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Information Management System for Hazardous Substances Transportation

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Abstract: Clear national regulations and guidelines are the baseline for the sound management of chemicals in every country. Information system and databases are modern tools to achieve this goal. The industrial base in Egypt accommodates a variety of chemical industries that have created several problem, most important of which is that posed by industrial chemical. This problem is rather complex and can not be attributed to one single cause but rather to a sequence of interrelated events eventually leading to uncontrolled disposal of Hazardous Wastes. Different chemical substances are being used in the pharmaceutical and petroleum industries, in laboratories, in housing, and in the production of consumer goods. Currently an exceedingly large umber of chemicals are imported, manufactured, marketed, transported, stored and disposed of thus creating not only huge benefits but also significant health and environmental risks. In 1988, the United Nation Environmental Program (UNEP) launched in conjunctions with governments and with the chemical industry, APELL addresses all emergencies related to industrial or commercial operations with a potential for fire, explosion, spills or releases of hazardous materials. The programme has two main goals: To create and/or increase community awareness of possible hazardous involved in the manufacture, handling and use of hazardous materials, and of steps taken by authorities and industry to protect the community from those hazards. To develop emergency response plans in cooperation with local communities. The development process involves the entire community to ensure maximum preparedness should a dangerous emergency situation arise. In 1994 the Ministry of State for Environmental Affairs (MSEA) and Egyptian Environmental Affairs Agency (EEAA) enacted the environmental law 4/1994. A complete chapter in the law and another one in its executive regulation concern the safe handling and transportation of hazardous substances. This law also clearly stipulated the need for a permit to handle hazardous substances. The enforcement of this law is an interdisciplinary issue in which several governmental organizations are involved. This paper aims at presenting a useful application of Information System to follow up and monitor the transportation of hazardous substances on roads which passing through residential areas and based on the steps of UNEP APELL program, we proposed a scenario of Risk Management for Hazardous Substances Transportation.

Keywords: Awareness and Preparedness for Emergencies at Local Level (APELL),United Nations Environmental Program (UNEP), Hazardous Substances (HS), TransAPELL, Egyptian Environmental Affairs Agency (EEAA), Egyptian Hazardous Substance Information Management System (EHSIMS), Awareness and Preparedness for Emergencies at Local Level (APELL)

INTRODUCTION

The Awareness and Preparedness for Emergencies at Local Level (APELL) assists decision makers and technical personnel in improving community awareness of hazardous installations and in preparing response plans. It has a ten-step process for implementation of APELL, as follows:

- Identify the emergency response participants and establish their roles, resources and concerns.
- Evaluate the risks and hazards that may result in emergency situations in the community.
- Have participants review their own emergency.Identify the required response tasks not covered by existing plans.Match these tasks to the resources available from the identified participants.
- Make the changes necessary to improve existing plans, integrate them into an overall community plan and gain agreement.

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- Commit the integrated community plan to writing and obtain approval from local government. Educate participating groups about the integrated plan and ensure that all emergency responders are trained chemicals.
- Establish procedures for periodic testing, review and updating of the plan.
- Educate the general community about the integrated plan.

TransAPELL takes APELL guidance beyond the risks associated with fixed facilities to include those arising from the shipping, distribution and transport of dangerous goods. Planning for risks arising from the transport of dangerous goods is just as necessary as for fixed facilities but even more complex, for the following reasons:

- Transport routes — the "risk objects" in this context — normally have a considerable geographical extension. As an emergency can occur anywhere along the route, emergency planning must be very flexible.
- For historical or practical reasons, many routes pass through densely populated areas, along river valleys or along the shores of inland lakes, etc. There may, therefore, be many threatened objects (people, property or the natural environment) in the vicinity of possible accident locations.
- Hazard identification is more complex. Many hazardous materials are transported several times during their product lives. This means that, in most cases, planning has to cover a greater variety of hazardous materials than is the case for a fixed facility. When a transport emergency arises, there may well be delay in ascertaining what substances are involved.
- The number of stakeholders is generally greater than for fixed installations. Transport industries, particularly the road haulage industry, typically involve a large number of small and mediumsized enterprises (SMEs). Many of these or other stakeholders may not have offices or other representation in communities concerned.
- An accident involving dangerous goods may happen in transit through a community that does not have any fixed chemical installations. Its emergency services are, therefore, unlikely to be equipped or trained to tackle emergencies involving unfamiliar and possibly unidentified
- The population at large is likely to be more ignorant of the hazards and of how to act in an emergency. Nearby residents, people in private cars or passengers in halted trains could all be affected. It will be more difficult to produce and disseminate adequate public information.

Law number 4 of 1994 and its executive regulation has a clear articles for transportation of hazardous waste (Article28) and transportation of hazardous substances (Article 31)

Hazard Identification and Evaluation:

The main purpose of hazard identification and evaluation is to gain an overall understanding of the types of product transported through the community and the routes used. Conducting hazard identification and evaluation is not as difficult nor as complicated as it may at first appear. The process is outlined in Figure 1. After an initial assessment, it may be decided to limit the study to the five to ten types of dangerous goods most commonly transported through the community. Table 1.1 shows how a general approach can be adapted for hazards arising from transport of dangerous goods.

The Hazard Identification and Evaluation in a Local Community" produced by UNEP IE, Paris, and the Swedish Resource Agency. The process shows:

- Where serious accidents can occur (risk objects).
- What the threats may be (hazards).
- Which types of accident can occur (risk types).
- Who and what could be affected and where (threatened objects)
- What damage could be caused (consequences).
- The (very approximate) probability of an accident and which factors affect the risk (risk factors).
- How to present the results of the analysis.

Table shows the general approach referred to above can be adapted to hazards arising from the transport of dangerous goods.

All existing material, including any current community emergency plans, should be gathered together and reviewed for any information on hazard and risks relevant to the TransAPELL Group's work.

Table 1: Generic Elements in Dangerous Goods Transport Hazard Analysis.

Step in General Process	Application to Dangerous Goods Transport	Suggested Contents
Risk objects	Transport pattern analysis	Determine the major transport links (roads, railways, pipeline and water routes) used for transport of dangerous goods.
Hazads	Dangerous goods flow study	Determine the general types quantities of dangerous goods transport within and through the community.
Probability	Accident history	Compilation and analysis of past accident statistics
Risk Types	Accident scenario assessment	Determine possible accident scenario statistic
Threatened Objects	Vulnerability assessment	Humans, environment and property in vicinity of transport routs identification of high risk areas
Consequences	Damage assessment	List possible damage scenario based on possible accident scenarios and threaded areas.
Risk Factors	Risk factors	List factors which could affect transport accident probability or consequence graveness.
Present Results	Result presentation	Produce maps identifying high risk areas such as corridors along major transport routes.

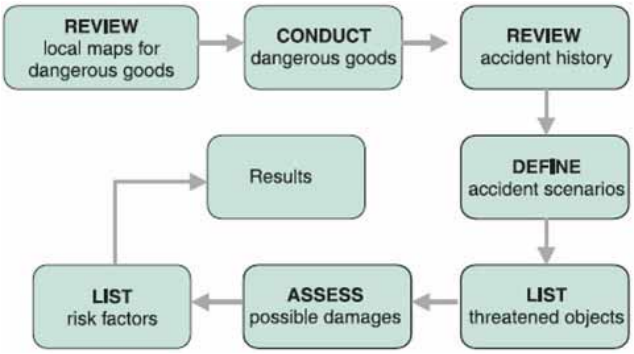

Fig. 1: Hazard Identification and Evaluation.

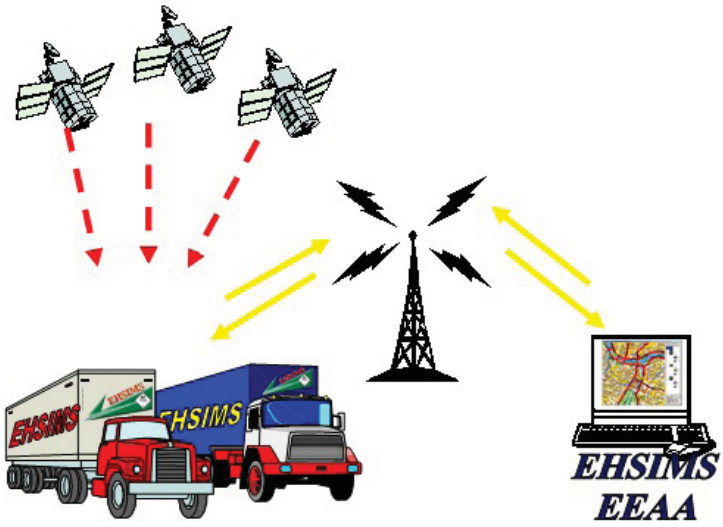

Fig. 2:

Hazard Identification:

The goals of hazard identification are to:

- Determine the major routes used for transport of dangerous goods.
  Determine the general types and quantities of dangerous goods being transported.

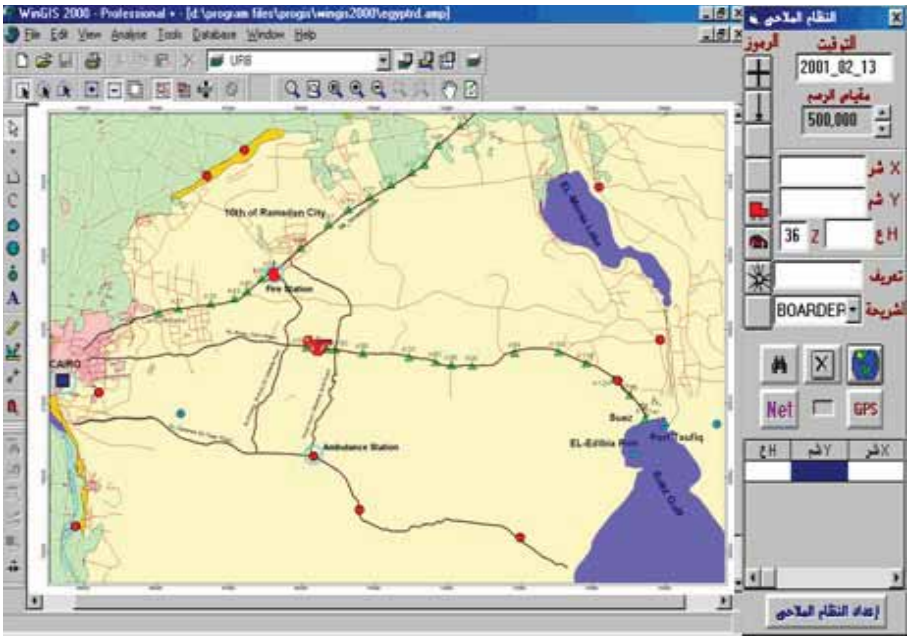

Fig 3:

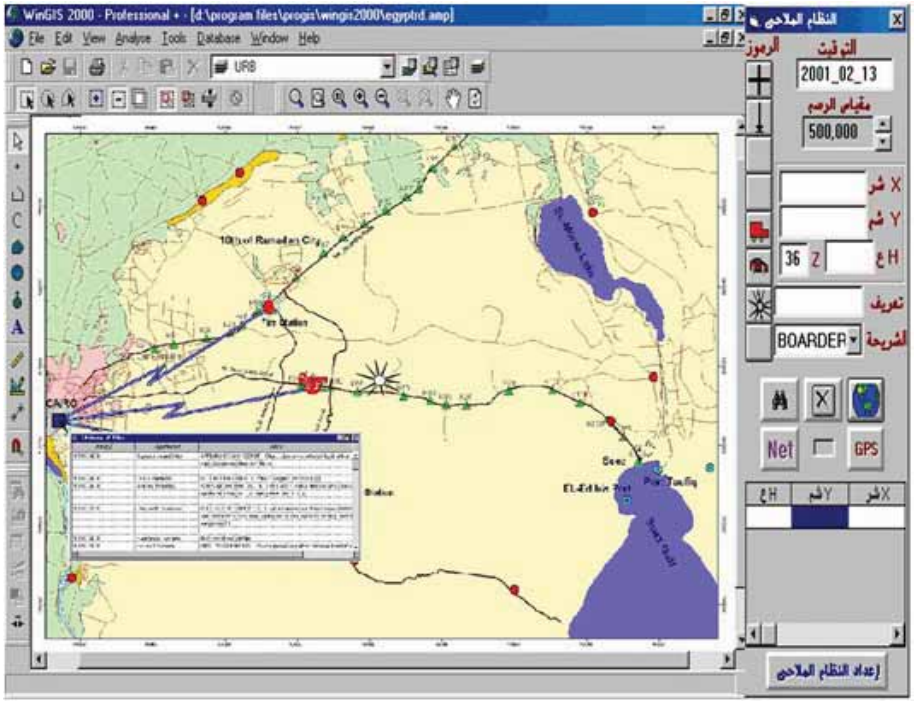

Fig. 4:

Compile and study information about actual accidents, in order to identify types of accidents with a higher probability of occurrence and their likely locations.

A state of the art information and management system for hazardous substance was development containing a database for all the chemicals used at least in Egypt with a full details about its acronames

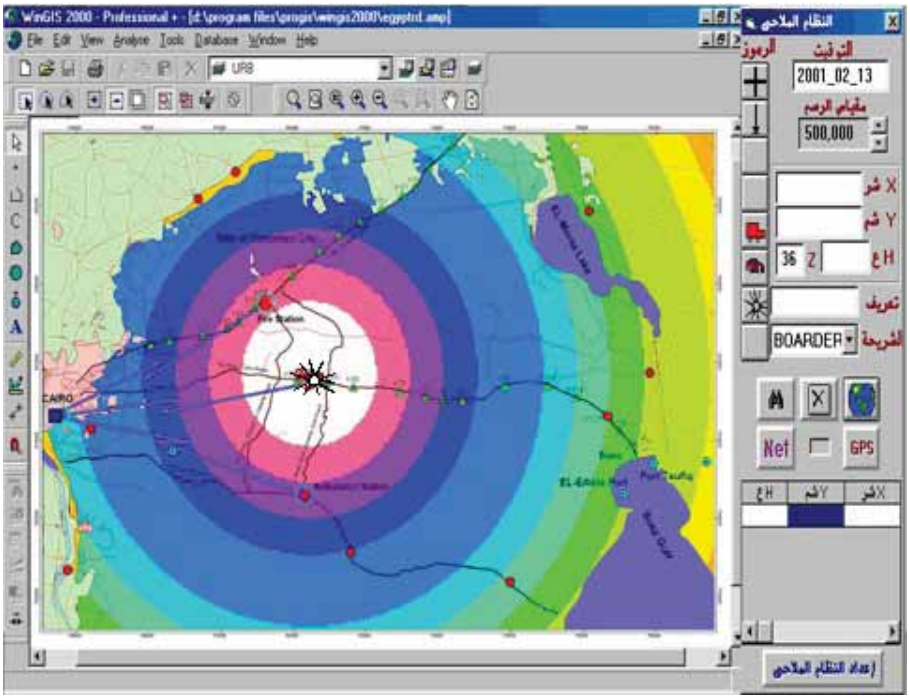

Fig. 5:

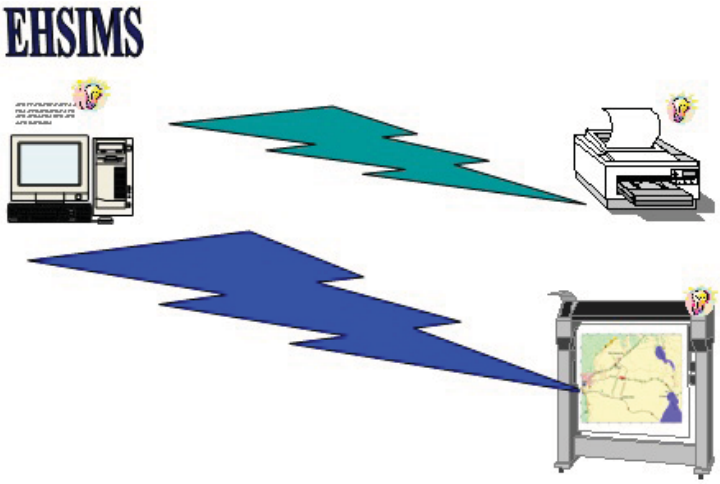

Fig. 6:

(commercial, scientific,….) physical characterizes, chemical charateiers, it's toxicity, effect environment and humenbeings, material safety data sheets, safety storage and handling, first aid treatments, …ect.

On of the main data is the necessary measure when there will be a leakage, mission of toxic vapors, explosion, fire…ect.

The team works who manage the hazardous substance transportation risk represent different partners. The main partners are:-

- Environmental Agency.
- Civil Defense Authority.
- Transport Authority.

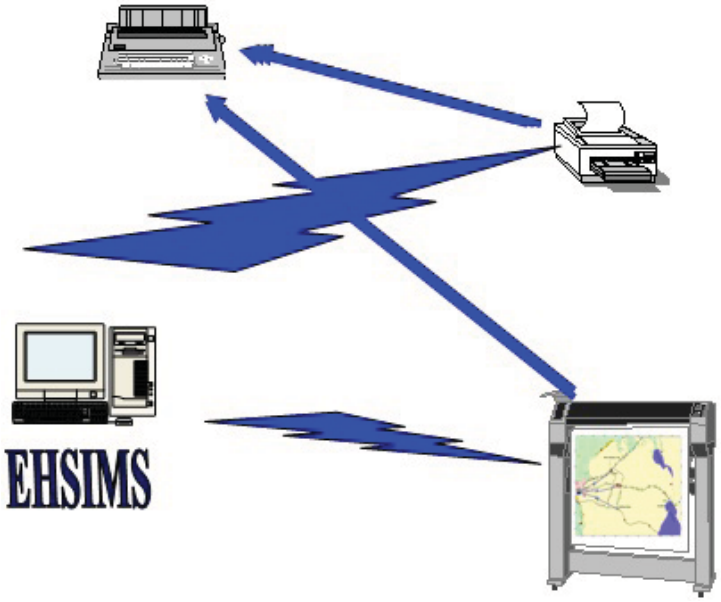

Fig. 7:

- Health Agencies.
- Industrial Authority.
- Media (TV, newspaper…).
- Traffic Police.

The Proposed Scenario:

- The operation room in Egyptian Environmental Affairs Agency (EEAA) has the Egyptian Hazardous Substance Information & Management System (EHSIMS) which include a geographical map containing the specific rout of transporting the hazardous substance.
- The trucks containing hazardous substance are going from Suez to 10th Ramadan and are connected to the Geographic Information System (GIS) of the EHSIMS. This connection either through satellite using Global Positioning System (GPS) or an interface with GSM or at least a radio network of Civil Defense (Figure 2). So the location of truck is shown on the digital map. (Figure 3)
- The information about the hazardous substance which are transported are retrieved from the database of EHSIMS, and a continuous monitoring of truck as well as it's position on the digital such that we can plot on the map at any time its location.
- An accident occurs on the road between Suez and 10th Ramadan industrial city.
- On the message through the suitable communication means was sent to operation room in EEAA at Cairo, it was immediately passed to Civil Defense, Health Authorities,… ect. The system will call the nearest fire station and ambulance station, to take the necessary measures. (Figure 4)
- The EHSIMS presents the content of the hazardous substance database so as to take the necessary measures about any release or leakage of the transported hazardous substance (Figure 4).
- Drawing of different zones around the location of accident (ground zero) to represent different hazardous intensities to alarm the residential areas near by. (Figure 5)
- The system output either through the plotter or a printer are ready to be sent to different stacked holder to take the necessary actions. (Figure 6)The system output will be faxed and sent to the specified stacked holder. (Figure 7)

The application of this proposed system will minimize the risk of hazardous substance transportation and facilitate the quick intervention of different parties to manage the crisis.

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