate; and
- Training and exercises at the Tier 2 level.

## **Tier 3 – Oil Spill Response Plan**

EEAA are responsible to coordinate the response to a major Tier 3 oil pollution incident. Protocols and agreements are reviewed annually through the national exercise program to ensure effectiveness where:

- Reliance is placed on local resources from ports and the petroleum sector;
- Other stakeholders are involved such as oil pollution incident involving a tanker owned by or carrying the oil of one of the petroleum companies operating in Egypt. As the representative of that company will be a member of the Emergency Response Committee which will be established by EEAA and he may be asked to activate a response from the petroleum industry's stockpile of equipment in Southampton, UK, where appropriate and relevant; and

- Egypt's partners in sub-regional contingency plans may be asked for their assistance.

Figure 2 - Egypt's National Response Network "NRN"

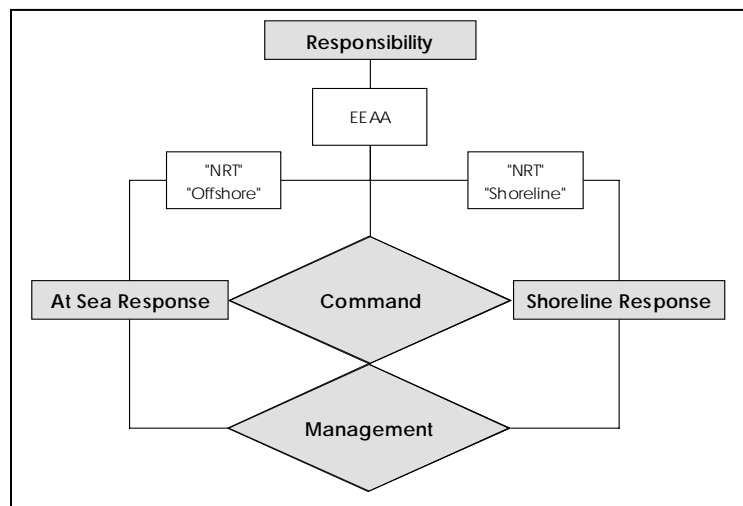
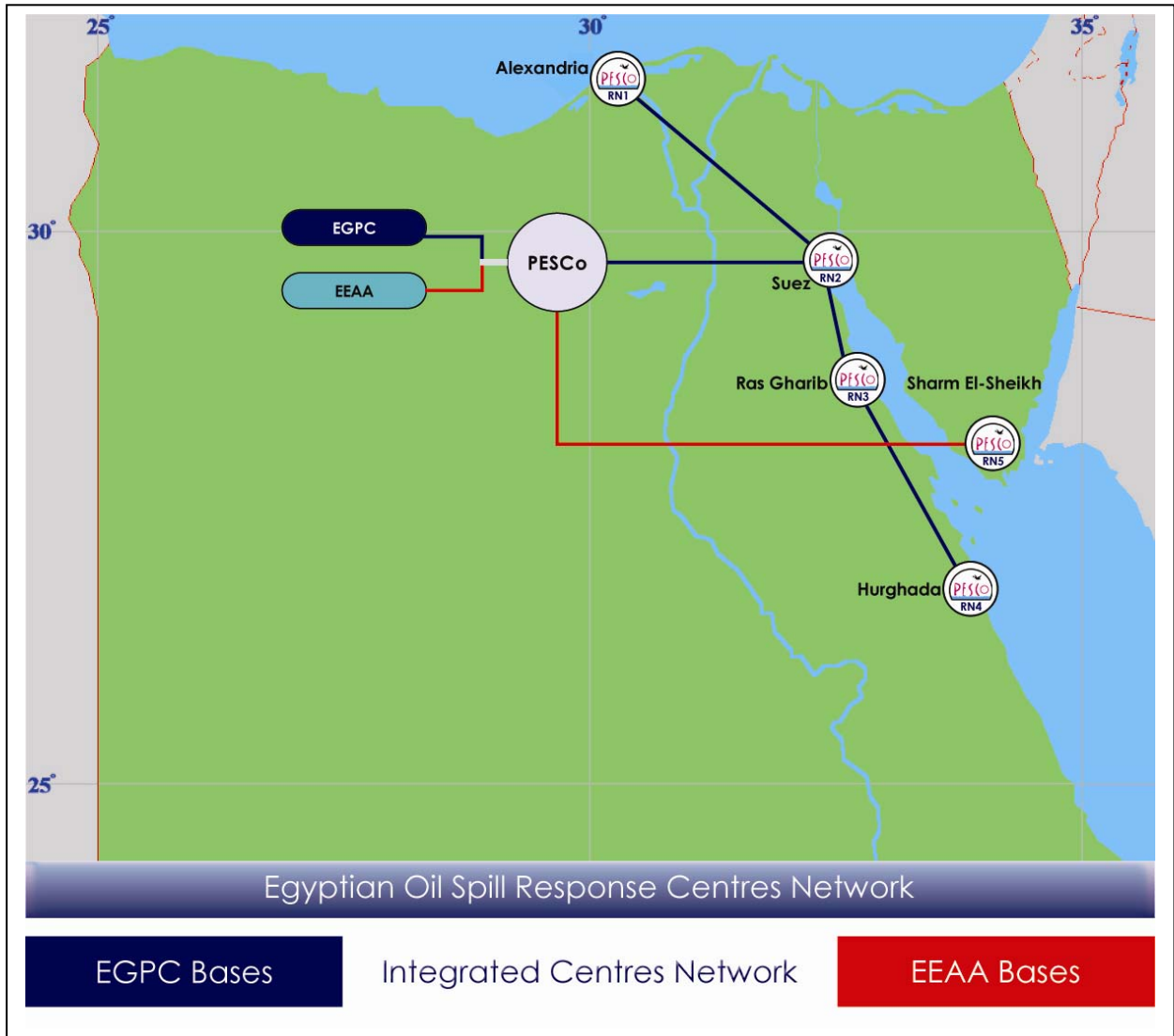
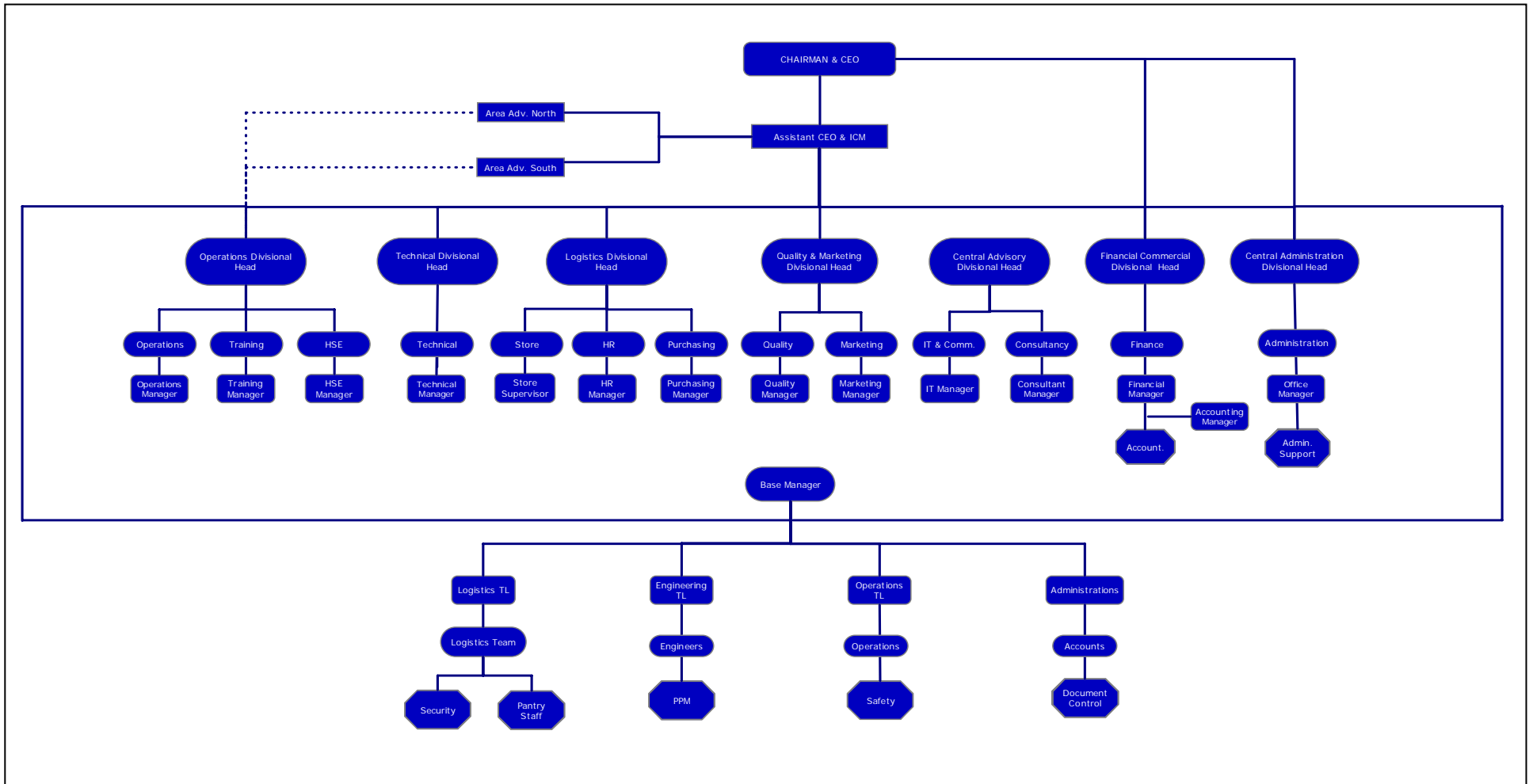


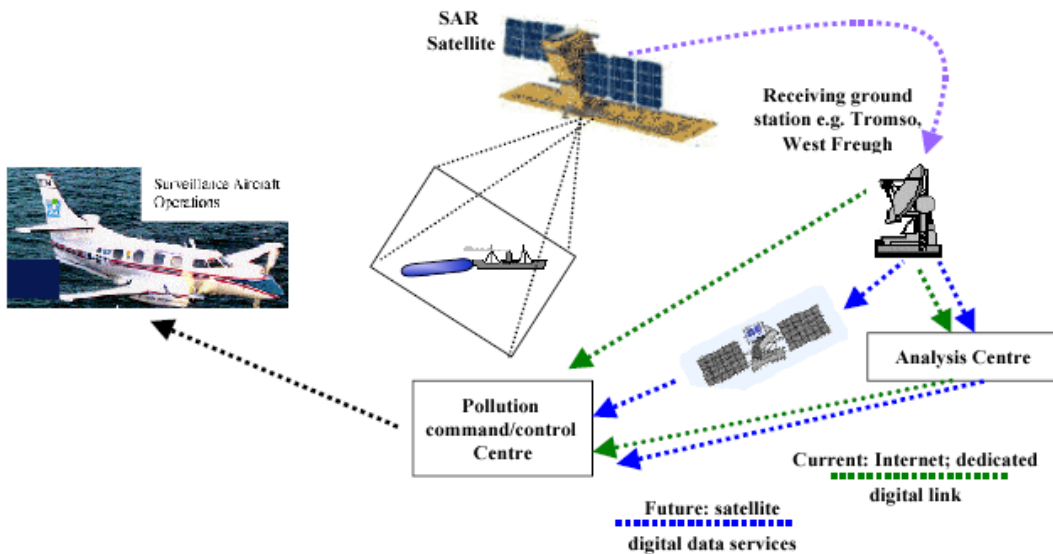
Figure 3 - Egypt's Response Management System – National Response Teams "NRT"



## Oil Spills and Technology

It must be remembered that technology does not replace the need for preparedness; however, can reduce the level of preparedness due to the effective early warning systems currently in place and being developed. The following is information on selected technological advances within the framework of oil spill response.

Communication technologies, such as satellite and wireless services play an important role in operational oil spill surveillance. Oil spill detection sensors and technologies are predominantly available on aircraft, but they might also be available on other platforms such as ships, satellites, and land. Airborne-based surveillance can benefit from space-borne radar data, if the satellite-derived information can be communicated within a very short time (e.g. within 1-3 hours) from satellite overpass. This implies that reliable data links are needed to: a) deliver and retrieve the multi-sensor/technology data to a centre where the data can be integrated; and b) coordinate decision-making (e.g. at the control centre) and response (transmitting the information to appropriate surveillance missions).



## Detection

Oil spills are frequent occurrences; but early detection and response can prevent the kind of oil-drenched wildlife and environmental impact caused by oil spills. There is recently a newly developed maintenance-free oil spill detection system called Slick Sleuth which uses optical sensors, wireless telemetry and software to monitor and detect oil spills as they occur in real time - whether in a port, bay, river, spillway, industrial sump, offshore; or anywhere oil spills might occur.

The sensor uses the fluorescence of polyaromatic hydrocarbon (PAH/BTEX) compounds, such as diesel/fuel oil and lube oil, to spot the first oily sheen on water, day or night. Mounted above the water, the monitor's high-power xenon flash tube fires pulses of UV light onto the water surface; any oil present will fluoresce and be detected by the monitor's photodetector.



The monitor contains the sensor, wireless telemetry equipment and power (rechargeable batteries and a solar panel).

The water surface is scanned based on a preset schedule. At the scheduled time, the monitor fires the flash tube several times to get a good statistical average. If the sensor registers oil on the water, this flash sequence is repeated to verify the detection. If oil is detected, the monitor alerts the base station (a laptop running the Slick Sleuth software). Each monitor has a unique ID that enables the software to graphically pinpoint the spill location and provides alarm capabilities and site-specific response information, such as points of contact, environmental details and response scenarios.



## Observation and Tracking

On initiative of the United Nations, space agencies from all over the world agreed in November 2000 to make available free-of-charge satellite images in the immediate site of a major disaster. The International Charter ([www.disasterscharter.org](http://www.disasterscharter.org)) aims at putting into operation past space investments by providing in short response time useful situation overviews to those affected by natural or man-made disasters, through authorized channels. A 24-hour on-duty operator prepares an archive and acquisition plan using available satellite resources.

*“Public authorities and private organizations concerned with early warning and related practices should realize the benefits of partnership in the development of technological innovation and related commercial opportunities. This may include the expanded use of technologies related to earth observation, telecommunications, and other information technologies, including geographical information systems.”*

The charter has been activated for oil spills from 2002 to 2003 more than 5 times and has supported early warning and disaster relief operations with actual map information such as pollution extent, usable infrastructure and resources. The activation record is shown in the table:

Oil Spill off the Coast of Galicia	<a href="#">Spain</a>	November 14, 2002
Oil Spill in the Gulf of Aden	<a href="#">Gulf of Aden</a>	October 6, 2002
Oil Spill	<a href="#">Denmark</a>	March 30, 2001
Oil Spill	<a href="#">Lebanon</a>	March 30, 2001
Oil Spill, Marine Pollution	<a href="#">Galapagos</a>	January 26, 2001

	
<p>Part of an oil slick of several kilometers follows the stricken Bahamas-flagged Prestige oil tanker, November 20, 2004. Photo by European Space Agency.</p>	<p>A satellite image of the same November 20, 2004 event. This SAR image shows tanker, Prestige, 100 km off the Spanish coast. Photo by European Space Agency.</p>

## Fingerprinting

With advances in scientific capability, there have been attempts to develop formal systems of fingerprinting and until recently the most advanced of these was the NordTest method. This was developed in 1983 by 5 Nordic laboratories, and was later modified. The focus was successful prosecution, recognising that the scientific evidence would not necessarily identify the offender, but was an important part of the legal process. The method considered forensic evidence requirements and came with detailed recommendations for sampling, handling samples, transport, chain of custody, storage and analysis procedures. Analysis was by standard scientific methods that had been available for some 10 years prior, so court acceptance was not an issue.

The NordTest advanced the use of forensic scientific evidence and the interpretation of results in oil spill cases. In conjunction with other evidence, it could identify the perpetrator of a spill - as usual - where there was any doubt it went in favour of the suspect. It became an important part of the legal process in some countries despite not being able to provide a unique fingerprint. Another of the limitations was that it remained necessary to have a sample of spilled oil and samples from a suspect ship.

The EUROCRUDE system of fingerprinting: EUROCRUDE was an attempt to achieve a more effective identification and to work in those cases where there was no suspect ship. It was developed through the collaboration of 6 European countries. It recognized that there had been advances in scientific capability since the NordTest was developed and there was greater accessibility to computers and software packages for statistical analysis and comparisons.

The goal was to develop a database of fingerprints for crude oil produced or transported in European waters, at least in the first instance, and to evaluate or develop statistical methods and computer software for comparing and matching fingerprints in a database.

The biomarkers were the focus of interest and the team went through an extensive exercise by testing many different crude oils to identify which of the biomarkers would enable them to produce a fingerprint and the highest evidential value. As part of this, they developed standardized methods that would give reproducible fingerprints suitable of use in a database and which any laboratory with the appropriate scientific instrumentation could use. They revisited the effects of weathering and decided which biomarkers were most effective for weathered oils.

The result --- they found that fifty six biomarkers provided a fingerprint sufficient to identify the country and oil field of origin. Sometimes it could even identify the oil well of origin. It also used biomarkers with greater resistance to weathering so time delays between spill and sampling would not be crucial. This meant that even when the vessel was long gone from the scene, shipping records could still be used to identify the culprit. It was not necessary to have samples from the ship as the records could identify which ships were carrying what crude, where they were bound and, therefore, whether they were potentially in the area at the time of the spill.

#### **References:**

- OPRC 1990
- The Egyptian Environmental Law No. 4 of 1994
- National Oil Spill Contingency Plan, Egypt
- Oil Sector Contingency Plan, Egypt
- PESCo Linear management system

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