UNEP

UNITED NATIONS ENVIRONMENT PROGRAMME
Division of Technology, Industry and Economics

TECHNICAL REPORT N°35

TransAPELL

Guidance for Dangerous Goods Transport Emergency Planning In a Local Community

RÄDDNINGS VERKET

Prepared with the support of the Swedish Rescue Services Agency

TransAPELL

Guidance for Dangerous Goods Transport Emergency Planning in a Local Community

UNEP

Division of Technology, Industry and Economics
Production and Consumption
Tour Mirabeau
39/43 quai André Citroën
75739 PARIS CEDEX 15
FRANCE
Tel. : 33 01 44 37 14 50
Fax : 33 01 44 37 14 74
email : unep.tie@unep.fr
http://www.uneptie.org

This is the thirty-fifth publication in the UNEP Technical Report Series. The Series aims to meet the needs of a wide range of governement officials, industry managers and environment protection associations, by providing information on the issues and methods of environmental management relevant to various industrial sectors.

First edition 2000.

UNITED NATIONS PUBLICATION
ISBN 92-807-1907-6

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

FOREWORD: Why TransAPELL?

At every instant of every day dangerous goods are being loaded, moved and unloaded all over the world. From the innumerable feedstocks for our industry to the fuels we use to heat our homes or power our vehicles, useful substances which – if they escape – are potentially dangerous for health or to the environment move along our roads, railways and inland waterways, passing through or close to our communities.

Although the vast majority of loads reach their destinations safely, accidents can – and do – occur anywhere en route. Some, like the propane tanker explosion in Los Alfaques, Spain, in 1978, or the pipeline explosion in 1984 in Sao Paolo, Mexico, kill hundreds. Others, like the massive oil spill from the Exxon Valdez in 1989, cause widespread and long-term environmental damage. Events on this scale are, of course, exceptional. However a glance at accident statistics reveals that transport accidents involving dangerous substances occur frequently on some scale, and that they regularly result in death, injury and damage to property and the environment. Table 1.1 below gives some examples from recent decades.

Unlike "normal" transport accidents – often tragic enough in themselves – those that involve dangerous goods can have consequences extending far beyond the place of accident, and can affect many more people than those directly involved. For example, in 1998 a truck transporting cyanide to a gold mine in Kyrgyzstan plunged off a bridge spilling around 1800 kilograms of sodium cyanide into a river upstream of several villages. Within days of the accident hundreds, possibly thousands, of local residents were reported to have sought treatment at medical clinics. This incident illustrates clearly how a single, localised event can have far reaching consequences. It also highlights the need for communities to develop some sort of capability to respond to such events.

This UNEP DTIE Technical Report, "*TransAPELL – Guidance for Dangerous Goods Transport Emergency Planning in a Local Community*", is the UNEP APELL programme's response to that need. It has been prepared in response to requests from APELL users round the world to provide communities with help in planning for accidents arising from the transport of dangerous goods.

TransAPELL can be used by existing APELL Co-ordinating Groups to add emergency plans for dangerous goods transport to their fixed facility plans, or by local communities that have no fixed facilities, to develop and evaluate transport accident response plans. Specifically, **TransAPELL** is designed to:

- Encourage co-operation between community, government and industry to develop understanding of the dangerous goods being transported through communities.
- Provide emergency planning groups with a method to identify and evaluate the hazards associated with the types of dangerous goods transported within their communities.
- Provide guidance for local officials and decision-makers on how to develop and evaluate their communities' emergency preparedness plans for transport.

- Assist with the testing of plans and with carrying out of training for dangerous goods transport emergencies.

The guidance in the Report has been tried out in two communities, Daugavpils (Latvia) and Kristinehamn (Sweden) and has been amended to take account of the valuable lessons learned from these two important pilot projects.

The Report was prepared by UNEP DTIE with the help of the Swedish Government and the Swedish Rescue Services Agency. UNEP and the Government of Sweden hope that the material presented will be of help to everyone involved in dangerous goods transport. The authors gratefully acknowledge their use of US CMS's TransCAER Guidance Manual as a model.

Year	Place	Description	Consequences
1978	Los Alfaques, Spain	A tanker delivering propane to a camp site exploded	216 people died and another 200 were injured
1989	Alaska, USA	About 40 million litres of crude oil spilled into the ocean from the supertanker Exxon Valdez	Massive environmental damage. Clean up cost over US$2 billion
1990	Bangkok, Thailand	A tanker carrying liquefied petroleum gas (LPG) crashed in Bangkok resulting in an LPG explosion	63 people killed, 90 injured
1996	Alberton, USA	A freight train derailed releasing around 59,000 kilos of chlorine into the air and 64,000 litres of potassium hydroxide solution into the soil	One person died instantly from acute chlorine exposure. 300 area residents who had inhaled chlorine were taken to hospital. 1000 people in Alberton and the surrounding area were evacuated and over 1000 m^3 of soil were contaminated
1998	Kyrgyzstan	A truck transporting cyanide to a gold mine plunged off a bridge. Around 1800 kg of sodium cyanide were spilled into a river upstream of several villages	Within days hundreds, possibly thousands of people sought treatment at medical clinics
1998	Nigeria	A fire and explosion in a leaking fuel pipeline	As many as 500 people are reported to have been killed with 32 communities being affected and farms and buildings destroyed
1999	France	8,000 tonnes of fuel oil escaped from the tanker, "Erika"	100 kilometres of coast were polluted. Many seabirds were trapped in the oil. The spill had major economic effects on fishing, oyster farming and tourism.

Table 1.1. *Transport Accidents and their Consequences.*

ACKNOWLEDGEMENTS

This Technical Report was jointly prepared by the United Nations Environment Programme and the Swedish Rescue Services Agency.

The following people are acknowledged for their involvement in the report's production:

- Mr Thomas Gell, Head, Risk & Environment Department, Swedish Rescue Services Agency, and Mr John Morton, Senior Industry Consultant, who drafted the text
- Mrs Janet B. Stevens, APELL Co-ordinator, who reviewed and edited the text
- Mr Geoffrey Bird, Editorial Consultant.

Other Swedish Rescue Services Agency staff who provided input:

- Ms Josefin Gullstrand (Fire engineer)
- Ms Janet Edwards (GIS expert).

Other UNEP staff involved:

- Mrs Jacqueline Aloisi de Larderel, Director, UNEP DTIE
- Mr Fritz Balkau, Chief, Production and Consumption Unit, UNEP DTIE
- Dr Ernst Goldschmitt, Senior Industry Consultant
- Ms Alessandra Giuliani, Programme Assistant
- Ms Marie-Christine Guédon, Secretary.

Contribution were also made by:

- Mr Kent Andersson Fire Engineer, Malmö Fire Brigade, Sweden
- Mr Bertil Simonsson , Inspector, Swedish Railway Inspectorate
- Ms Gundega Muchs, Swedish Materials and Mechanics Standards who handled the contacts between Sweden and Latvia.

We also want to acknowledge the contribution of the communities of Kristinehamn in Sweden and Daugavpils in Latvia.

Special thanks to Mr Per Modin, Deputy Fire Chief of Kristinehamn and Mr Gunnar Zvirbulis, (Former) Director Head of City Civil Defence, Daugavpils, for their contribution to this Technical Report.

1
INTRODUCTION

The **TransAPELL** process described in this manual is based on the proven logic of UNEP's Awareness and Preparedness for Emergencies at Local Level (APELL) programme. The basic APELL approach is explained below.

■ 1.1 UNEP's APELL Programme

Launched in 1988 in conjunction 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 hazards 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 co-operation with local communities. The development process involves the entire community to ensure maximum preparedness should a dangerous emergency situation arise.

The APELL *"Handbook on Awareness and Preparedness for Emergencies at Local Level"* assists decision makers and technical personnel in improving community awareness of hazardous installations and in preparing response plans. The Handbook sets out a ten-step process for implementation of APELL, as follows:

(1) Identify the emergency response participants and establish their roles, resources and concerns.

(2) Evaluate the risks and hazards that may result in emergency situations in the community.

(3) Have participants review their own emergency plan for adequacy relative to a co-ordinated response.

(4) Identify the required response tasks not covered by existing plans.

(5) Match these tasks to the resources available from the identified participants.

(6) Make the changes necessary to improve existing plans, integrate them into an overall community plan and gain agreement.

(7) Commit the integrated community plan to writing and obtain approval from local government.

(8) Educate participating groups about the integrated plan and ensure that all emergency responders are trained.

(9) Establish procedures for periodic testing, review and updating of the plan.

(10) Educate the general community about the integrated plan.

These are the basic steps to APELL. However, the process is flexible and aims neither to provide a unique model for accident prevention and preparedness nor to impose actions to be taken. In each case the APELL objectives remain unchanged although the mechanics of the operation may differ from place to place and may need to be adapted to local conditions.

1.2 What is TransAPELL?

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 medium-sized 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 chemicals.

- 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.

1.3 Scope of TransAPELL

Hazardous materials and dangerous goods are broad terms. For the purposes of this document they are interchangeable and encompass all materials which may, when they exist or are released in specific quantities or forms, pose an unreasonable risk to health, safety, property or the environment. Such goods or materials include articles, substances and wastes.

The guidance in this Report is applicable to all land transport of dangerous goods by road, rail and pipeline, as well as to the handling of such goods at interfaces with other modes of transport, e.g. ports and airports. The guidance is intended to supplement the provisions of national and international law and regulations, not to replace or interfere with them.

The Report does not attempt to offer unique or even original solutions to the problems of community contingency planning for emergencies arising from the transport of dangerous goods. Its intention is rather to outline well-tried approaches reinforced by examples from the **TransAPELL** pilot projects.

1.4 Preliminary Steps for TransAPELL

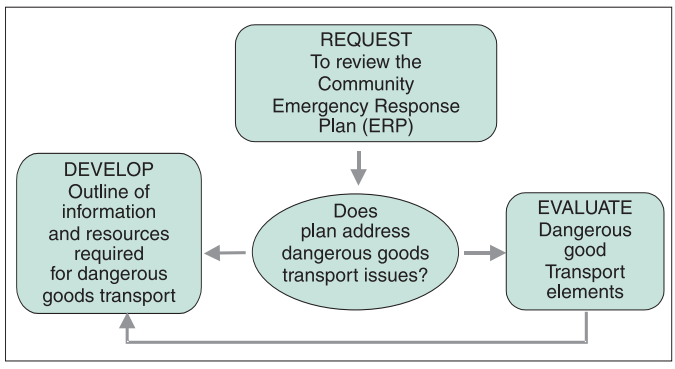


Figure 1. *Reviewing the Community Emergency Plan.*

The guidance given in this document outlines a method to evaluate the current status of transport

emergency planning within a community and suggests steps to improve it. The initial part of this process is summarised in Figure 1. In providing guidance, the authors are assuming that all stakeholders know the steps in the planning process, and that a Working Group has been set up. If the community already has an APELL Co-ordinating Group, then the **TransAPELL** Group could be an expert sub-group of this. If there is no APELL Co-ordinating Group, those with an interest in improving planning for transport emergencies may take the lead and form the **TransAPELL** Group as an independent entity. In these circumstances, the Group members are strongly advised to read the APELL Handbook which gives details of the APELL process and partners, and provides the techniques for building community awareness and for achieving preparedness for emergencies.

2
THE TRANSAPELL PROCESS

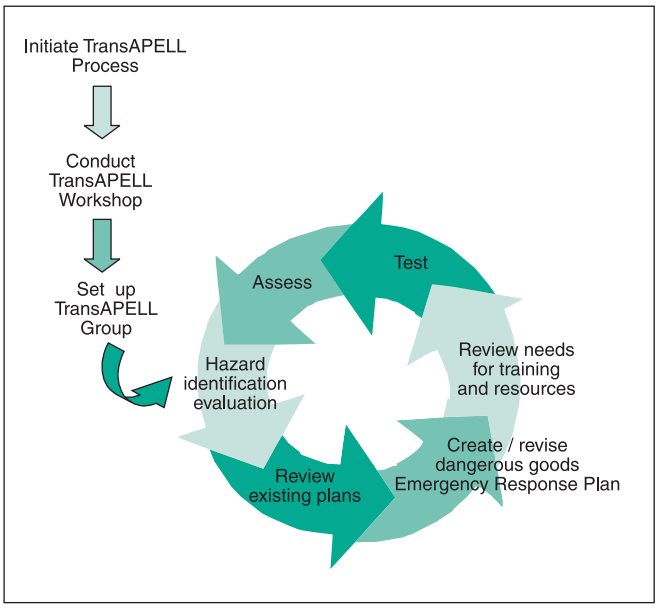


Figure 2. *TransAPELL Implementation Process*

If the **TransAPELL** process is to be brought to a successful conclusion, the project must be carefully planned and broken down into manageable parts. Figure 2 shows nine interconnected stages in implementation of **TransAPELL**. This process, based broadly on the steps of the basic APELL approach, has a proven logic. However, in practice it may be found appropriate to have sub-projects corresponding to two or more steps running simultaneously.

The goals and scope of each sub-project must be clearly defined and each participant must be made aware of his/her responsibilities. This will greatly help to concentrate minds and simplify the reporting tasks.

Target dates should be assigned, but timetables should not be too tight.

Some activities such as tests of alarm functions or joint drills should be carried out in the early stages of the project. Such activities can help to boost motivation and set a reference level for efficiency, providing a marker against which future improvements can be measured.

The steps in Figure 2 are expanded upon and explained in the following sections below. A final section (2.10), explains the importance of educating the general public about the community plan.

■ 2.1 Initiating the TransAPELL Process

There is no one answer to the question of who takes the initiative to launch a **TransAPELL** project in a community. The impulse may come from any local, provincial, regional or national authority, organisation, enterprise or group, or from an individual.

■ 2.2 Conducting a TransAPELL Workshop

Experience from **TransAPELL** pilot projects indicates that the most advisable first step for those initiating a **TransAPELL** project is to organise a **TransAPELL** Workshop. If carefully planned and executed, a workshop will:

- Raise awareness and promote enthusiasm for improving community emergency planning for dangerous goods transport.

- Recruit members for the **TransAPELL** Group from among the large number of stakeholders whose expertise will be needed.
- Produce a broad view of the current status of emergency planning for dangerous goods transport.
- Start producing data for use in the planning process.
- Initiate contacts with the media.

❒ 2.2.1 Planning the Workshop

Experience has shown that a minimum of two to three days should be allowed for a **TransAPELL** Workshop if any significant output is to be expected. This is particularly true if most of the participants do not already know each other. They will need time to become acquainted and to establish trust between them. This is essential if participants are to share experience, to admit to any deficiencies in their own organisations and to co-operate to improve matters.

The organiser(s) must define the expected outcomes of the workshop clearly and must devise a programme that will enable those objectives to be achieved. Objectives must be set in accordance with the existing organisational structure and with the current levels of safety culture and general community awareness. However, the following are recommended as minimum elements:

- Presentation by each participant of himself/herself and of his/her organisation and its role in dangerous goods transport emergencies.
- Presentation of the APELL process and methodology as outlined in the APELL Handbook and in this document.
- Role play exercise. This will promote understanding and motivation.
- Presentations on general accident-related topics, e.g. experiences from past accidents, international and (if any) national legislation, and state-of-the-art techniques and equipment for response operations.
- Work in sub-groups on specific questions and concrete tasks.
- Identification of strengths and weaknesses in the present state of community preparedness for major accidents arising from transport of dangerous goods.
- Suggestions for improvements.

Session chairmen, lecturers and working group leaders must be chosen carefully and must be well briefed. The workshop organisers should make sure that they all have a thorough understanding of the APELL process before the workshop begins.

❒ 2.2.2 Identifying Participants

There are three very important partners at national and local levels: local authorities; industry; and local and community interest groups. Representatives of these bodies should be invited to the **TransAPELL** Workshop.

Examples of possible partners are:

– Rescue service departments
– Civil defence organisations
– Enforcement authorities
– Transport authorities
– Health agencies and hospitals
– Red Cross
– Airport authority
– Port authorities
– News organisations (TV, radio, newspapers)

Some of these choices are obvious. But there may be other possible partners that are not so obvious. Workshop organisers should think wide and should aim to include as many potential stakeholders as possible. Chapter 2 of the APELL Handbook may be of help here– it presents the main APELL process partners at national and local level, together with their roles and responsibilities.

TransAPELL will, of course, need to include representatives of other industries and bodies, especially

chemical and transport industries. It is advisable to approach the relevant industries early in the process. Individuals responsible for emergency planning response within companies can be an excellent source of information. Representatives from the following sectors should be invited to the workshop:

- Road haulage industry
- Rail industry
- Petroleum industry
- Explosives and fireworks manufacturers
- Metal producing industry
- Soda and beer manufacturers
- Mining industry
- Fish processing industry
- Pharmaceutical industry
- Fertiliser manufacturers
- Specialty chemical manufacturers
- Cement manufacturers
- Chemical/agricultural storage
- Public works authorities
- Regional planning authorities
- Public works using chemicals, e.g. power generators, water treatment plants
- Cargo consolidators
- Cleanup contractors

Representatives from the news media should also be invited and a press conference should be organised at the end of the workshop. The media can play a major role in promoting the **TransAPELL** process by raising public awareness. They are also vital for dissemination of information in an actual crisis. The media should therefore be fully involved in the emergency planning process.

A letter of invitation to the workshop should be sent out well in advance of the meeting, together with the proposed programme. The letter should state the purposes of the workshop clearly. This Report should also be sent to confirmed participants.

❒ 2.2.3 Organising the Workshop

Organisers should try to interest a senior level person (political or official) in coming to open the workshop. This will indicate that there is "top level" support for the event.

The workshop must be organised so as to encourage a free and open atmosphere where all participants can contribute and express opinions. Firm but benign leadership should be exercised by chairs to ensure that all views are expressed but that the timetable is also adhered to.

All contributions to the workshop must be documented. Rapporteurs should be appointed for each session and for the workshop as a whole. Their brief is to summarise the contents of presentations and the conclusions of the discussions.

Feedback is also important. This can be obtained from a questionnaire on the contents and organisation of the workshop. It will also help to gauge the level of participants' interest in further involvement in the **TransAPELL** process and can provide suggestions for other potential APELL partners.

❒ 2.2.4 Disseminating the Results of the Workshop

The documentation collated by the rapporteurs should be put together in a workshop report. The report should then be distributed as soon as possible to the participants and to other individuals and organisations having an interest. Complete contact details for all participants should form an annex to the workshop report.

Once the workshop is finished it is important to maintain the momentum created by it. A properly conducted workshop will considerably raise the awareness and motivation of participants. It will provide a general sense of what needs to be done and of how to organise further work. At this point, the organisers should draft preliminary proposals to take the whole project forward. These can also form the basis for discussion at the first meeting of the **TransAPELL** Group.

■ 2.3 Setting up a TransAPELL Group

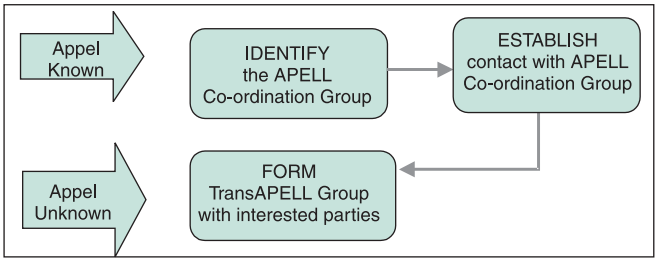


Figure 3. *Constituting the **TransAPELL** Group.*

Whether the **TransAPELL** Group is an expert sub-group of an existing APELL Co-ordinating Group or an independent entity (as explained in section 1.4 above), the process will be the same. Figure 3 illustrates this. However, in the "expert subgroup" situation, the existing APELL Co-ordinating Group may have to review its own membership to ensure the presence of transport industry representatives with dangerous goods expertise.

The aim of the APELL Group is to be a resource to the community for all aspects of planning for dangerous goods emergencies. The Group should therefore be prepared to call for support and resources from national, regional or local authorities and organisations.

As indicated above (Section 2.2.2), one outcome of the **TransAPELL** Workshop will be a list of potential **TransAPELL** Group members. These people should, of course, be approached about their willingness to take part if they were not participants in the workshop. It may also be necessary to check that they do in fact have the ability, mandate and resources to undertake this work on behalf of their organisations or those whom they represent. Formal invitations to take part in the Group's work should then be sent. It is good practice to send invitations to senior management with a request for the participation of a named individual.

Selection of the right Group leader is crucial. In general, the leader should be a person with a good working knowledge of the emergency response field and who is also well respected and able to manage the Group and its work.

The size and precise functions of the Group will vary. For instance, in small communities the Group will probably do most of the actual work itself. In larger communities, a choice will have to be made between two models:

– a small **TransAPELL** Group with a co-ordinating role and subordinate working groups;

– a large **TransAPELL** Group including all people who are in any way involved in the project. Identified tasks would then be delegated to *ad hoc* working groups in which **TransAPELL** Group members will also take part.

It is important to establish and maintain good working relations among the Group members and between the Group and all other emergency response contacts. It is strongly recommended that regular Group meetings be scheduled– at least once a month in the first instance. These meetings will provide the mechanism for the exchange of information and updating of plans. Conclusions and decisions must be fully documented and circulated promptly to all **TransAPELL** partners. The process of setting up a **TransAPELL** Group is summarised in Figure 4.

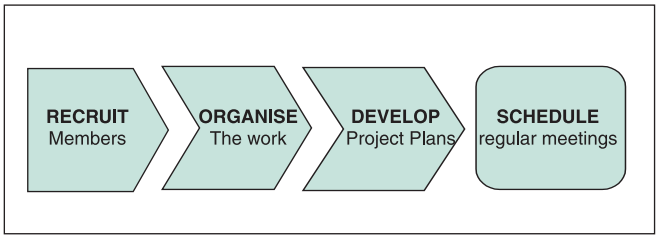


Figure 4. *Setting up the **TransAPELL** Group.*

■ 2.4 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 5. 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 2.1 shows how a general approach can be adapted for hazards arising from transport of dangerous goods. The

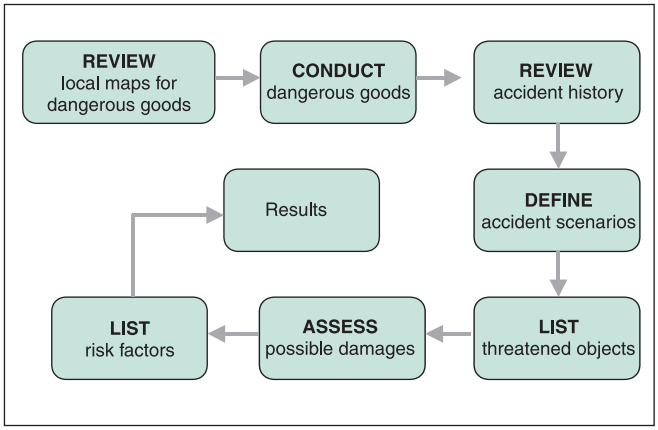


Figure 5. *Hazard Identification and Evaluation.*

approach is taken from Technical Report No 12, "*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 2.1 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.

❒ 2.4.1 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.

Table 2.1. *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, pipelines and water routes) used for transport of dangerous goods
Hazards	Dangerous goods flow study	Determine the general types and quantities of dangerous goods being transported within and through the community
Probability	Accident history	Compilation and analysis of past accident statistics
Risk Types	Accident scenario assessment	Determine possible accident scenarios based on type of goods and type of packaging
Threatened Objects	Vulnerability assessment	Humans, environment and property in vicinity of transport routes; identification of high risk areas
Consequences	Damage assessment	List possible damage scenarios based on possible accident scenarios and threatened 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

- 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 suitable minimum goal would be a **transport pattern analysis** followed by some **analysis of the flow of dangerous goods**. The **TransAPELL** Group will decide on the degree of sophistication of analysis which is appropriate.

Transport pattern analysis is carried out as follows:

Road routes
The **TransAPELL** Group should obtain a detailed map showing all major and other roads in and near the community. Representatives from the local road transport companies, national road haulage associations and the police should be contacted as they may be able to provide further information. Local transport companies should be able to identify major routes for packaged and bulk transport, and national associations may issue directories of membership giving useful contacts. If the local or national police have a Transport of Dangerous Goods Enforcement Unit, this too should be able to assist the **Trans-APELL** Group in identifying dangerous goods routes.

Rail routes
Local representatives of railway companies should be contacted. They will be able to provide maps of rail yards and spur tracks and possibly other forms of assistance.

Pipeline routes
To identify pipeline routes, start by contacting the local fire department. Also, there may be pipeline identification signs along the major roads indicating on-call telephone services. These services can provide information on pipeline routes and identify company emergency numbers. Further information may be available from the national public utility commission or ministry. Local manufacturing, distribution and storage facilities should be surveyed to obtain routeing information on pipelines they use or operate. If no pipeline plans are available, a drawing should be made showing all of the pipelines above and below ground. Pumping stations and transfer points should also be shown and the products carried indicated.

Water routes
If the community is on the coast or close to a navigable waterway, water routes should be included in the transport pattern analysis. A considerable amount of data is usually available for inland waterways. For coastal routes, the emphasis should be on movements through ports. It is possible to obtain information about shippers and marine transport companies by contacting authorities, the coast guard or the national maritime administration.

For the second part of the hazard identification process, **analysis of the flow of dangerous goods**, the **TransAPELL** Group should commence by collecting information on the amounts of dangerous goods transported through the community and their UN classes. This product flow study has two purposes:

- Collecting information for hazard assessment, to improve decisions on emergency planning priorities.

- Collecting information for emergency response, to develop emergency response plans and community preparedness training specific to the products transported through the community.

Dangerous goods flow studies should be appropriate to available resources. It may not be necessary or practicable to do a comprehensive flow study for every transport route in the community. A general understanding of flow is sufficient to begin planning. Emphasis should be placed on the key routes identified during transport pattern analysis. It should also be borne in mind that the vast majority of goods moved are not dangerous.

The times of day at which dangerous goods are moved are also significant and these should be defined, at least roughly. For the purposes of both hazard identification and emergency planning, it can make a significant difference if a large part of the dangerous goods are transported during the daytime when people are at work or school, or if they are moved at night when people are at home. Major seasonal variations should also be identified.

Initial activities in conducting a dangerous goods flow study should include the following:

- Collection of data available from manufacturers and transport companies. These will be able to provide data on routes and on general types and amounts of dangerous goods shipments.

- Contacting nearby communities and national transport and environmental agencies to determine whether they have conducted similar studies. Determine if resources can be made available to study major routes such as interconnecting major roads or inland waterways.

- Request for assistance from chemical users and transport companies within the community. Each facility's emergency co-ordination representative (if there is one) should be contacted, to find out more about individual transport practices.

- Practical surveys, e.g. by interviewing truck drivers (make sure you find a safe place to this, such as a gas station or motel). If possible, obtain statistical expertise to establish correct sample sizes.

Be realistic and practical about the information you request. Data for one month or even one week can provide adequate information for planning purposes, as long as there are no large seasonal fluctuations.

Below are some tips on how to obtain dangerous goods flow data for different modes of transport:

Road transport
Contact representatives of local or national transport enforcement units (where these exist) and representatives from local haulage firms, to ascertain types and amounts of dangerous goods transported by road.

Rail transport
Contact the local railroad representative, where one exists, or the national railroad companies, national railroad association or transport ministry.

Pipelines
The local emergency services may well already have been in touch with pipeline operators for details of the amounts and types of products moving through the system, so start with them. Otherwise, go to local pipeline companies and to manufacturing or utility companies receiving materials by pipeline.

Water transport
The flow of dangerous goods transported on waterways can be obtained from managing companies or authorities, enforcement authorities, where these exist, or from barge and shipping companies.

Air freight
For communities near a major airport, the airport authority should be consulted about how dangerous goods are transferred at the interfaces with other transport modes.

The results of the dangerous goods flow study should be given in an appendix to the eventual emergency plan.

As a further step, transport accident data should be reviewed to identify routes with high incidence of past accidents. This data is normally available from police, coast guard and road, rail and maritime administrations.

If specialised data on transport accidents involving dangerous goods is available, it should, of course, be used. Failing this, general traffic accident data should be reviewed and used to identify incident frequency and particular accident "black spots". As a rough estimate, the ratio of dangerous goods accidents to total heavy vehicle accidents may be assumed to be the same as that of dangerous goods traffic flow to total flow of heavy vehicles.

And finally, it should be remembered that loading and unloading are sensitive parts of most transport operations. Efforts should be made to gather data on past accidents arising in these situations.

An example of a dangerous goods flow study for our hypothetical community "Hazardville" is given in Section 3.

❒ 2.4.2 Hazard Evaluation

Hazard evaluation, the next step, involves assessing the level of risk of accidents arising from the transport of dangerous goods. Risk is conventionally

defined as the likelihood of an event multiplied by the consequences. This stage therefore requires you to attach some estimates of frequencies or probabilities to the hazards you have identified. A simple method for doing this is outlined in "*Hazard Identification and Evaluation in a Local Community*" (UNEP IE, Paris, 1992 – see especially Sections 2.2 and 2.3), so great detail is not provided here. The outcome of hazard evaluation will serve as a basis for the type and level of emergency planning which should be done for each transport mode.

It is worth pointing out at this stage that the process of hazard evaluation also offers opportunities to think about preventive steps which could be taken to reduce the risks identified.

Hazard evaluation should enable the **TransAPELL** Group to pinpoint likely accident locations and scenarios together with the objects they threaten: residential areas, schools, hospitals, freshwater reservoirs, etc.

Use of scenario techniques is recommended. However, you should be aware that real accident events will seldom follow the scenarios used for planning purposes. It is often good practice to work with a number of scenarios at a general level, rather than to go into great detail on just a few. This encourages a more flexible approach to emergency planning.

❒ 2.4.3 Presentation of Results

Visual presentation of the results of the hazard identification and evaluation is recommended. Maps should be used to display locations of dangerous goods facilities and high risk areas. The presentation may include colour codes for corridors along transport routes and intersections as well as enlarged sections of vulnerable facilities showing access and evacuation routes, passability, driving times for responders to reach key locations, etc.

■ 2.5 Reviewing Existing Plans and Preparing to Create an Integrated Community Plan for Emergencies Involving Transport of Dangerous Goods

If the community already has the APELL process in place, then the APELL Co-ordinating Group will eventually need to look at how the main plan meshes with the dangerous goods transport emergency plan. If the guidance given in Section 2.3 has been followed, then the APELL Co-ordinating Group will have co-opted members with expertise in this area to help them. This guidance document does not give detailed advice on this point but concentrates instead on the basic requirement of getting the dangerous goods transport emergency planning right first. The process is summarised in Figure 6.

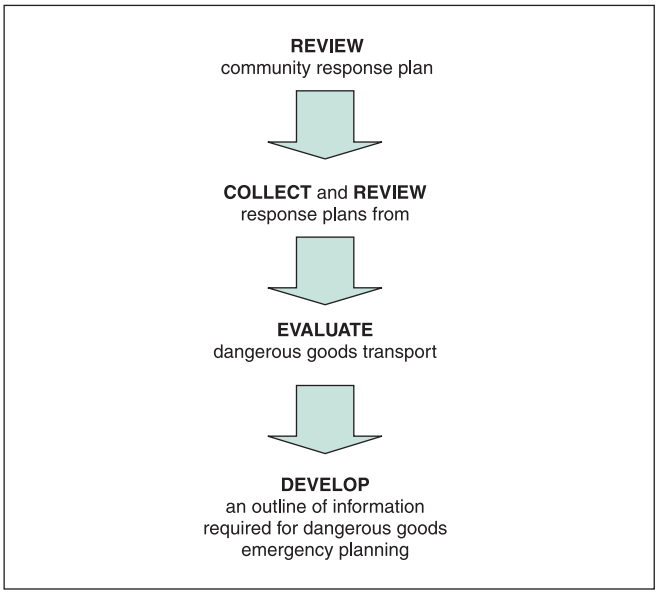


Figure 6. *Reviewing Emergency Response Plans.*

The **TransAPELL** Group should remember that plans not only have to be tailored to fit local circumstances. There may also be a need to consider co-operation with neighbouring communities.

❒ 2.5.1 Reviewing Existing Plans

Reviewing all existing emergency plans in the light of the results of the hazard identification and evaluation exercise is the first step towards identifying what needs to be done to improve or create an integrated dangerous goods transport emergency plan for the community. The **TransAPELL** Group should have used all existing plans in the hazard identification and evaluation stage. When that stage is completed it is time to look again at all existing plans to see how they can most

EMERGENCY RESPONSE PLAN EVALUATION MATRIX

Figure 7A : Emergency Response Plan Evaluation Matrix

	Regional				Local Governments (Country/City/Town)							Other (Industrial/Institutional				
Plans evaluated																
Planning Elements																
Organisational Responsibilities																
Risk evaluation																
Notification Procedures and Communications System																
Core Elements in Place and Emergency Equipment and Facilities Readiness																
Assessment Capabilities																
Protective Action Procedures																
Public Education and Information																
Post-Emergency Procedures																
Training and Drills																
Programme Maintenance																

KEY :
A – Acceptable
B – Minimal work needed
C – Substantial work needed
N – Not applicable

appropriately be incorporated into a dangerous goods transport emergency plan.

A community may or may not already have an integrated emergency response plan, and this may or may not make some provision for emergencies arising from transport of dangerous goods. Whether such a plan exists or not, it is likely that some of the stakeholders in the **TransAPELL** process will be able to provide some dangerous goods emergency planning documents from their own organisations.

The **TransAPELL** Group should also bear in mind that organisations not represented in the local group may be able to provide more examples of existing emergency plans. In particular national organisations such as ministries of transport, health, environment and civil defence, industry associations and national or international emergency response centres may be able to help.

Figure 7A and 7B shows the review process as a series of steps. An Emergency Response Plan

Figure 7B. *Example.*

EXAMPLE

	Regional				Local Governments (Country/City/Town)							Other (Industrial/ Institutional)				
Plans evaluated																
Planning Elements																
Organisational Responsibilities	A				B	B	C	B				A	A	B	A	A A
Risk evaluation	A				C	B	C	C				N	N	N	N	A A
Notification Procedures and Communications System	A				B	B	B	C				B	B	B	A	B B
Core Elements in Place and Emergency Equipment and Facilities Readiness	A				C	B	C	B				A	A	A	A	B
Assessment Capabilities	B				C	C	C	C				N	N	N	N	B B
Protective Action Procedures	C				C	B	C	C				C	N	N	N	B B
Public Education and Information	C				C	C	C	C				B	C	B	B	C C
Post-Emergency Procedures					C	C	C	C				B	B	B	A	B B
Training and Drills	B				B	C	C	B				B	B	B	A	B B
Programme Maintenance	B				B	C	C	B				B	B	B	A	B B

KEY :
A – Acceptable
B – Minimal work needed
C – Substantial work needed
N – Not applicable

Evaluation Matrix, of which an example is given below, could be used to help identify and summarise strengths and weaknesses.

In particular, the **TransAPELL** Group should look at:

- How well the hazards the Group has already identified are known and prioritised.
- Identification of emergency equipment, facilities and other resources within the community.
- Existence of contact lists and emergency checklists.
- Identification of evacuation routes.
- Description of emergency response procedures.
- Training plans for emergency response personnel.
- Documentation of strategy for testing the emergency plan with practical exercises and revising the plan in accordance with the results.
- Provision for information to the public.

■ 2.6 Creating and Revising an Integrated Community Plan for Emergencies Involving Transport of Dangerous Goods

The activities described in this section correspond to Steps 4-7 of the original APELL methodology (see Section 1.1).

Although it is important to start from existing material, it is assumed for the purposes of this guidance that the **TransAPELL** Group will have to do a lot of the work from a zero base. The process of creation of an integrated emergency response plan is shown in Figure 8.

When planning for emergencies arising from transport of dangerous goods, there will be a need for collection and recording of data on goods transport movements for eventual incorporation into the plan. This should be done utilising the nomenclature contained in the United Nations Recommendation for the transport of dangerous goods (see Annex 4.1 for details). It is strongly recommended that data be collected in the prescribed format from the outset. This will facilitate communication and easy retrieval of information in the event of an emergency.

Tasks not covered in existing plans will have to be identified. The APELL Handbook suggests the following steps to do this:

- Using the results of the review of existing plans, prepare a list, for each **TransAPELL** Group participant, of missing elements or required tasks which are not being covered.
- Decide if the missing elements are important to the function of that participant (e.g. the fire brigade may not have the proper equipment to fight certain chemical fires).
- In the context of an integrated response, identify and list required tasks not covered by any group or individual.

Experience suggests that tasks commonly not covered include:

– Overall command authority

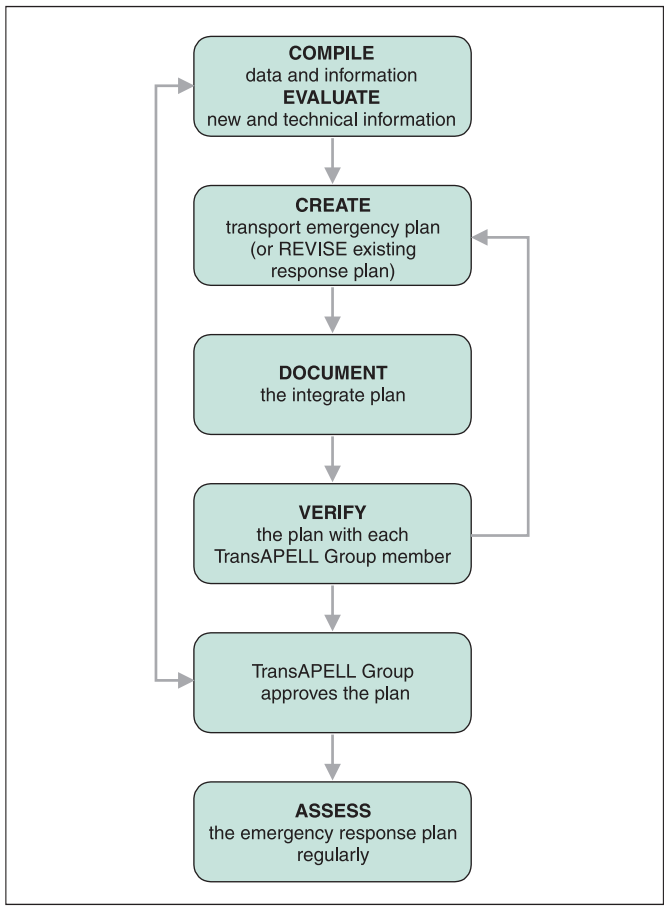


Figure 8. *Creating an Integrated Emergency Response Plan.*

– Communications equipment which can reach all participants

– Specialised hazard monitoring and associated training

– Alerting the public and co-ordinating evacuation

It is well worth stating at this stage that emergency planning often tends to focus on measures to be introduced after an accident has occurred. The **TransAPELL** Group, with its broadly-based membership, should take a more proactive stance from the beginning. It should consider the development of a prioritised list of possible preventive measures as part of its remit. Some possibilities are listed below:

- Consider restrictive routeing of road movements after proper risk analysis. A local risk analysis may be appropriate to decide whether to convoy dangerous material transporters through

communities or areas which present maximum risk, with police or fire service escorts. Local authorities would need prior notification of such a convoy system. The requirement for it would have to be defined in relation to specific, extremely hazardous substances.

- Avoid shipments of high-risk materials during rush hours to reduce accident probability and the number of people exposed to risk.

- Consider temporary restrictions on dangerous goods traffic during hazardous weather conditions: low visibility due to fog, high winds, or slipperiness due to snow or ice.

- Limit the potential for severe consequences of spills by special roadside constructions, e.g. drainage systems or impermeable layers where roads or railways pass through or near environmentally sensitive areas, water reservoirs, etc.

- Introduce proactive safety and educational programmes, launch specialised education for staff engaged in transport operations, and introduce safety programmes. For instance, incident reporting systems will increase staff awareness and help reduce the probability of accidents.

It should be emphasised that much can be accomplished on a voluntary, co-operative basis. The introduction of formal routeing restrictions into local regulations can be a long-drawn-out process. Equally good and much more rapid results can probably be achieved by voluntary agreement on a recommended network for dangerous goods transport within the community. Partners in such agreements can be sought first among the members of the **Trans-APELL** Group themselves.

Matching tasks not previously covered in emergency plans to available resources obviously involves identifying resources that are available to the whole community in the event of emergency. First responders from the police, fire and ambulance services must be consulted, as well as local hospitals. However it is also very important to determine what resources are available from the transport and chemical industries. Many manufacturers and transporters have personnel and equipment to assist in emergencies. The emergency plan should specify these organisations by name, together with the resources they can provide and how they can be contacted and mobilised in an emergency. Their individual roles should be clearly described. For example, rail carriers will normally take the lead in clean-up after a rail wagon incident.

The APELL Handbook gives examples of resource sharing. Although these are drawn from fixed facility case studies, they may equally apply to planning for transport of dangerous goods accidents:

- One planning group recognised that police resources were scarce. It therefore planned for volunteer firefighters to deal with traffic and access control.

- Another group established a multi-agency command post to resolve questions of “Who’s in charge?”

- Communication resource problems may require sharing of radio networks and equipment.

The following steps are suggested to make the necessary changes in existing plans and create an integrated plan:

- Preparation of a draft in a format acceptable to the members of the **TransAPELL** Group.

- Review of the plan against the following planning elements to ensure completeness:

– organisational responsibilities,

– risk evaluation (including assessment of potential for exposures near transport routes),

– emergency assessment and incident classification,

– notification procedures (emergency call out list) and communications systems,

– emergency equipment and facilities,

– public warning systems,

– media contacts,

– protective action procedures, e.g. evacuation,

– public education and information,

– post-emergency procedures,

– training and drills,

– programme maintenance.

- Conducting a table-top role-playing exercise as an initial test of the plan (i.e. key participants should sit round a table and describe how they would respond and interact for various scenarios involving a transport of dangerous goods emergency).

- Identifying weaknesses in the plan and repeating earlier steps, if necessary, to resolve these problems.

- Making sure that the plan is consistent with any regional or national plans.

- Revising the draft plan as often as necessary.

With regard to the last point but one in this list, it should be noted that there is a move among some governments to develop regional dangerous goods emergency response networks. If such a regional network exists covering your community, it may be able to support the implementation of your plan with resources from elsewhere in the region.

The APELL Handbook offers the following guidance on committing the plan to writing:

- Ask a small number of Group members to prepare the final draft.

- Begin arrangements to create written agreements among participants where necessary (mutual aid agreements, notification formats, use of media notification outlets, use of specialised response personnel and equipment).

- Prepare a standard presentation to be made to officials whose approval is needed before the plan can be implemented.

- Make presentations, hold review sessions and obtain approval signatures from appropriate officials in all jurisdictions and organisations concerned.

The Group should also review local and national laws to ensure compliance with international standards, especially the UN Recommendations on the transport of dangerous goods.

The purpose of this section has been to provide guidance on how to come up with an integrated community plan to deal with emergencies arising from transport of dangerous goods. However, experience from the pilot project suggests that:

– in some cases, this may be too ambitious as an initial objective;

– nevertheless, much may be accomplished by creating as much consistency and as many "co-ordinating bridges" as possible between existing plans.

The benefits to be gained from full co-operation will gradually become evident and the fully integrated community plan can be realised as a second step.

■ 2.7 Educating Participating Groups about the Plan and Ensuring that all Emergency Responders are Trained

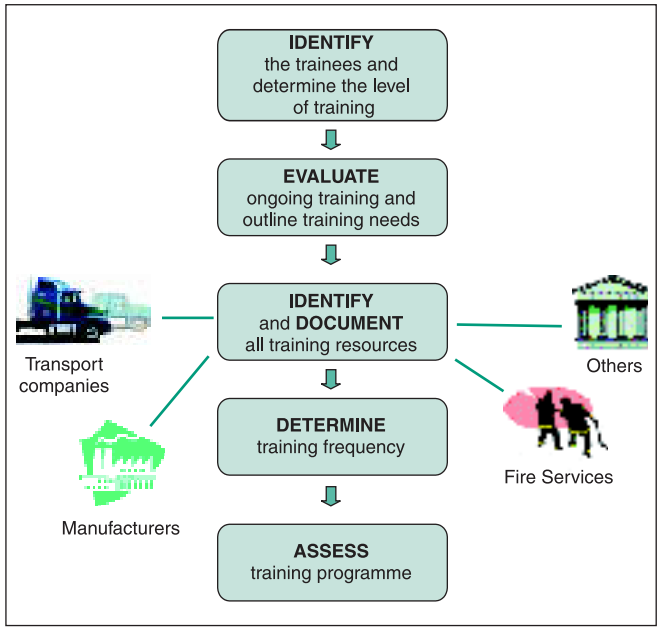


Figure 9. *Training.*

Community involvement is important throughout the planning process. If the community has established customs or procedures for public notification of meetings, committees, activities and public comment on planning proposals, then the **TransAPELL** Group should follow these. However, by the time this stage arrives the **TransAPELL**

Group should certainly have a definite plan for presentations. Presentations should **lay stress on the vital importance of training of emergency responders.**

The APELL Handbook suggests the following actions to complete this step:

- Compile a list of organisations, groups and individuals who will need to know about the plan.
- Make presentations to explain the plan, the roles of organisations, groups and individuals in it, and the type of training they should institute and/or receive.
- Identify who must be trained and prepare a training schedule.
- Develop and implement training sessions where necessary. This includes defining the training needs of each group, including any needs for which extra help and support have to be sought; identifying the individuals responsible for seeing that training is given; and determining frequency in order to maintain standards despite staff changes, etc. In cases where local authorities are not equipped to train key people, the transport industry, along with colleagues from other associated industries, may need to devise and implement these sessions.
- Complete field drills for hands-on training in monitoring, use of communications, traffic control, etc.
- Complete comprehensive table-top exercises to train leaders in co-ordination and communication among participants.

In training to implement emergency plans for dealing with dangerous goods transport accidents, the community will need to take a decision on the level of training required. In cases where support is available from national or regional dangerous goods response teams or from industry mutual aid groups, it may be decided that local responders need to be trained only to first response level.

Much of the training needed for dealing with dangerous goods transport emergencies is similar to that required for accidents at fixed installations. However, the following topics should also be included:

- Roles and responsibilities of responders that are specific to the transport emergency situation.
- How to use the resources for transport emergencies.
- Procedures for contacting road and rail carriers, manufacturers, etc. for information or assistance.
- The UN dangerous goods hazard class.
- Placards and labels.
- Location, content and interpretation of dangerous goods transport documents (shipping papers) on vehicles.
- Transport emergency cards and response guides– how they are structured and how to use them.
- Types of packaging, vehicle, tank and container commonly used to transport dangerous goods.

Figure 9 outlines the training process and indicates who is involved.

■ 2.8 Testing, Reviewing and Updating the Plan

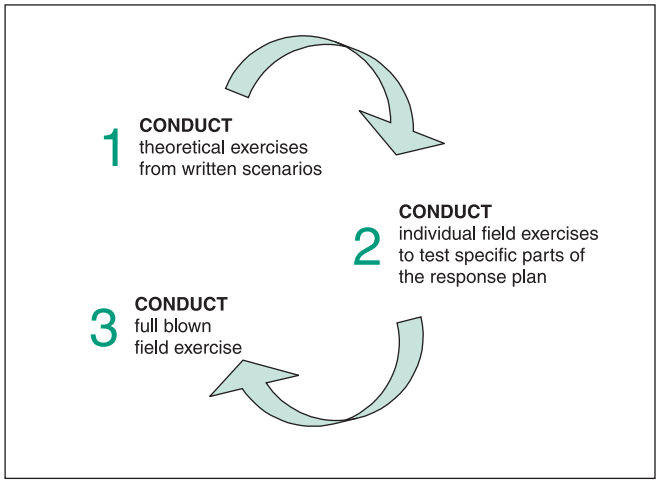


Figure 10. *Testing the Emergency Response Plan.*

Testing is a crucial part of all planning programmes. Exercises and drills will provide tests of the plan. Broad participation in simulated drills is necessary to increase awareness and understanding, and to enhance commitment. It is recommended that all **TransAPELL** Group members participate in all phases of simulation drills, including planning, simulation and critique.

It is advisable to start in a small way and to build up to a comprehensive simulation drill. The plan should first be tested through a number of smaller-scale theoretical exercises. Figure 10 shows the steps in this process.

❒ 2.8.1 Theoretical Exercises

Role-play technique is an effective tool to test the plan at executive level. Those running the exercise will provide the representatives of the organisations and functions to be tested with a scenario. Participants will then be required to make decisions on how to react and how to use the available resources as events develop. The flow of information to the participants should be as realistic as possible. New and updated information can be provided in accordance with adjustments based on previous decisions.

A role-play can be performed with all participants in one room or with the different functions "blindfolded" at separate locations. The latter approach also provides an opportunity to test the communications system.

The strategy for handling media contacts during the emergency should certainly be tested. Any major accident involving dangerous goods will, in today's society, inevitably lead to rapid and massive pressure from the news media. As most emergencies, at least initially, are characterised by lack of information, it is easy to give contradictory messages which lead to the spread of unfounded rumours. Even with proper training and co-ordination, this will be a difficult situation to handle for those in charge of the response operation. Press interviews and press conferences can be simulated to give personnel practice in handling this aspect of their duties under the plan. The importance of building prior contacts with media staff is highlighted in Section 2.10 below. Chapter 4 of the APELL Handbook gives more detailed guidance.

❒ 2.8.2 Practical Simulations

An emergency drill programme is an important part of any emergency response plan. A simulation drill presents an emergency scenario and challenges the participants to respond. In doing so, they will use the concepts and skills developed during the planning and training processes. The drill should be observed and evaluated by outside emergency response specialists.

Objectives for a drill could be as follows:

- Evaluate dangerous goods transport emergency plans and response capabilities.
- Provide the basis for improving plans and procedures.
- Provide training for participants.
- Improve co-ordination and relationships.
- Ensure the continued involvement of key community organisations.
- Provide a means to involve the public and the media.
- Integrate the dangerous goods transport emergency plan into the overall community emergency response plan, if any.

Proper planning is essential and sufficient time must be allowed for this. Some key drill planning activities are:

- Identifying participating organisations.
- Defining the functions and components of the plan to be tested.
- Developing a written scenario.
- Selecting a suitable location.
- Making all necessary practical arrangements– equipment, communications, media contacts, etc.
- Ensuring that the drill is properly documented.

Drills should be made as realistic as possible. The scenario(s) should be carefully chosen. It is not always necessary to depict the "worst case" in order to produce the desired effects. Use of fireworks, smoke or liquids to simulate explosions, fires and spills will add conviction. Normally it is desirable to conceal the scenario from the response personnel who are to be tested, in order to give them practice in responding to the unexpected. However, if a full-blown drill is to be conducted anywhere where the public can be affected, or even be aware of it, the public should be notified in advance through the media that a drill is to take place. This will avoid all confusion with a real emergency.

■ 2.9 Assessing and Updating the Plan

Any deficiencies in the plan uncovered during the testing process should be corrected both in the plan itself and in the training programme. The APELL Handbook recommends the following activities for this step:

- Hold evaluation sessions to present results immediately after the test.
- Assign the appropriate people to correct the deficiencies.
- Revise the plan accordingly.
- Prepare a procedure for a formal annual review of the plan to ensure that it is kept current.

In addition, alarm functions of vital importance should be regularly tested and routines established for immediate updating of emergency call lists.

The work of the **TransAPELL** Group should be regarded as an ongoing process. Attention should be paid to changes in the community which could have an impact on the plan. Changes in industrial infrastructure, product flow or transport arrangements should be monitored in relation to threatened objects and their impact on existing plans should be fully assessed. Dangerous incidents or accidents occurring within the community (or, indeed, in nearby communities) should be thoroughly analysed and the plan should be modified in accordance with the lessons learnt. A common incident reporting system will aid this process.

■ 2.10 Educating the General Community about the Plan

Opportunities for community involvement and public education should be pursued at all steps of the planning process. Educating the public about what to do during an emergency, where to turn for additional information and when and how to evacuate if necessary is a critical element in effective community emergency response. The APELL Handbook (Chapter 4, pages 24 to 33) gives details about the importance of building community preparedness for technological emergencies and advice on how to do this.

The following actions are recommended to complete this final step of the process:

- Prepare a standard emergency response brochure for distribution to all households in the community.
- Distribute the brochure by the most appropriate means.
- Prepare a standard media kit identifying local government and industry information contacts, providing background on dangerous goods

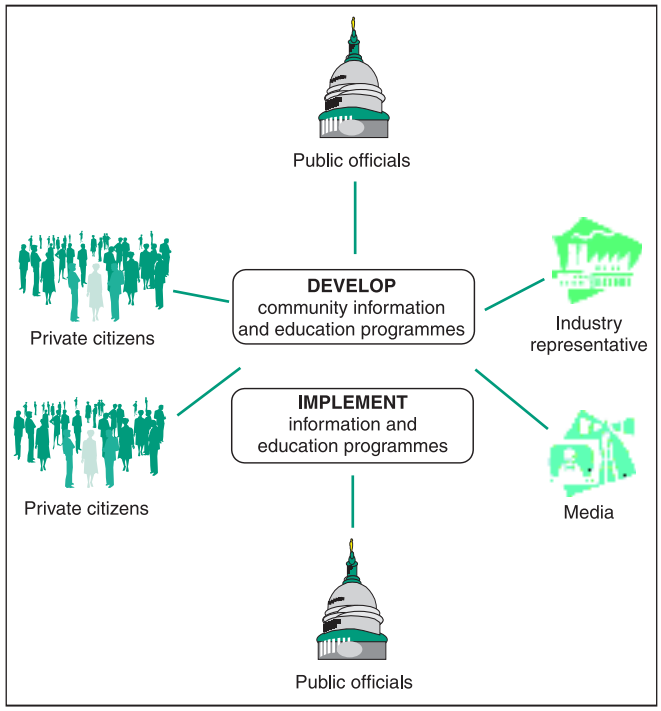


Figure 11. *Educating the General Community About the Plan.*

transport and the plan, and explaining where to get information in an emergency.

- Conduct a media briefing/training session to present the media kit and explain what is expected of the media during an emergency.

- Implement other parts of a public education programme– possibilities include:

– a speaker's bureau for local civic groups, schools, etc.,

– a hazardous materials advisory committee to answer specific public queries,

– media coverage of drills, training activities, presentations to local officials, etc.,

– invitations to members of the public to watch or participate in drills.

- Periodically, review and work to improve public education and community awareness programmes.

The next section of this report presents a fictionalised case study of **TransAPELL** in practice. Located in the imaginary community of "Hazardville", the case study incorporates practical experience gained from the pilot projects.

3

THE TRANSAPELL PROJECT IN "HAZARDVILLE"

The Hazardville project demonstrates the **TransAPELL** methodology in use. It shows some of the first steps and preliminary results for a fictitious **TransAPELL** project carried out in the equally fictitious local community "Hazardville".

■ 3.1 Introducing Hazardville

The municipality of Hazardville is a regional centre for communications and industry. The community has approximately 80,000 inhabitants, of whom 60,000 live in the city itself.

The port of Hazardville is a major gateway for both imports and exports. A large proportion of its traffic consists of dangerous goods. Two major industries are situated in the municipality. A railway and a major road pass close to densely populated areas.

Hazardville's emergency preparedness and response organisation is headed by the Civil Defence Authority (CDA), which has an overall co-ordinating role. The CDA is also responsible for: the Joint Alarm Centre; the warning function; the pre-planning of evacuation measures; and a stockpile of emergency equipment. The historical function of the CDA has been to deal with wartime emergencies and natural disasters. Consequently it is not ready or well prepared to handle emergencies calling for rapid first response such as chemical facility or chemical transport accidents. However first responders on 24-hour alert are available from the Hazardville Fire Department. The port, the railway and the two major chemical industries also have response forces. Although these have limited manpower, they have up-to date equipment and expert knowledge in their fields of responsibility.

■ 3.2 Forming the TransAPELL Group

No APELL Co-ordinating Group was active in Hazardville before the **TransAPELL** project was launched. The first initiative in the process was taken by the Hazardville Fire Chief, whose interest in the improvement of transport emergency planning had been aroused when he attended a regional APELL Seminar/Workshop in a neighbouring country. He discussed the matter with the Local Civil Defence Director and, together with the Director of the Marshalling Yard and the Safety Manager at PRO-Chemi Industries, they decided to form an organising committee.

The committee met for the first time in January. Everyone agreed that the present planning situation needed to be improved and that this called for a joint effort from all parties involved, both public authorities and private organisations.

The committee started by studying the APELL Handbook and the other APELL tools available in the local language. As the project would involve several municipal organisations, consent for the idea was sought from the municipal council.

■ 3.3 Start Up Workshop

The process started by arranging a workshop. A workshop-planning group, consisting of individuals from the organisations represented in the organising committee, was appointed for this purpose.

The planning group made a list of all possible local organisations which would have an interest in the workshop and which could contribute to it. The

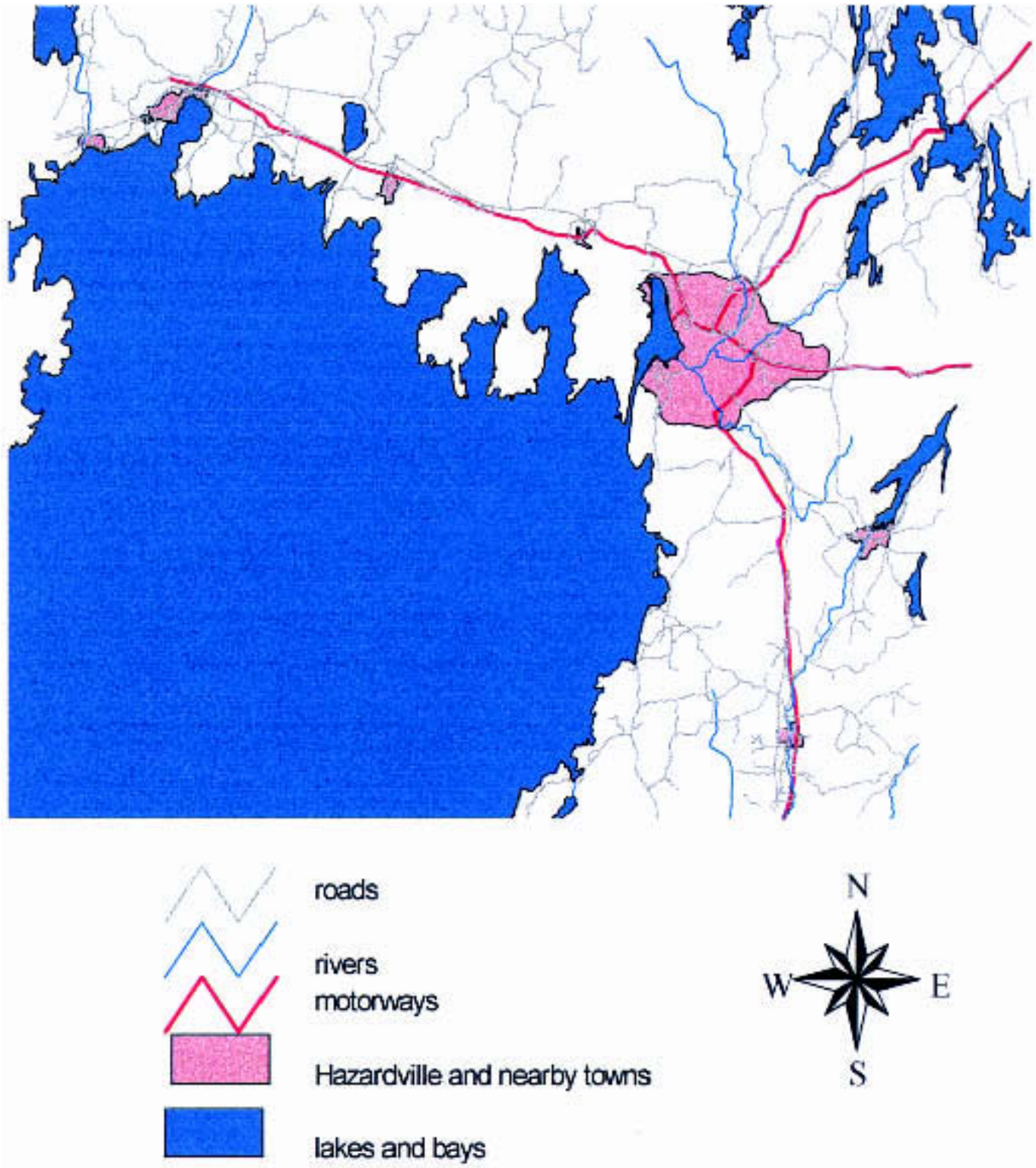


Figure 12. *Map of Hazardville Region.*

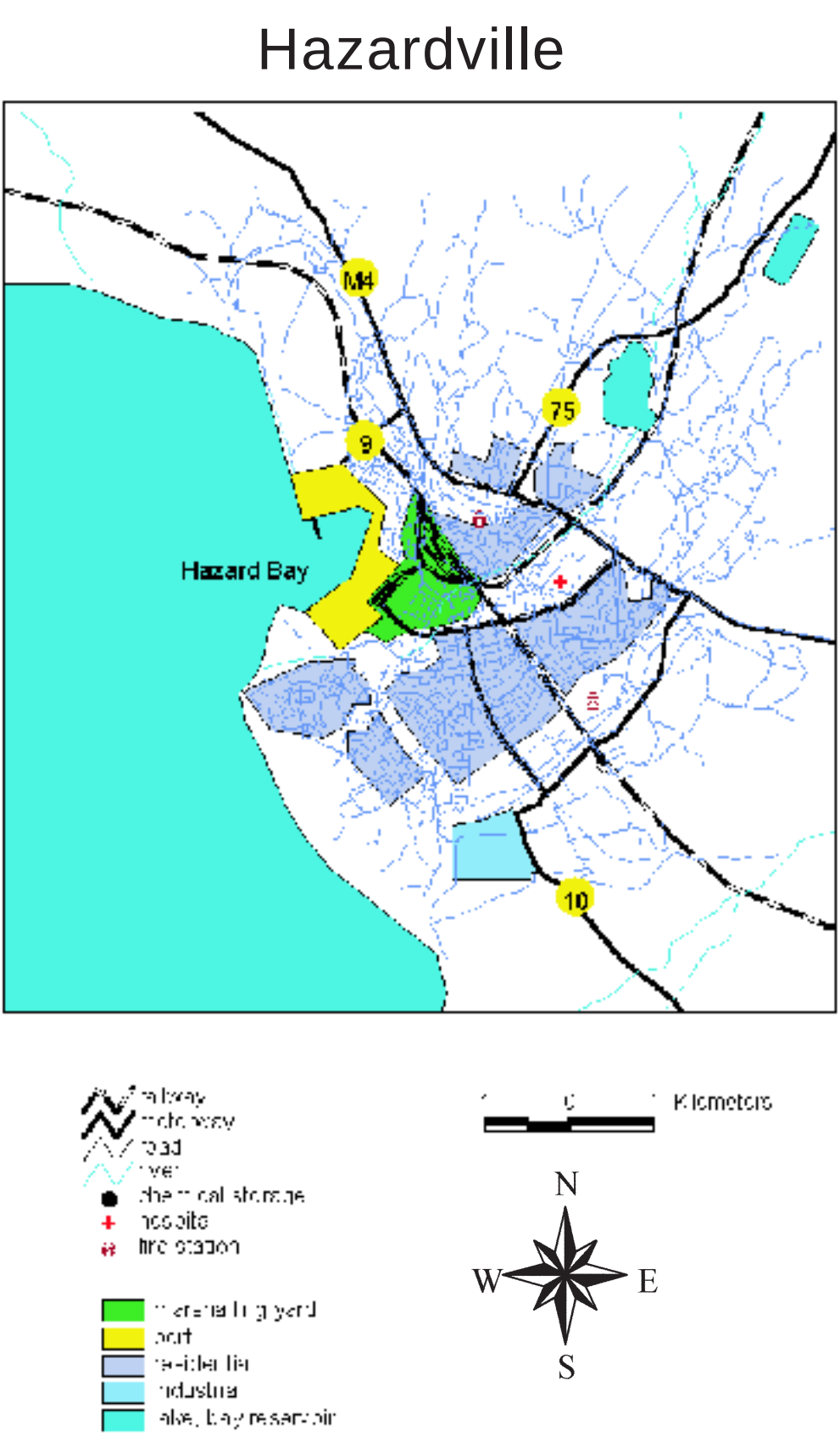


Figure 13. *Hazardville City Map.*

national APELL Co-ordinator was invited to take part in the workshop and was asked to find out whether any funds could be available to sponsor the event.

The invitation was sent to the following organisations:

- Municipal Council
- National APELL Co-ordinator from national Civil Defence Authority)
- Local Coast Guard Office
- Joint Alarm Centre
- Police Authority
- Local Civil Defence Office
- Fire and Rescue Department
- Hazardville Land Use Planning Office
- Hazardville Environmental Protection Bureau
- Telecommunication Company
- National Railway Company
- Regional Board of Road and Traffic
- PRO-Chemi Industries
- PETRO-Chemical Industries
- Hazardville Hospital
- Hazardville Group of Environmentalists
- Hazardville Times (newspaper)
- Port of Hazardville
- Hazardville Public Works
- Water Services
- Hazardville Military Garrison
- Local association of haulage contractors
- Hazardville Red Cross
- Local TV station

The agenda for the workshop was discussed at length. The workshop format requires a high degree of participatory activity. To allow for this, the number of participants was limited to a maximum of fifty. An overall goal was set: the workshop should

	DAY 1	DAY 2	DAY 3
09.00-09.30	Opening speech by the chairman of the municipal council	Presentation of present emergency response planning	Group discussions on need for better co-ordination, problem identification and suggestions for improvements
09.30-10.30	Presentation of participating organisations and their functions:		
10.40-12.30	Presentation of APELL methodology by national APELL co-ordinator	Presentation of experiences from recent dangerous goods accidents in Hazardville	Experiences from other APELL projects
12.30-13.30	Lunch	Lunch	Lunch
13.30-14.30	Role-play based on fictitious dangerous goods accident scenario Scenario 1: petroleum tank vehicle	Review and demonstration of existing equipment for rescue operations	Discussions regarding the framing of a possible project plan for a **TransAPELL** project in Hazardville
14.40-15.30	Scenario 2: Ammonia tank wagon	Railway safety, dangerous goods regulations for rail transport	Presentation of possible project plan from discussion
15.40-16.30	Evaluation of role-play		Conclusions Followed by press conference
16.30-17.00	Discussion	Discussion	

Figure 14. *Agenda for the TransAPELL Start-up Workshop in Hazardville.*

not end without establishing a clear framework for future work. The planning group came to the conclusion that a three-day event was required if all objectives were to be met. The proposed overall framework was:

- Day one: "setting the scene"
- Day two: mutual information
- Day three: discussions about future work

The organising committee accepted the proposal and submitted it to the municipal council for approval. Requests for co-sponsorship of the workshop were sent to the National APELL Co-ordinator, the Port of Hazardville, the National Railway and the two major chemical companies, PRO-Chemi and PETRO-Chemical.

The municipal council showed interest in the initiative and offered to host the workshop in the City Hall of Hazardville. Additional financial support was given by the various organisations mentioned above.

The invitation to all participating organisations was sent out three months before the workshop, asking them to nominate two representatives each. The invitation was accompanied by the preliminary agenda and a short introduction to the APELL process. The organisations were advised that their representatives should be prepared to give a short presentation of their organisation, with particular reference to dangerous goods handling and/or emergency response to transport accidents.

All the organisations invited accepted the invitation and took part in the workshop.

The purpose of the first day's role-play was to make a survey of the existing overall level of preparedness for a dangerous goods accident. The leader of the role-play explored: the ways of raising the alarm; the command hierarchy; means of communication; co-operation between different participating organisations; information to the public; and possible evacuation of the public at risk. The participants agreed on weak and strong points in the present position. Some of the weaknesses were:

- The organisation was too "rigid", having been primarily designed for wartime emergencies and the handling of natural disasters. It was very possibly not flexible enough to tackle accidents involving a rapid escalation of events.
- Co-operation between the various organisations could be improved.
- There was a lack of up-to-date equipment, e.g. chemical protection suits.
- The communication system was largely based on telephone connections and needed to be improved.
- At the scene of an accident, there was no obvious on-scene commander or single organisation responsible for co-ordination.
- The means of alerting and informing the public could be improved.
- The question of evacuation needed further detailed examination.
- There was no planning for how to handle the media at an accident.
- No comprehensive inventory of all rescue equipment available in Hazardville had been made.
- The possibility of introducing routeing restrictions for road transport of larger quantities of dangerous goods in the centre of the city needed to be investigated.
- The freshwater supply is dependent on a single reservoir, it was therefore vulnerable.

Presentations by the different authorities and organisations of their responsibilities and functions revealed both weaknesses and strengths. There were wide variations in levels of readiness to respond. Several authorities maintained a 24-hour seven-day system, while others had a low level of preparedness for emergencies and were not organised to respond rapidly. No thorough flow study of dangerous goods was available. However, it was possible to identify the major fixed installations using hazardous materials and some rough figures were presented on

rail transport of dangerous goods through Hazardville.

During the discussions on the last day the participants were divided into five groups.

The task was to discuss and comment on the following questions:

- What are the strengths and weaknesses in the present planning and preparedness in Hazardville with respect to accidents involving dangerous goods transport?
- Should a **TransAPELL** project be launched in Hazardville? If so:
  - are there any other organisations, not present at the seminar, which should take part in such a project?
  - what should be in a rough project plan and who should lead the project?
  - is there a need for any specified type of external support?

All groups said they wished to launch a **TransAPELL** project in Hazardville. Some other organisations were suggested as possible participants, including the Regional Road Safety Board and some local private companies. As to the concrete recommendations for project plans, a number of possible activities were suggested. Those mentioned by all groups included revision and co-ordination of plans, training exercises and tests. Handling of the media during emergencies, alerting the public and evacuation were also raised again as central issues to be addressed.

A consensus emerged on the following items:

- The local Director of Civil Defence should be the project leader.
- The membership of the **TransAPELL** Group (25 persons) should be defined to include organisations represented at the workshop plus the others identified as having an interest in transport of dangerous goods issues.
- A formal decision to start the project should be taken by the municipal council.
- The project plan should cover a two-year period.
- The frequency of **TransAPELL** Group meetings should be one meeting every month.
- Sub-groups should be formed for certain issues to render the work more effective.
- Exchange of experiences should be sought with other **TransAPELL** groups in the country and abroad.
- Progress reports should be produced regularly.

The **TransAPELL** Group was given a mandate to draft a formal project plan and to submit it to the municipal council.

- One organisation, the Hazardville Group of Environmentalists (HGE), declined to take an active part in the group. The rationale behind this decision was HGE's policy of keeping its freedom to criticise "The Establishment". HGE nevertheless welcomed the initiative and promised to follow subsequent progress closely.

3.4 Press Conference

A press conference was arranged in conjunction with the workshop. The event was advertised by a press release prepared by the TransAPELL Group and distributed to local newspapers and TV and radio stations one week before the workshop.

3.5 The Work of the TransAPELL Group

The **TransAPELL** Group wanted to benefit from the enthusiastic spirit developed among the participants during the workshop and made a considerable effort to give feed-back quickly. The workshop report and a draft project plan were presented to the municipal council within two weeks of the workshop. The council approved the plan but allocated no special funding for its implementation. All costs for the project were to be covered by the regular budgets of the participating organisations. However the possibility was left open for the **TransAPELL** Group to submit a further application for council financing, should it identify, for example, an

INVITATION
to
PRESS CONFERENCE

IMPROVED PREPAREDNESS FOR DANGEROUS GOODS TRANSPORT EMERGENCIES IN HAZARDVILLE

Hazardville is a major transport and industrial centre for the region. Large volumes of dangerous goods are shipped through our port and on the main rail and road arteries that go through the community. Dangerous chemicals are processed or stored at our industrial sites.

The most recent fatality in our community due to transport of dangerous goods took place back in 1989. Every year, however, minor incidents happen and most of us will remember the spill of petrol due to a road tanker rollover on the motorway last month.

A number of organisations have suggested that Hazardville should launch an APELL project, in order to improve awareness and preparedness and to encourage co-operation with regard to dangerous goods emergencies. A workshop on this theme will be conducted on 5-7 May. A press conference will be arranged at the end of this workshop.

Representatives of all participating organisations will be present and prepared to answer questions regarding the project at a Press Conference, arranged at 5 p.m. on Tuesday 7th May in the City Hall of Hazardville.

WELCOME!!!

Questions regarding the press conference will be answered by telephone: Call 717-33 44 11

Best regards,
Ann Smith
Hazardville Community
Civil Defence Authority

Figure 15. *Press Release to Local Media in Hazardville. In Connection with the Start-up Workshop.*

important task which could only be carried out with extra funding.

The draft project plan developed by the Group was very simple. Although one of the conclusions from the workshop was to plan for a project span of two years, the Group found it advisable not to extend the first project phase beyond twelve months. The goal was not to achieve a joint plan during that period but rather to concentrate on the already known weaknesses, to gather knowledge and information and to create informal networks between individuals in the various organisations. It was envisaged that the project plan would be subject to continuous updating.

Key principles were:

– monthly meetings
– the minimum of formalities
– inclusion of practical elements, e.g. training exercises, as early as possible in the work programme
– simple, practical goals

– as much involvement as possible of people at "grass roots level"

– keeping members active between meetings by allocating tasks and requiring reports.

The plan included a proposed organisational structure. The main **TransAPELL** Group would function as a steering group, setting goals and target dates and making major decisions. However, the bulk of the work would be done in ad hoc sub groups, composed according to the topic in question. These would report their progress to the main Group and function only as long as they had a task.

The Civil Defence Authority undertook the secretarial function. Short minutes were written of all meetings of the main Group. The working groups were free to document their meetings if they so wished. However proposals for and reports of formally allocated tasks were to be submitted to the secretariat in writing at least one week in advance of the meetings of the main group.

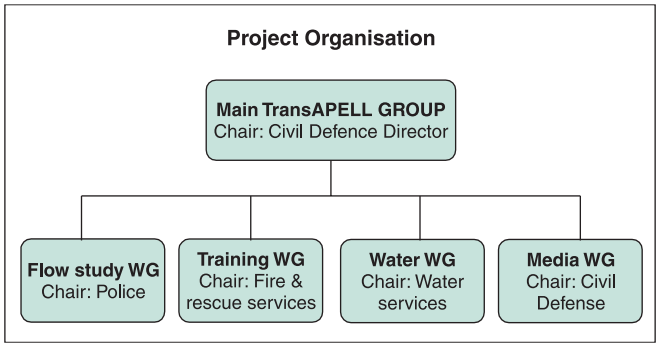


Figure 16. *Initial Organisation for **TransAPELL** in Hazardville.*

Once the municipal council had approved the project plan, invitations to the first constituent meeting were sent to the appointed group members. This meeting took place five weeks after the workshop.

At the meeting tasks were given to sub-groups, as follows:

Training Working Group:

– Start planning for practical exercise to take place within three months. Report plans at meeting no. 2. Report evaluation of exercise at meeting no. 4.

– Identify needs and draft a "grassroots" education programme. Report at meeting no. 6.

Flow Study Working Group:

– Plan road/rail flow study to be completed within three months. Report plan at meeting no. 2. Report final result at meeting no. 4.

– Review present routeing regulations. Report at meeting no 6. Group thereafter committed to vulnerability study for populated areas near the transport routes.

Media Working Group:

– Make a media plan for the promotion of the project. Report at meeting no. 2.

– Draft a plan for co-ordinated handling of media questions in emergency situations. Report at meeting no. 4.

Water Working Group:

– Investigate present water supply situation. Report at meeting no 2.

– Propose a hazard identification and evaluation project with respect to accidental water pollution. Report at meeting no. 4. After this, the Group should propose practical prevention measures and emergency response plans, including an action plan for a water shortage situation.

All participating organisations were required to submit all emergency response and training plans to the secretariat before meeting no. 2. Collation of all plans and identification of dangerous goods elements was to be undertaken by the Civil Defence Authority. Report at meeting no. 3

■ 3.6 Dangerous Goods Flow Study

Hazardville has neither an airport, nor inland waterways nor a pipeline network (other than internally at the industrial sites and in the port). The transport modes appropriate for the **TransAPELL** Group to investigate were road, rail and sea (i.e. the port). The data sources and the preliminary results for the dangerous goods flow study for road and rail were those given below.

Figure 17. *Project Plan for First Year of the Project.*

TransAPELL Project in Hazardville	**Year 1**												**Year 2**							
Activity	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8
Org. committee / planning of workshop																				
Workshop					X															
Main TransAPELL Group Meetings							M1		M2	M3	M4		M5	M6	M7	M8	M9	M10		M11
All plans submitted to secretariat																				
Collate and report on plan situation										R							X			
Flow study working group :																				
Task 1 Plan, perform and report flow study									R		R									
Task 2 Review routeing restrictions														R						
Task 3 Vulnerability study																				R
Training working group :																				
Task 1 Plan exercise									R		R									
Task 2 Perform exercise										X							X			
Task 3 Plan education programme														R						
Water working group :																				
Task 1 Investigate and report present situation									R											
Task 2 Hazard identification project											R					R				
Task 3 Practical measures. Action plan																			R	
Media working group :																				
Task 1 Media plan for project									R											
Task 2 Draft co-ord. Plan for emergency information											R									
Task 3 Train individuals and exercise																	X			

Planning or investigation R Report at TransAPELL Group Meeting

Planned activities running X Major event

R Report at TransAPELL Group Meeting

X Major event

The Following Lists Some Typical Dangerous Goods That Were Found In The Hazardville Dangerous Goods Flow Study For The Road Network

U.N.Class	DANGEROUS GOODS Proper shipping name	Primary	Secondary Hazard	Tertiary	Packaging Group (II or III)	U.N
Class 2.1	Liquefied Petroleum					1075
(Flammable Gases)	Gas (LPG)	2.1				1063
	Methyl Chloride	2.1				*--
	Others (each material less than 1%)					
Class 2.2	Carbon Dioxide	2.2				1013
(Non-Flammable Gas)						
Class 2.3	Anhydrous Ammonia	2.3	8	8		1005
(Poisonous Gases)	Chlorine	2.3	5.1			1017
	Ethylene Oxide	2.3	2.1			1040
	Others (each material less than 3%)					*--
Class 3	Methyl Alcohol	3	6.1		II	1230
(Flammable Liquids)	Styrene Monomer	3			III	2055
(3.1 less than 18 °C)	Gasoline	3			II	1203
(3.2 less than 23 °C)	Crude Oil	3			III	1987
(3.3 less than 61 °C)	Denatured Alcohol	3				1301
	Vinyl Acetate					*--
	Others (each material less than 3%)					
Class 3	Fuel Oil	3			III	1993
(Other Flammable	Petroleum Naphtha	3			III	1255
Liquids)	Flammable Liquid	3**				1993
	N.O.S.	3				2348
	Butyl Acrylate					--
	Others (each material less than 4%)					
Class 8	Formaldehyde Solution	8			III	2209
(Corrosive Materials)	Sodium Hydroxide	*			II	1824
	Solution	*			III	1830
	Sulphuric Acid					1805
	Phosphoric Acid					1789
	Hydrochloric Acid Solution					*--
	Others (each material less than 5%)					

* Will depend on concentration of components. ** Depends on flash point.

Figure 18. *Result of Dangerous Goods Flow Study on Road Network.*

❒ 3.6.1 Road

The PETRO-Chemical representative provided detailed information on the local distribution of petroleum products– LPG, petrol and heating oils. A two-tier approach was then used to obtain an overview of the types and quantities of the other dangerous goods transported by road.

First, an enquiry was sent to all enterprises that were members of the Regional Chamber of Commerce. This gave information about the goods flow into and out of Hazardville.

Second, a field survey was launched by the Flow Study Working Group. The purpose of the survey, led by the local police, was to get a picture of the transit traffic. Traffic was observed for four days, on a 24-hour basis, at a number of strategic places at main road intersections and major parking locations along the main road network. The main target of the survey was bulk transports, i.e. tanks or tank containers. When possible, the drivers were stopped and asked questions according to a prepared questionnaire: how frequently they used the road in question, which types of goods they normally carried, whether they had any specific observations related to safety, etc. One of the questions in the survey dealt with drivers' attitudes towards a draft proposal for routeing restrictions in the city centre. This had been elaborated by the Flow Study Working Group (see section 3.7 below).

The results of the flow study were analysed and presented in a table listing the main types of dangerous goods (see below), and a map showing the total annual quantities of dangerous goods on the main roads.

❒ 3.6.2 Rail

The National Railway Company keeps a record of all transport in a register at its regional office. The safety officer at the Hazardville Marshalling Yard B a member of the **TransAPELL** Group – was able to retrieve and collate data for the "top ten" hazardous substances handled at, or passing through, the Hazardville Marshalling Yard. The result is shown below.

■ 3.7 Routeing Restrictions

As in most cities, Hazardville's infrastructure is the result of decades of development. The city centre grew up around the port, the railway and the industrial sites, leaving the planners with a land-use problem, especially in relation to management of industrial risk.

The question of routeing restrictions had been debated for a long time. Local citizen groups had been asking the authorities for several years to ban the heavy dangerous goods traffic from some of the roads running through heavily populated areas in the city centre.

The Flow Study Working Group arrive at agreement on the general principles of a routeing restriction system quite easily:

– dangerous goods traffic to and from the port should be directed to the northern entrance of the port (via M4 and Route 9)

UN Class	UN number	Proper Shipping Name	Annual Quantity (1000 - Tons)
3.1	1230	Gasoline	410
3.3	1993	Fuel oil	275
2.1	1075	Liquefied Petroleum Gas (LPG)	150
2.3	1005	Anhydrous Ammonia	60
5.1	2070	Ammonium Fertiliser	57
8	1830	Sulphuric Acid	33
4.1	2821	Phenol solution	25
2.3	1017	Chlorine	18
4.3	1408	Ferrosilicon	16
6.1	2929	Toxic liquids, organic, flammable n.o.s.	11

Figure 19. *Most Common Types of Dangerous Goods. Transported by Rail.*

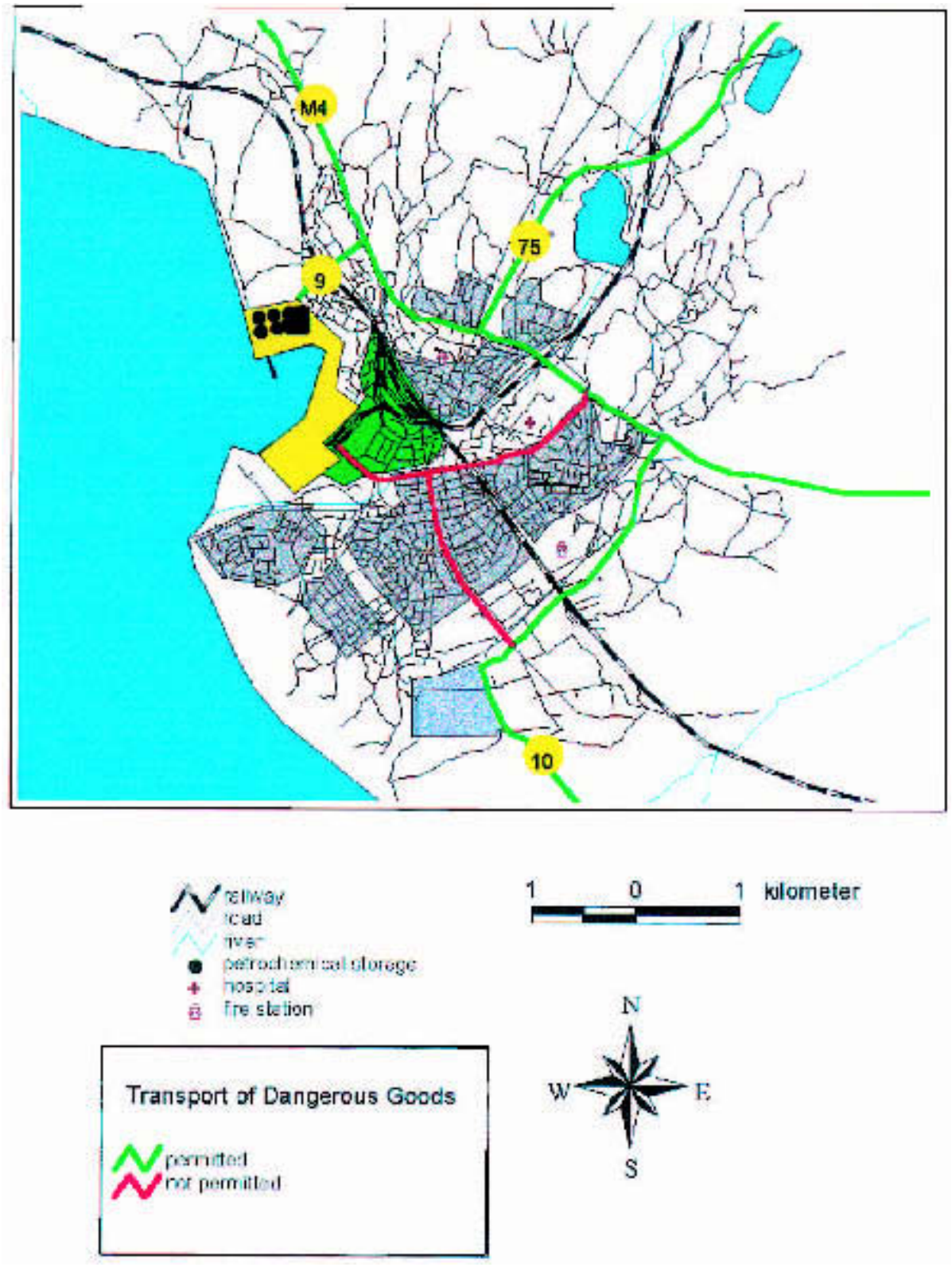


Figure 20. *Routeing Restrictions Implemented in Hazardville.*

– transit traffic coming from or bound for Route 10 should not be allowed to go through the city; it should be diverted along Route 75.

As soon as the Flow Study Working Group had produced a written proposal, supported by explanatory maps, it arranged an open hearing to which hauliers, the drivers' union, the chemical firms, the Port Authority and the public were invited. The meeting began with a description of the problem, followed by a plenary discussion during which the various aspects of the proposal were examined.

Even though the prohibitions would mean quite considerable detours for some transporters, the participants were nevertheless generally in favour. However the proposals created serious problems for local shuttle deliveries (mostly petroleum products for heating purposes and petrol stations). The trade unions required adjustments of the time-tables and the payment system for the drivers before they would consider accepting the new system. The hauliers announced the need for re-negotiation of the freight rates.

The proposal was further developed by the Flow Study Working Group, was discussed and approved by the main **TransAPELL** Group, and was then formally submitted to the Municipal Council. The new regulations came into force fourteen months after the start of the **TransAPELL** project. It was agreed that there would be a transitional period of six months. During that time the police would not issue fines but would only caution any driver found guilty of infringements of the new regulations.

Considerable attention was paid to disseminating information about the new routeing regulations. It was recognised that merely issuing a formal regulation would not automatically lead to improvements unless it was supported by an information campaign. It would be quite easy to get the information to the local drivers via the local hauliers and drivers' trade union. In order to reach the long-distance and transit drivers, however, a simple pamphlet was produced. This was to be distributed by the industrial firms and the Port Authority to all transport contractors and by the ferry companies to all drivers arriving by ferry.

The possibility of publicity by means of special road traffic signs was also discussed. Such signs are in use in some countries. However a decision to introduce new traffic signs was outside the competence of the local authorities. The **TransAPELL** Group accordingly sent a letter to the National Road Traffic Board, explaining the problem and appealing for action.

Another action — which could be regarded as a type of routeing restriction in the broadest sense — was a voluntary change of routines to minimise the time spent by loaded gas tank wagons in the main railway marshalling yard. The Port Authority and the chemical firms had been in the habit of shifting all loaded tank wagons to the marshalling yard immediately after filling. In some cases this meant loaded wagons being stored in the marshalling yard for up to three days before being sent off.

An incident with a minor chlorine leak from a rail tank wagon (see Section 3.13 below) clearly revealed the difficulties involved should a major gas leak occur from a wagon in the main marshalling yard. The proximity to densely populated areas in the city centre and the risk of incidents due to the high number of vehicle movements, as well as the problems presented by response operations within the huge track area, made it quite clear that every effort should be made to keep down storage times in the yard. Keeping the wagons within the industrial facilities for as long as possible would move the hazard two hundred metres further away from the city centre. It would also provide a more controlled environment with fewer train movements and tighter security.

Consequently, it was agreed with the railway company and the chemical firms that new "just-in-time" routines would be implemented. The wagons would now be kept within the industrial or port areas until just before assembly of the outbound trains.

■ 3.8 Risk Analysis for Freshwater Resources

Hazardville's main water supply reservoir is a lake situated approximately ten km. north of the city centre. Reserve ground water sources consist of a number of artesian wells. However the maximum

capacity of these reserves is around twenty-five percent of the average consumption and they would not be able to supply for very long at maximum outtake. Damage to the main water reservoir would soon lead to a severe water shortage, requiring rationing of the supply for both household and industrial use. The main northbound road, Route 75, runs close to the reservoir, as does the northbound railway line. At its closest point, the road is less than ten metres from the waterfront.

One of the scenarios in the role-play during the start-up workshop (see Sections 3.3 above and 3.11.4 below) dealt with contamination of the water reservoir by petroleum from an overturned road tanker. During the role-play and the subsequent discussions, the high vulnerability of the water supply system became evident to the municipal leadership. The Water Working Group therefore decided to conduct an environmental risk assessment of the road network within the municipality. The group lacked the necessary geological competence and recommended that an external consultant should be hired for the geological assessments. A plan with cost estimates was drafted and discussed by the main TransAPELL Group before being submitted to the municipal council. The council approved the project and allocated the necessary funds.

The method used was to construct a relative risk index reflecting the likelihood of a road accident involving spillage of dangerous goods which could pollute the water, and the potential consequences of such an accident. The probability of an accident for a certain segment of the road was estimated based on the type of road, the traffic flow and the historic traffic accident rate. In estimating the possible consequences topography, distance to water resources, geology, drainage pattern, etc., were taken into account. The road network was divided into segments according to the degree of variation of the parameters. In total one hundred and sixty km. of roads were assessed, subdivided into 250 different segments.

Three types of maps were produced:

– a probability map, showing the relative likelihood of an accident with a dangerous goods tank vehicle
– a vulnerability map, showing the relative sensitivity of the near-road environment to oil contamination
– a "risk index" map, constructed by overlay of the other two maps. This indicated the relative risk for an accident involving pollution of water resources.

From the study it was quite evident that the major threat of water pollution arises from the transport of heating and diesel oil in road tank vehicles, because large volumes of these substances are transported and the tanks of these vehicles are of the "thin-walled" type.

All three presentations served their purpose:

– the risk map gave a good overview of the "hot-spots" for traffic safety. It was communicated to vehicle drivers in connection with the Mutual Education Programme (see Section 3.9 below)
– the vulnerability map was found useful by the fire and rescue services, as it gave a first indication of the need for quick action– an accident in a "red zone" would mean permeable soil and/or proximity to sensitive water resources, calling for a more rapid and massive response
– the risk index map came to function as the basis for prioritising measures taken by the Roads Administration to improve road-side drainage, barriers, etc. Even if the results by themselves have not yet led to the initiation of new construction projects, the information has been used to strengthen the water protection installations through the ongoing new building and maintenance projects.

An overview version of the aggregated risk index map is shown below.

■ 3.9 Training Activities

One simple activity that was tested and developed during the first year of the Hazardville **TransAPELL** project, and which was well received, was the so-called "Mutual Education Programme". The idea was to get the grassroots in the different organisations involved and committed and to make them share their expert knowledge with each other.

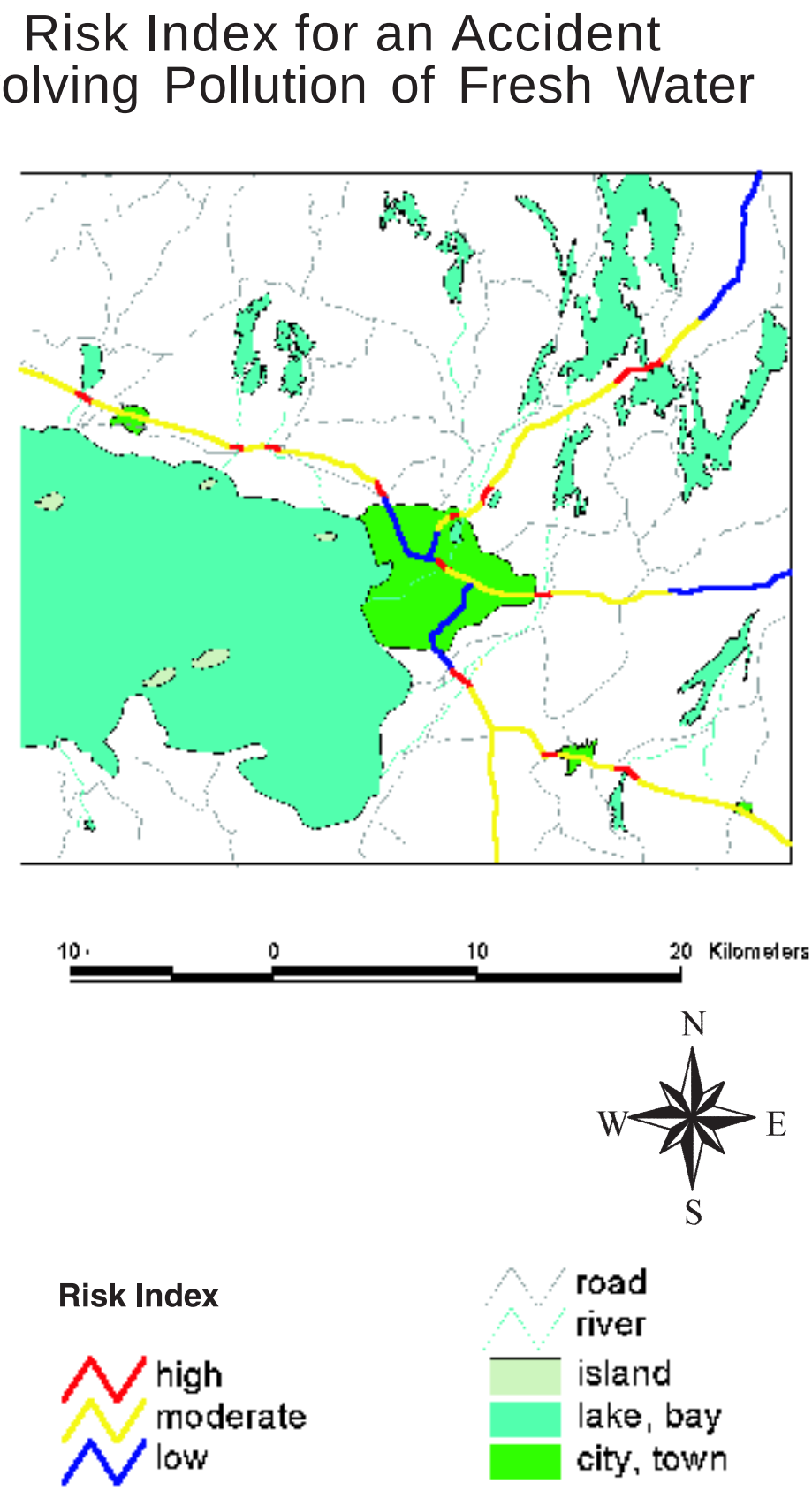


Figure 21. *Overview Map of Relative Risk Index for Accidental Pollution of Fresh Water Resources.*

Host Organisation	Contents of Training Block
Fire and Rescue services	Use of fire equipment, protective equipment, how to handle small spills
Civil Defence Authority	Visit to Joint Alarm Centre, function of outdoor warning system
Industry	Product knowledge for top ten chemicals, visit to loading bays
Port	Visit to tanker pier, tank farm
Railway	Visit to marshalling yard and control centre, display of rescue equipment, wagon types
Haulier	Common tank types, how to empty overturned tanks
Hazardville hospital	First aid, health hazards from most common chemicals, decontamination

Figure 22. *Mutual Education Programme.*

The activity was focused on hands-on practical know-how and experiences and was far from being a "boss" exercise.

A typical length for any such block was 2 hours.

■ 3.10 Practical Exercise

The first practical exercise was scheduled at an early stage during the project. The aim was not to test any new elements in the response plans but rather to get a picture of the present state of affairs in terms of practical capabilities and to reveal deficiencies not discovered during the theoretical exercise at the start-up workshop. The exercise was planned by the Training Working Group and details were kept secret from all but a small number of people.

The scenario dealt with a truck with anhydrous ammonia involved in a traffic accident with a bus. A platoon from the Hazardville garrison was used as "victims". The civil defence alarm centre, the traffic police, the fire and rescue service, the hospital and the ambulance service took part in the exercise.

The event was recorded on videotape, which was later edited by the Media Working Group and broadcast on the local television network.

The planning elements for the practical exercise are depicted in the scheme below.

■ 3.11 Theoretical Exercise

❒ 3.11.1 Role-Play

The main purpose of a role-play exercise in this context is to look at areas of responsibility, command lines, alarm procedures and co-operation between the emergency services (rescue, police, ambulance, alarm centres), transport organisations and industrial firms. Co-ordination with the political leadership at local level and media contacts also need to be featured.

Role-play exercises will be particularly useful during the start-up workshop and this is the example given in this section. However they may also be used at later stages, e.g. when training people in how to work with the integrated emergency plan. Simply speaking, a role-play is a discussion of a chosen scenario between representatives of the various organisations and functions involved. (A variation for training purposes is to get participants to play somebody else's role, so that, for example, the plant manager can see what it feels like to be the fire chief in such a situation, and vice versa ! However this is definitely for later stages in the process.)

Participants should be placed around tables in one room, grouped according to their functions. In the role-play during the start-up workshop in Hazardville, the following groups were formed:

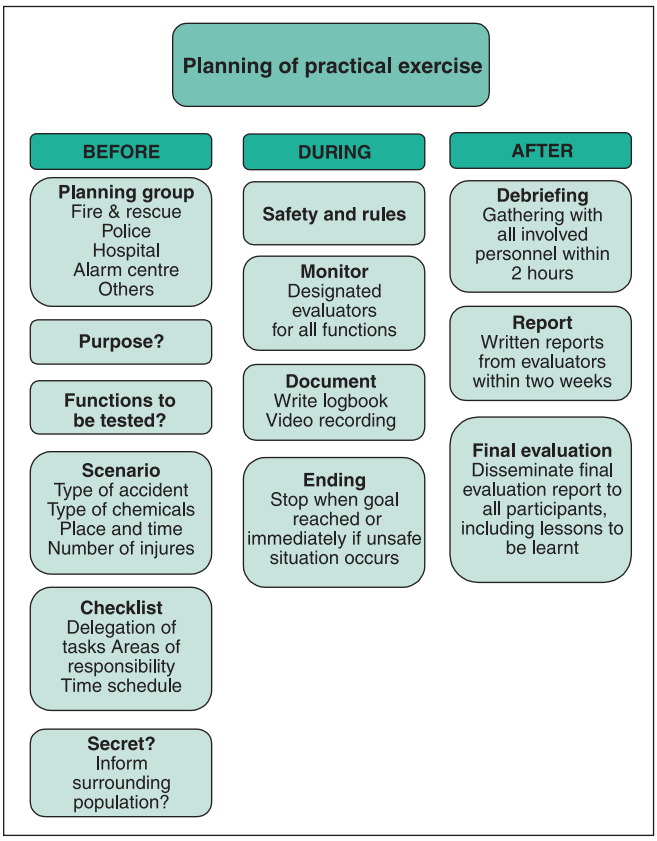


Figure 23. *Planning Elements for Practical Exercise.*

– Rescue/fire service/civil defence.
– Police authority at staff level.
– Rescue/fire service/civil defence/police and ambulance at field level. This group represented the personnel involved at the scene of an emergency.
– Local hospital
– Joint alarm centre
– Public works (water services, local road administration)
– Political leadership
– Industry (port authority, chemical companies)
– Transport companies (road hauliers, railway)
– Media

An appropriate scenario is presented by the Discussion Leader (DL), who guides the participants through the sequence of events. The principal questions to be explored are:

– Who does what? In what order?
– Who is in charge? Who are the partners among whom co-operation needs to be organised?
– How should requests for assistance be routed? How can further resources be accessed?

❒ 3.11.2 The Discussion Leader (DL)

The role of the Discussion Leader (DL) is a difficult one. He must be firm without offending the participants and competent without reverting to a teaching attitude. It is normally an advantage if the DL is independent of any of the participating organisations. The task of the DL is to help clarify the local situation. In co-operation with the participants he has to find out which problems persist and, in particular, which problems are difficult to tackle. The DL should emphasise co-operation. If he detects any disagreements, inconsistencies or failures of clarity, he keeps asking questions until everyone is aware of the problem. It is important, however, to keep up the pace of the play. This normally means that the aim should be to try to establish what the problems are rather than to start trying to solve them.

❒ 3.11.3 Scenarios

At the Hazardville start-up workshop two scenarios were used:

Scenario 1: A tank vehicle containing heating oil is involved in a traffic accident. The oil spill pollutes the main fresh water reservoir.

In this scenario, the DL tries to get a common understanding of ordinary alarm procedures, the command system and the responsibilities of the different organisations. The scenario can be thought of as being divided into three different phases: the initial alarm phase, the response phase and the recovery phase. It is important to keep up the speed of the discussion so that all three phases are covered.

Scenario 2: An overfilled railway tank wagon containing ammonia is involved in a collision at the

Accident Scenario-Hazardville

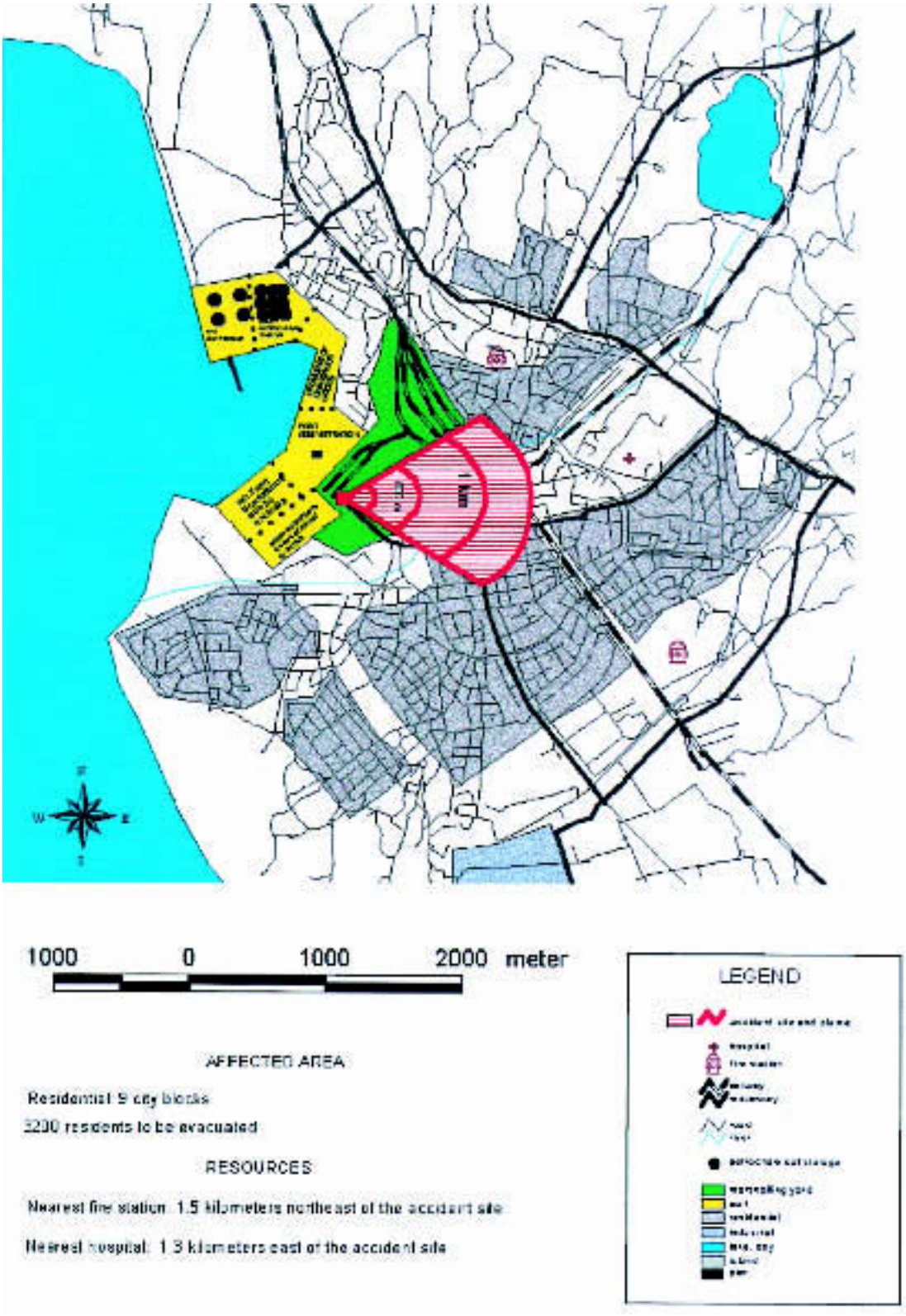


Figure 24. *Ammonia Release from Rail Tank Wagon. Used as Scenario 2 in the Role-play.*

railway marshalling yard. A minor leakage is detected, which develops into complete tank failure during an emptying or lifting operation. Residential areas are threatened by a gas cloud.

In such a worst-case scenario, there is always a danger that the participants will despair: "It won't matter what we do, it's not possible to have plans for this situation", etc. It is therefore vital that the DL guides the discussion in a flexible way. In Hazardville the old civil defence plans (designed for wartime conditions) provided for mass evacuation in this type of situation. Rather than pursuing this line of action, which would require a level of organisation and readiness that clearly did not exist, the discussion was steered towards more possible and practical solutions (e.g. warning messages by radio and loudspeakers, advice to stay indoors and to close doors, windows and ventilation and to go to the top floors of buildings etc.).

❒ 3.11.4 Excerpts from the Scenario 1 Discussion

Initial Phase B Alarm

DL: *It's 7.00 o'clock on a Monday morning in June. A woman calls the Joint Alarm Centre and says that a large tank vehicle has overturned. Turning to Joint alarm centre operator: What do you do ?*

JAC operator: I would ask her who she is and where she's calling from and ask if there are any injured people around.

DL: *Well she's upset but she'll tell you that she lives close to Lake Springwater and that the vehicle is on Route 75. Will you ask her anything else ?*

JAC operator: Since it's a tank vehicle, I guess I would ask her if she can tell what type of tank vehicle it is..... I mean, whether it's a dangerous goods vehicle or not.

DL: *She tells you it's one of these vehicles delivering fuel to the petrol stations and that she can't see any people around. No other cars can be seen either. What do you do now ? Who will you call ?*

JAC operator: I call the police switchboard and report the facts.

DL: *You call the police by telephone ?*

JAC operator: Yes.

DL: *Do you call anyone else ?*

JAC operator: No, not at this stage.

DL: *Turning to the police headquarters representative: You have received a call from the JAC. What do you do ?*

Police HQ: Send a patrol car.

DL: *Only one ?*

Police HQ: Yes, that is the standard procedure if we don't have information about.....

DL: *OK, you send one patrol car. Can you estimate how long it will take for the car to get to the scene of the accident ?*

Police HQ: It will depend on the cars available but, if I have to send the car from the station, then it will take around eight to ten minutes to get there.

DL: *Lets say eight. Now, it took the woman two minutes to call JAC, the questioning took another two minutes, the call..... and the drive..... let's say fifteen minutes have elapsed since the vehicle crashed. The patrol car arrives. Turning to one of the patrol officers while showing a transparency of an overturned petroleum vehicle: This is what you see. The driver is still in the cabin, apparently unconscious; oil is leaking from the tank and pouring into the lake. What do you do ?*

Patrol officer: I'll report the situation back to the station, asking them to send an ambulance and the fire squad. Then we have to consider blocking the road and warning other vehicles. We must find other routes along which to divert the traffic if the salvage operation is going to be long-drawn-out.

DL: *To police HQ representative: Well, you've got this report.... ?*

Police HQ: Our action will be to call the JAC, give an account of the situation and request them to alert the hospital and the fire and rescue services.

DL: *Will Civil Defence send any personnel ?*

Civil Defence Director: Probably not at this stage. Our responsibility is major emergencies and this is still just a quite ordinary traffic accident.

The discussion for the initial phase continues in this manner.....

Second Phase B Response

DL: *Now we have police, fire and rescue services and an ambulance at the scene of the accident. Who is co-ordinating the activities, who is the on-site commander ?*

Policeman: We assume the overall responsibility – as the Civil Defence Director said earlier, after all it's basically a road traffic accident.

DL: *Do the other responders agree ?*

Fire Brigade Foreman: I disagree ! The police have no competence to decide how the leak should be plugged or how to use the oil collecting devices. Moreover, if the chemical carried by the tank vehicle had been more inflammable and volatile, like petrol, it might have been necessary to cover the whole vehicle with foam before starting to cut the driver loose. No, we have the training and equipment, we should be in charge.....

Policeman: The vehicle isn't on fire.....

Fire Brigade Foreman: No, but oil is leaking.

DL: *OK, there are obviously different opinions here. Let's note this and carry on, we can't get stuck here. Never mind who is formally in charge, what would be the first thing to do ?*

Fire Brigade Foreman: To get the driver out of the cabin.....

Policeman: Agree.....

The discussion for the response phase continues in this manner.

Third Phase B Recovery

DL: *One hour after the accident. As we have heard, the injured driver is on his way to hospital, if he hasn't arrived there already. The hole in the tank has been plugged and oil booms have been deployed but more than twelve cubic metres of diesel oil has already escaped into the lake. The traffic has been re-routed around the blocked part of Route 75. A warning message to road users has been broadcast by the local radio station. An empty tank vehicle and a salvage truck are on their way to the scene to take care of the remaining oil in the tanks and to clear the road. Turning to the water services (WS) representative: At least twelve cubic metres of oil are on the loose in the lake approximately one km. upstream the fresh water intake. What will happen, what will you do ?*

WS: We'll have to shut down the intake immediately. Even if the mean current is as low as half a knot, the oil would reach the intake within the hour.

DL: *Yeah ?*

WS: Diesel oil is a light product, it will probably mix quite well with the water. I don't expect that we could collect more than a small fraction of it with oil booms or similar devices. No, we should have to keep the intake closed until measurements show no signs of oil in the water. Even the smallest amounts of oil, down to ppm level, make the water useless. It could take several weeks before we could reopen.

DL: *Then what ? Do you have any reserves ?*

WS: Our reservoir of processed water will last only a couple of days at normal consumption. Then we have our reserve wells, but they'll cover only up to, say, twenty-five per cent of normal consumption. I see no solution other than rationing.

DL: *Who will make this decision ?*

WS: Well I can't. I can recommend it to the municipal council but it's up to them to decide.

Chairman of the municipal council: Well of course we have to make this decision but I am seriously concerned. Do you mean that an ordinary tank vehicle carrying diesel oil could force us to institute water rationing down to twenty-five per cent of normal usage for several weeks ? Is this really realistic ? Aren't there any gutters or ditches along the road that would prevent.... ?

DL: *No. I visited the actual spot when preparing this scenario. The road is less than ten metres from the waterfront, the roadside slope is steep and hard and there is nothing that would prevent the oil from flowing right into the lake.*
Discussion for the recovery phase continues in this manner.

■ 3.12 Response Plan for the Railway Marshalling Yard

The marshalling yard was considered to be one of the major sources of risk for potential emergencies involving dangerous goods. The theoretical exercise, and the ill– managed chlorine incident (see Section 3.13 below) revealed a number of deficiencies in the current routines. The railway's own response team, consisting of only four men, was judged to be incapable of handling anything more than minor spills or leakages. Furthermore no formalised ways of communicating had been established between the railway response team and the Hazardville fire brigade. Experience from previous incidents showed that the huge area of track presented a number of problems. For instance, access for the heavy fire vehicles was very difficult.

As a starting point for a more comprehensive response plan, the railway, together with the Fire and Rescue Services and the Civil Defence Authority, worked out a preliminary "alarm plan" for the marshalling yard. The plan covered:

– routines for initial alarm notification

– pre-determined rendezvous points and approach routes

– incident checklists for key operators at the marshalling yard

– telephone roster

Below, the essential features of the first two of the above elements are given:

Alarm Routines for Dangerous Goods Incident at Hazardville Marshalling Yard

The following routines shall be applied by the duty-officer in the shunting-tower in case of an incident at the Marshalling Yard which has led – or can lead – to a release of hazardous material. When contacting the Civil Defence Joint Alarm Centre it is of vital importance that the information given to the operator be as correct and comprehensive as possible.

1. Call Civil Defence Joint Alarm Centre. Tel: 009
2. Give the following information to the operator:
   Who is calling and from where?
   What has happened? (e.g. leaking tank-wagon containing dangerous goods).
   Which substance(s) is(are) involved? (UN numbers).
   The fire brigade will be met at rendezvous position X. (Pre-determined rendezvous points according to alarm map).
   Estimated number of injured people (if any)?
   In case of a major accident with the potential to threaten the population off-site, request Civil Defence Joint Alarm Centre to initiate outdoor alarm system in central Hazardville
3. Make sure that a duty officer from the railway rescue force is sent to the rendezvous point to meet the Fire Brigade.
4. Warn all personnel by using the loudspeaker system. All shunting shall cease immediately and work may not be re-started until approved by the rescue commander. If deemed necessary: order evacuation of the whole yard or part of it. Estimate wind direction and advise a suitable point of assembly.
5. Inform National Railway central traffic safety office. Tel: 112 - 123356.
6. Follow "incident checklist".

Rendezvous Points and Approach Routes for a Dangerous Goods Emergency at Hazardville Marshalling Yard (see also map).

Point	Position	Approach Route
A	Container Terminal	From West Coast Street, road signs "Combi Rail", stop at gate
B	Pump Station	Approach from Union Ave., stop at grey building
C	Shunting Tower	Approach from Timber Valley, turn right at fence
D	Engine Stable	Approach from Timber Alley, turn left at fence

■ 3.13 How Did It End?

The **TransAPELL** project in Hazardville has been under way for one and a half years. It will continue, if not forever, then at least as long as the enthusiasm of the Group is maintained.

After the first year, the frequency of the main Group's meetings was reduced to four times per year. The working groups continue to meet when needed. The plans, calling lists etc. are up-dated as necessary. New officials from participating organisations are introduced to the working groups. It has been agreed to undertake at least one joint exercise per year.

The Group has not yet arrived at a joint response plan. The dangerous goods emergency planning elements have, however, been given special attention in the general municipal emergency plan, which is administered by the Civil Defence Office. The plans of the different stakeholders have been updated to various degrees and a number of interfaces between the separate stakeholder plans have been included.

During the one and a half year period, a number of dangerous goods accidents and incidents have occurred in Hazardville, the most important ones being:

– Overturning of tank truck and consequent major leak of phosphoric acid outside populated area. Eight cubic metres of acid escaped. The efforts to prevent the acid from spreading were handicapped by the presence of dug-down power and telecom cables at the roadside. The lack of availability of the large amount of neutralising agent required and the lack of means of spreading it on the contaminated soil also constituted serious problems for the responders. As one result of this accident, the Joint Alarm Centre and the fire and rescue departments obtained access to drawings of telecom– and power-line networks and to updated contact lists for the duty personnel at the telecom and power distributors. A list of major stockpiles of chalk and suitable transport vehicles within the community was also produced.

– Minor leakage of chlorine from defective valve on railway wagon at marshalling yard. A distinct smell of chlorine detected by shunting personnel caused a major alarm. Shunting and traffic were shut down for two hours. The wagon proved to be empty but uncleaned. This event initiated a review of the alarm routines for the marshalling yard and also a change of practice with regard to long-time storage of wagons at the yard. (See Sections 3.12 and 3.7 above).

– Small package containing medical radiation source stolen from railway transport. The package had been thrown away and was later found by school-children who opened it and played with the contents. The preparation proved to be relatively harmless but the incident caused major media pressure on local officials, involving interviews on national television and radio. The poor management of the information flow during the incident led the Media Group to draft a training programme on media contacts for selected personnel from each organisation. The Group has also suggested that information at incidents receiving such intense media interest should be co-ordinated by gathering these people in a room at the Civil Defence Authority building, to which all media contacts should be directed.

In general the Group has tried to compile as many facts as possible regarding the causes of all incidents and accidents; to evaluate the emergency response, the restoration work and the lasting effects; and to explore preventive measures for the future. The information generated has been collected in a computer database administered by the Civil Defence Authority.

Gradually, the interest has shifted from a pure emergency perspective to a broader Arisk management" view with more emphasis on preventive measures and follow-up. An example of this is that a representative of the Land Use Planning Office has become a member of the Group. It is quite evident that many of the present problems are the results of poor planning practices. Although much attention has been paid to the safety of the fixed chemical installations and the areas in their vicinity, little or no concern has been focused on the transport routes into and out of these areas.

The scope of the work has also been widened to cover not only dangerous goods transport but also adjacent fields of accident prevention and response,

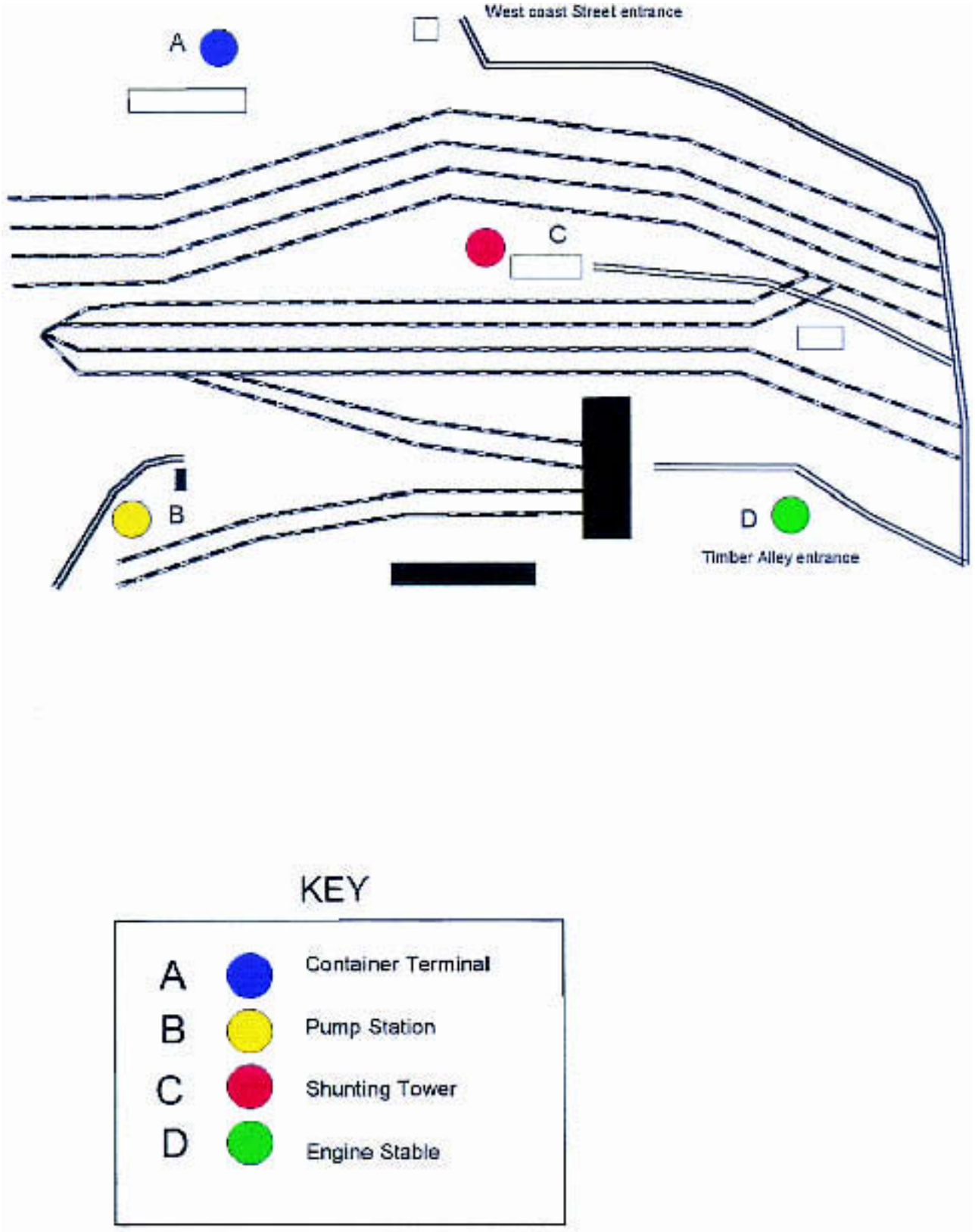


Figure 25. *Map of Hazardville Marshalling Yard with Rendezvous Points, where the Response Team are to be Met by Duty Officer from Railway.*

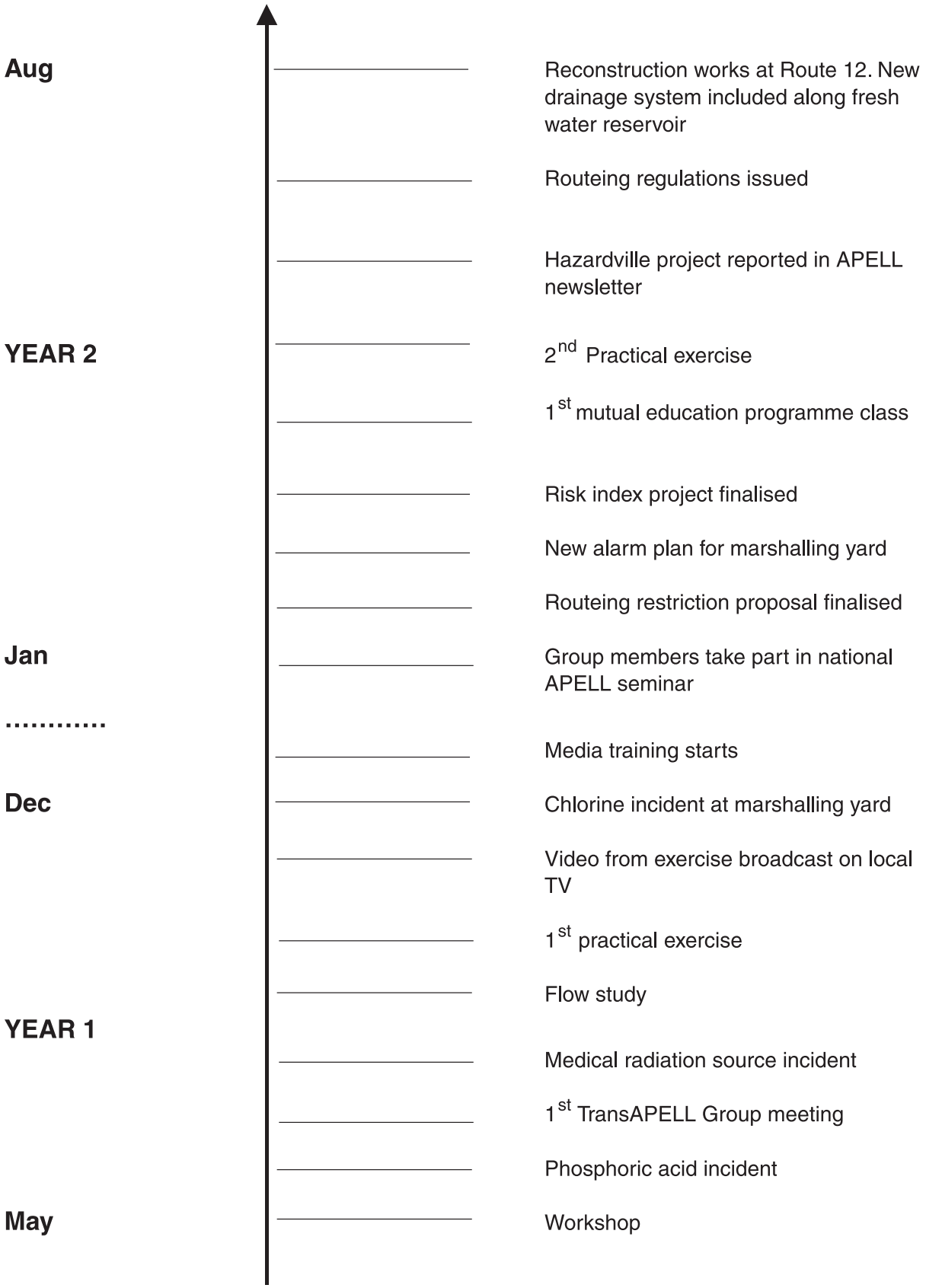


Figure 26. *Project Highlights.*

such as fixed chemical installations and "ordinary" transport accidents.

A number of ongoing small-scale activities can be seen as spin-offs from the **TransAPELL** work. The Mutual Education Programme, as described in Section 3.9 above, is still active. Another example is the so-called "Positive Stop" initiative launched by the Road Police. Contrary to ordinary enforcement activities, the primary aim here is not to detect infringements and levy fines but rather to give information and to help drivers in matters related to transport of dangerous goods regulations.

Representatives of the group have been requested to take part in national APELL gatherings as well as in start-up workshops in other municipalities, both at home and abroad, to share Hazardville's experiences. These activities have been promoted by the leadership of the municipality and of industry, as they give good publicity for Hazardville and its companies. For the Group members who have been involved, the possibility to leave daily routines behind for a short while has meant improved job motivation.

A graphical representation of the main highlights of the project over time is given below.

4

ANNEXES

4.1 Transport of Dangerous Goods Information Systems

Unambiguous and rapidly available information is a basic need when planning for or responding to transport of dangerous goods emergencies. This need can be met by using standard words or symbols to describe dangerous substances and the hazards they represent.

The United Nations Recommendations for the Transport of Dangerous Goods provide a framework covering the basic needs of information transfer throughout the transport chain – including information transfer to emergency responders should an accident occur. These recommendations also set out the basic principles for the safe containment of the various types of dangerous goods.

National governments are advised to implement the international recommendations in their national regulations as far as possible. This will normally cut costs and improve safety. Traditionally, many countries have applied the international recommendations only to border-crossing shipments and have kept a different set of regulations for internal transport. However this is starting to change in favour of national regulations which are consistent with the UN Recommendations.

It is important to note, however, that neither the UN Recommendations nor the international sea, air or land transport regulations derived from them address general transport policy issues or matters such as emergency preparedness and response, enforcement procedures etc. These are left for the governments and authorities of individual states to decide for themselves.

The increased public concern about dangerous goods transport not only requires improved emergency planning, it also demands better incorporation of risk considerations into infra structural planning. The rapid growth of urban regions has in many cases caused great problems due to the off-site risks presented by existing fixed industrial sites or transport infrastructure where dangerous goods are handled. Port areas, railway marshalling yards, major roads, etc., are very often surrounded by residential areas, even they were located at a safe distance from populated areas at the time of their construction.

When new facilities or the upgrading of existing infrastructure are being planned, the following points should normally be considered:

- Protection of health, property and environment.
- The types and volumes of dangerous goods likely to be transported or handled.
- Population density in the area under consideration.
- Ease of evacuation or other measures which may need to be taken in the event of an accident.
- Emergency services and procedures available.
- Probability of an accident occurring.

The use of special routeing systems (designated or prohibited routes) for vehicles carrying dangerous goods has been introduced in many countries. By diverting the traffic to other routes, such systems aim to protect sensitive areas or objects where a dangerous goods accident could have especially serious effects, e.g. city centres, tunnels, water

reservoirs. The problem of how to inform drivers of such restrictions is usually solved by the use of special traffic signs or road maps.

❒ 4.1.1 The United Nations Transport Regulatory System

In 1956 the Committee of Experts on the Transport of Dangerous Goods, established by the United Nations Economic and Social Council (ECOSOC), presented a report, which set out the minimum requirements applicable for the international transport of dangerous goods by all modes.

This report, the United Nations Recommendations on the Transport of Dangerous Goods, is usually known as the "UN Recommendations" or "the Orange Book" from the colour of its cover. It has no legal status but is recommended to international organisations and national governments as a general framework within which existing regulations can be adapted and developed. The ultimate aim is global uniformity.

The work has been successful. The basic ideas of the UN Recommendations have won worldwide acceptance and have been used as the basis for international agreements and conventions on all modes of transport: sea, land (road and rail) and air. Some governments have adopted the UN Recommendations in whole or in part as national regulations for dangerous goods transport.

The UN Committee of Experts meets every two years to revise the Recommendations.

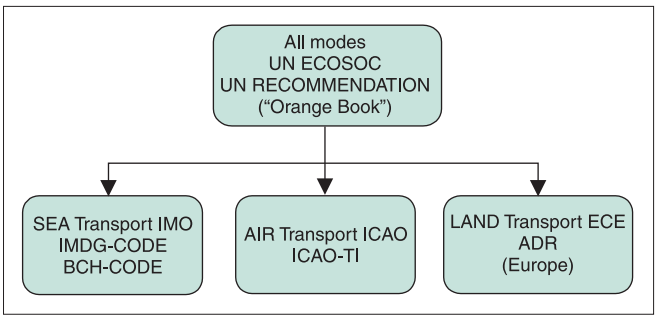


Figure 27. *The International Regulatory System for Transport of Dangerous Goods. (ECOSOC, IMO, ICAO and ECE are bodies within the United Nations framework. The IMDG-code, the BCH-code, the ICAO-TI and ADR are acronyms for the applied regulations).*

THE ELEMENTS OF THE REGULATIONS

The UN Recommendations assist with the following dangerous goods transport problems:

- **Classification** which goods should be considered as being dangerous?
- **Documentation** how should the dangerous goods be described in writing in order to establish their exact properties, and to allow transfer of information throughout the transport chain?
- **Labelling** how should the dangerous properties of the goods be displayed, in order to distinguish packaging containing dangerous goods from those containing other goods and to allow proper handling by transport personnel or emergency services? (Note: some materials may have multiple labels to provide warnings of multiple risks, such as UN 1181 Ethyl Chloroacetate which has Class 6.1,3 and 8 hazards.)
- **Packaging** how should the dangerous goods be contained in order to minimise the risk of accidental releases during transport and handling?

Classification

In the UN Recommendations dangerous substances or articles have been grouped into nine classes according to the property of the primary, dominating hazard of the substance or article. The classes are further divided into subclasses, referred to as "divisions". The hazard classes and divisions are:

Within most of the classes there exists a further rating of the substances according to the relative degree of hazard they present. This is achieved by assigning the substances to one of three packaging groups. A higher level of packaging performance is required as the danger rating rises. Packages require UN markings to indicate the level of danger:

Packing group I: goods presenting great danger

Packing group II: goods presenting medium danger

Packing group III: goods presenting minor danger.

Table 4.1.1. The United Nations Hazard Classes for Classification of Dangerous Goods.

		EXAMPLE	U.N. No.
CLASS 1	**Explosives***		
Division 1.1	Explosives with a mass explosion hazard		
Division 1.2	Explosives with a projection hazard		
Division 1.3	Explosives with predominantly a fire hazard		
Division 1.4	Explosives with no significant blast hazard		
Division 1.5	Very insensitive explosives		
CLASS 2	**Gases**		
Division 2.1	Flammable gases	Butadienes, inhibited	1010
Division 2.2	Non-flammable gases	Argon, compressed	1006
Division 2.3	Poison gases	Chlorine	1017
Division 2.4	Corrosive gases (Canadian)		
CLASS 3	**Flammable liquids**		
Division 3.1	Flashpoint below –18 °C (0 °F)	Divinyl ether, inhibited	1167
Division 3.2	Flashpoint –18 °C and above but less than 23 °C (73 °F)	Ethyl borate	1176
Division 3.3	Flashpoint of 23 °C and up to 61 °C (141 °F)	Kerosene	1223
CLASS 4	**Flammable solids; Spontaneously combustible materials; and Materials that are dangerous when wet**		
Division 4.1	Flammable solids	Naphtalene, crude	1334
Division 4.2	Spontaneously combustible materials	Cotton waste, oily	1365
Division 4.3	Materials that are dangerous when wet		
CLASS 5	**Oxidizers and Organic peroxides**		
Division 5.1	Oxidizers	Ferric nitrate	1466
Division 5.2	Organic peroxides	Organic peroxide, type B, solid, temperature controlled	3112
CLASS 6	**Poisonous and Etiologic (infectious) materials**		
Division 6.1	Poisonous materials	Arsenic acid, liquid	1553
Division 6.2	Etiologic (infectious) materials	Infectious substance, affecting humans	2814
CLASS 7	**Radioactive materials**		
		Radioactive material, surface contaminated objects (SCO)	2913
CLASS 8	**Corrosives**		
		Shromosulphuric acid	2240
CLASS 9	**Miscellaneous hazardous materials**		
		Blue asbestos	2212

* Class 1 is subdivided into 5 divisions and further grouped into so called compatibility groups.

Table 4.1.2. *Grouping Criteria for Toxicity in Class 6.1.*

Packing Group	Oral Toxicity (LD_{50}) (mg/kg)	Dermal Toxic. (LD_{50}) (mg/kg)	Inhalation Toxic. By dusts & mists (LC_{50}) (mg/l)	Examples UN class 6.1	UN #
I	< 5	< 40	< 0.5	Tetramethylsilane	2749
II	> 5-50	> 40-200	> 0.5-2	Selenium disulphide	2657
III	Solids: > 50-200 Liquids: > 50-500	200-1000	> 2.10	Hydroquinone	2662

A continuing systematic modernisation of the classification system has taken place over the years. The most important change is perhaps the gradual transition to a system based on criteria. For some of the classes the criteria are quite obvious. For example the criterion for Class 3 is a flashpoint below 60,5ºC for the liquid designated as flammable. For class 6.1 the criteria are based on the toxicity of the substance when ingested, inhaled or absorbed through the skin.

For other classes, such as 1, 4.1, 4.2, 4.3, 5.1 and 5.2, the choice of criteria is not as straightforward. This problem has required the development of relevant test methods and the UN Committee of Experts has collected and developed a large number of these, which are published in a separate Test Manual.

For Class 7, radioactive material, the Recommendations do not contain any detailed provisions or criteria but instead make reference to the publications of the International Atomic Energy Agency (IAEA).

Often both pure substances and products which consist of mixtures, or compounds of several substances, exhibit hazards from more than one of the classes above. For such cases there exists a principle of precedence, by which the substance is classified in the class corresponding to its "primary" hazard. The classes 1, 2, 4.1, 4.2, 5.2, 6.1, 6.2 and 7 have the highest rating in this respect. The secondary or tertiary hazards are considered as "subsidiary" and are dealt with e.g. in the labelling provisions.

Although the first paragraph of the Recommendations states that their aim is to "ensure the safety of people, property and the environment", the work of the UN Committee so far has been concerned mainly with the first two. There are at the moment no uniform criteria and provisions to cover the environmental aspects. However the Organisation for Economic Co-operation and Development (OECD), has recently started work aimed at aligning the criteria within this field. It can thus be expected that criteria based on the acute toxicity, biodegradability, bioaccumulativity and tainting properties of substances will be covered by the UN Recommendations within the next few years.

IMO has already created designations and provisions for substances, which are harmful to the marine environment. These have already been included in the overall system by the introduction of the concept Marine Pollutant in the IMDG code for packaged dangerous goods and the BCH code for bulk chemicals.

Documentation

The transport chain from the shipper to the final consignee often contains a great many links. Many people will have the goods in their custody and, consequently, will be exposed to the potential hazards. The forwarder, the vehicle driver when the goods are carried by road, dock workers and port staff when the goods are lifted on or off a ship, the crew when the goods are on board a ship or an aeroplane, all need a correct and unambiguous description of the goods and their associated hazards, in order to be able to treat them correctly and to take the appropriate precautions.

In case of accident the possibility of launching a successful rescue operation is strongly dependent on

Table 4.1.3. *Examples of UN-numbers and Proper Shipping Names. (The last example indicates that the Proper shipping name should be supplemented with the technical name of the substance when used in transport documents).*

U.N.No.	Proper shipping names	UN class
0030	DETONATORS, ELECTRIC for blasting	1.1B
1072	OXYGEN, COMPRESSED	2.2
1149	DIBUTYL ETHERS	3
2758	CARBAMATE PESTICIDES, LIQUID, FLAMMABLE, TOXIC, N.O.S	3
2920	CORROSIVE SOLID, FLAMMABLE, N.O.S (contains butyl-trichlorosilane)	8

the availability of proper documentation about the goods involved, namely the Proper Shipping Name and the assigned UN number. These are the other two basic "information carriers" used to describe dangerous substances, apart from the hazard class described above.

The UN number is a four-digit number, which is assigned to individual substances or to groups of substances or articles exhibiting similar physical and hazard properties. For each UN number there is a corresponding name, the Proper Shipping Name, which should always be used when describing the actual substance or article in the transport documents.

The most common substances and articles have a unique UN number and Proper Shipping Name. However it is obviously impractical to list every possible article or substance that could be offered for transport. To cover these other dangerous goods, so-called generic entries appear in the list. Also a number of generalised entries have been introduced which refer to generic groups of substances "not otherwise specified (n.o.s)". Examples are given below. Note that the n.o.s description in shipping documents must be supplemented by the technical name of the substance.

For transport emergency purposes some of the applied regulations have gone a very long way towards establishing a direct information link all the way back to the shipper. According to the United States federal law, the Hazardous Materials Transportation Act of 1990, a shipper of hazardous materials must enter an emergency response telephone number on the shipping papers. The listed number must be monitored at all times while shipments are being transported. The first responder using that number must be able to reach, in one call, a person who can provide comprehensive response and mitigation information.

The use of standardised transport documents is strongly recommended. (see Section 4.1.3 for sample documents.)

Labelling/Visualisation/Warning

The use of symbols or labels instead of written text has several advantages in transport emergencies, e.g. avoidance of language barriers and better visibility. With this in mind the UN Committee has developed a set of symbols corresponding to the different hazard classes. The symbols are to be printed on diamond-shaped labels, which shall be affixed to packaging and containers. The dimensions of the labels are prescribed as 100 mm × 100 mm for packages and 250 mm × 250 mm for larger containers.

It is of crucial importance that the old, invalid labels on re-usable packages and containers are removed. If this is not done, the whole purpose of the labelling provisions will be defeated. (see Section 4.1.2 for details.)

Packaging

Even a normal transport operation will in most cases subject the dangerous goods to rather harsh mechanical stresses, e.g. ship movements at sea, drops and blows during handling, etc.

Climatological conditions such as temperature, moisture and sunlight will cause overpressure in packaging for liquids, embattlement of steel packaging, deterioration of packaging made of paper and plastics, etc. The goods might affect the integrity of the packaging by corrosion, stress cracking or other phenomena. All these examples underline the need for safe packaging during transport.

The UN Committee has developed a comprehensive system of definitions, test methods, marking and type specifications for dangerous goods packaging. The test methods are largely based on performance requirements, i.e. the provisions do not specify in detail how a specific type of packaging should be constructed, but rather what it should be capable of withstanding during performance testing.

The UN performance testing includes various elements: drop tests, stacking tests, hydraulic pressure tests for packaging for liquids etc. In most cases the packaging have to be preconditioned before the mechanical tests; paper packaging have to be prestored in an atmosphere with a high specific humidity, plastics packaging must be “deep-frozen” etc.

The relative hazard of the substance to be transported is taken into account. For very dangerous substances of packing group I (see above) the drop test is carried out from a height of 1,8 metres, for packing group II from 1,2 metres and for Group III from 0,8 metres.

Every packaging which conforms to a tested and approved design type shall be clearly marked with the so-called UN marking. This generally accepted marking allows the chemical manufacturer to be sure that he is choosing a packaging well suited for his product and facilitates the task of enforcement personnel.

The UN Recommendations also cover the minimum requirements for intermodal tank containers. Tank containers, as well as ordinary freight containers, are normally also expected to comply with the provisions of the Convention for Safe Containers (CSC) of 1972.

Users Guide to Information System Useful to Emergency Planners and Responders - Available in OECD Member Countries. OECD/GD(91) 103. OECD, Paris, 1991

❒ 4.1.2 Hazard Labels and Placards

13.5 Specimen labels
13.5.1 Specimen primary risk labels

Class 1
Explosive substances or articles

(No.1)
Divisions 1.1 , 1.2 and 1.3
Symbol (exploding bomb): black ; Background : orange ; Figure '1' in bottom corner

(No.1.4)
Division 1.4

(No.1.5)
Division 1.5

(No.1.6)
Division 1.6

Background: orange ; Figures: black; Numerals should be about 30 mm in height and be about 5 mm thick (for a label measuring 100 mm x 100 mm); Figure '1' in bottom corner

** Place for division
* Place for compatibility group

Class 2
Gases

(No.2.1)
Division 2.1
Flammable gases
Symbol (flame): black or white;
Background: red Figure '2' in bottom corner

(No. 2.2)
Division 2.2
Non flammable , non-toxic gases
Symbol (gas cylinder) : black or white ;
Background : green ; Figure '2' in bottom corner

(No. 2.3)
Division 2.3
Toxic gases
Symbol (skull and crossbones) black ;
Background : white ; Figure '2' in bottom corner

Class 3
Flammable liquids

(No. 3)
Symbol (flame) : black or white ;
Background : red ; Figure '3' in bottom corner

Class 4

(No. 4.1)
Division 4.1
Flammable solids
Symbol (flame) : black ;
Background : white with seven vertical red stripes ;
Figure '4' in bottom corner

(No 4.2)
Division 4.2
Substances liable to spontaneous combustion
Symbol (flame) : black ;
Background : upper half white, lower half red ;
Figure '4' in bottom corner

(No 4.3)
Division 4.3
Substances which in contact with water emit flammable gas
Symbol (flame) : black or white ;
Background : blue ;
Figure '4' in bottom corner

Class 5

(No. 5.1)
Division 5.1
Oxidizing substances

(No. 5.2)
Division 5.2
Organic peroxides

Symbol (flame over circle) : black ; Background : yellow ;
Figures '5.1' in bottom corner
Figures '5.2' in bottom corner

Class 6

(No. 6.1)
Division 6.1
Toxic substances
Symbol (skull and crossbones): black ;
Background : white ;
Figure '6' in bottom corner

(No. 6.2)
Division 6.2
Infectious substances
The lower half of the label may bear the inscriptions : 'INFECTIOUS SUBSTANCE' and 'In the case of damage or leakage immediately notify Public Health Authority';
Symbol (three crescents superimposed on a circle) and inscriptions : black ;
Background : white ; Figure '6' in bottom corner

Class 7
Radioactive material

(No. 7A)
Category I - White
Symbol (trefoil) : black ; Background : white
Text (mandatory): black in lower half of label :
'RADIOACTIVE'
'Contents.....'
'Activity.....'
Figure '7' in bottom corner

(No. 7B)
Category II - Yellow

(No. 7C)
Category III - Yellow

Symbol (trefoil) : black ; Background : upper half yellow with white border, lower half white ;
Text (mandatory) : black in lower half of label :
'RADIOACTIVE'
'Contents.....'
'Activity.....'
In a black outlined box -'Transport Index'
Two red vertical bars should follow the word 'Radioactive';
Three red vertical bars should follow the word 'Radioactive';
Figure '7' in bottom corner

Class 8
Corrosive substances

(No. 8)
Symbol (liquids, spilling from two glass vessels and attacking a hand and a metal) : black ;
Background : upper half white,
lower half black with white border ;
Figure '8' in white in bottom corner

Class 9
Miscellaneous dangerous substances and articles

(No.9)
Symbol (seven vertical stripes in upper half) : black ;
Background : white ;
Figure '9' underlined in bottom corner

Complementary Marking System for Vehicles

For dangerous goods road vehicles and railway wagons in Europe, a marking system which complements the UN system is in use. In order to provide information to the emergency services – even at some distance – in the case of an accident, all vehicles carrying dangerous goods above certain quantities have to display an orange plate. The plate measures 400 mm x 300 mm and has to be displayed in the front and back of the vehicle, and, in some cases, even at the sides of the vehicle.

For vehicles transporting goods in packaged form, the plate is without any marking. However, in the case of tank vehicles and tanks carrying tank containers, the lower part of the plate must bear accommodate the UN number of the substance carried. The hazard number for the substance is to be given in the upper part of the plate.

The main advantage of this number is that is very easy to understand. While few people can learn any significant amount of UN-numbers by heart, the only prerequisite for "decoding" the hazard identification number is knowledge of the nine classes in the UN classification system. (NB There are, however, some combinations of figures which have a special meaning.)

The hazard identification number consists of two or three figures. In general the figures indicate the following hazard:

2 emission of gas due to pressure or to chemical reaction

3 flammability of liquids (vapours) and gases or self-heating liquid

4 flammability of solids or self-heating solids

5 oxidising (fire-intensifying) effect

6 toxicity

7 radioactivity

8 corrosivity

9 risk of spontaneous violent reaction

Doubling of a figure means intensification of that particular hazard. When the hazard associated with a substance can be adequately indicated by a single figure, this is followed by a zero. If the number is pre-fixed by the letter "X", this means that the substance is prone to react dangerously with water.

Examples:

33 means a highly flammable liquid

60 means a toxic or harmful substance

74 means a radioactive, solid flammable

X886 means a highly corrosive substance, toxic, which reacts dangerously with water.

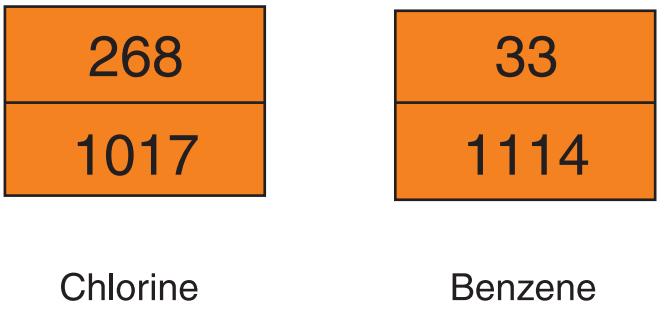


Figure 28. *The Orange Plate Used for Marking of Road Tank Vehicles, Railway Tank Wagons and Tank Containers (applied in Europe, according to ADR and RID regulations).*

❒ 4.1.3 Dangerous Goods Shipping Papers

Documentation for transport of dangerous goods is required in order that specific information may be provided, with the aim of avoiding danger to the health and safety of people, damage to property and contamination of the environment. You will need this information if you are involved in preparing dangerous goods for transport, handling dangerous goods, transporting dangerous goods or responding to an emergency, e.g. spill, leak, fire or the possibility of an explosion. You will need to know the following details:

– what precisely is being shipped?

– how much of it is being shipped?

– what are the hazards involved?

– who is responsible for the shipment?

– how should you respond to a spill or a fire?

– where can you get more details if necessary?

This information need not be entered on a special form, except where this is specified by regulations, e.g. for movement of hazardous wastes and for shipments by air, which is an international requirement of ICAO/IATA. However national operating practice should require that all shipments of dangerous goods be accompanied by shipping papers which contain this information in a prescribed uniform manner.

The shipping document must always contain the following four main parts:

– basic description of the dangerous goods

– any additional description requirements

– the shipper's certification

– an emergency response telephone number.

The shipping papers should be properly prepared before the shipment leaves the facility. They should be accessible for inspection at any time during transport. Transporters should not accept any shipment of dangerous goods for which documentation has not been provided or for which there is no certification that the basic description is correct.

❒ 4.1.4 Emergency Response Information

Fire and rescue services at the site of a dangerous goods incident depend greatly on the information supplied by hazard labels and placards and dangerous goods shipping papers to assist them in identifying the substance(s) concerned and the associated dangers. However both Europe and North America have found it necessary to require the use of additional documents to assist first responders. These contain instructions on spill clean-up procedures, fire-fighting and basic first aid which are not part of the shipping description. Emergency Response Guides and Transport Emergency Cards (TREMCARDS) are examples of first response documents.

This type of document should be readily available at all times when dangerous materials are present, in particular:

– during transport

– at locations where dangerous goods are loaded or unloaded for transport

– where dangerous goods are stored incidental to transport.

It should contain the following information:

– the basic description and technical names of the dangerous goods, using: the Proper Shipping Name and (when required) the technical names of the hazardous ingredients; the correct UN hazard class; the UN identification number; and the UN packing group

– the immediate health hazards of exposure to the material

– the risks of fire and/or explosion

– immediate precautions to be taken in the event of an incident or accident

Table 4.1.4. *Description Examples – Shipping Papers for a Road Tanker of 20,000 litres Volume.*

Basic description:	Methyltetrahydrofuran
Additional description:	Class 3, UN 2536 PGII, NAERG Guide 127
Basic description:	Corrosive liquid N.O.S.
Additional description:	Class 8, contains caprylyl chloride
Basic description:	Motor fuel antiknock compound (tetraethyl lead)
Additional description:	Class 6.1, UN 1649 PGI (poisonous and flammable), NAERG 131
Basic description:	Flammable liquid, corrosive N.O.S.
Additional description:	Class 6.1, UN2924 PGII, (contains methanol and potassium hydroxide) NAERG 132

NB: These descriptions would be modified by any intermodal requirements, e.g. any numbers required under IMO codes for marine carriage. The North American Emergency Response Guide (NAERG) number is used here as an example – there are other Emergency Response Guides in the world.

– immediate methods for handling small or large fires
– immediate methods for handling spills or leaks in the absence of fire
– preliminary first aid measures.

It should be emphasised that the purpose of first response documents is to provide information essential for safe first response in an acute situation. Information on any chronic hazards or long-term effects is normally available in manufacturers' Material Safety Data Sheets (MSDS).

Transport Emergency Cards (TREMCARDS)

TRANSPORT EMERGENCY CARD (Road)

CEFIC TEC(R) - 2
Revision: 01/1997

Class 2 ADR
It. 2TC

LOAD

CHLORINE

- Greenish-yellow liquefied pressure gas - Strong odour

NATURE OF DANGER

- Toxic, Corrosive
- Severe poisoning, perhaps fatal: by inhalation. Symptoms may develop after several hours
- Contact with liquid causes strong irritant effect: on eyes, on skin, on air passage
- The gas causes strong irritant effect: on eyes, on skin, on air passages
- Reaction with water: Production of corrosive fumes
- Spilled liquid has very low temperature and evaporates quickly
- The gas is heavier than air and spreads along ground
- May attack many materials and clothing: Reaction with combustible substances, generation of heat, fire hazard
- Heating will cause pressure rise with risk of bursting

BASIC PERSONAL PROTECTION

- Suitable respiratory protective device
- Goggles giving complete protection to eyes
- Plastic or rubber gloves. Apron or other light protective clothing. Boots
- Eyewash bottle with clean water

IMMEDIATE ACTION BY DRIVER - Notify police and fire brigade

- ✓ Stop the engine
- ✓ No naked lights. No smoking
- ✓ Put on protective equipment before entering danger area
- ✓ Mark roads and warn other road users
- ✓ Keep public away from danger area
- ✓ Keep unwind

SPILLAGE

- Consult an expert immediately
- Contain leaking liquid with sand or earth or other suitable material
- Sewers must be covered and basements and workpits evacuated
- If vapour cloud drifts towards populated area, warn inhabitants and keep them indoors. On the advice of an expert consider evacuation
- Use waterspray to “knock down” vapour. Do not use water jet on a leak of the tank
- Avoid direct contact with substance
- If substance has entered a water course or sewer or been spilt on soil or vegetation, advise police

FIRE

- Keep container(s) cool by spraying with water if exposed to fire

FIRST AID

- If substance has got into eyes, immediately wash out with plenty of water. Continue treatment until medical assistance is provided
- Remove contaminated clothing immediately and drench affected skin with plenty of water, then wash with soap and water
- In case of contact with liquid, thaw frosted parts with water, then remove clothing carefully. Wash with soap and water
- Seek medical treatment when anyone has symptoms apparently due to inhalation or contact with skin or eyes
- Persons who have inhaled the gas may not show immediate symptoms. They must lie down and keep quite still and should be taken to a doctor with this card. Patient must be kept under medical supervision for at least 24 hours
- Keep patient warm
- Apply artificial respiration only if patient is not breathing or under medical supervision

Additional information

24 HOUR EMERGENCY TELEPHONE NUMBER:

HI No. : 268
UN No. : 1017

Transport Emergency Cards (Road)

TRANSPORT EMERGENCY CARD (Road)

CEFIC TEC(R) - 7
Revision: 01/1997

Class 3 ADR
It. 3b

LOAD

BENZENE

- Colourless liquid or paste - Usually with perceptible odour
- Solidifies at 5? C
- Immiscible with water
- Lighter than water

NATURE OF DANGER

- Highly flammable
- May evaporate quickly
- The vapour may be invisible. The vapour is heavier than air and spreads along ground
- May form explosive mixture with air, particularly in empty uncleanness receptacles
- Heating will cause pressure rise with risk of bursting and subsequent explosion
- The substance poisons: by absorption through skin, inhalation
- The vapour may have narcotic effect

BASIC PERSONAL PROTECTION

- Suitable respiratory protective device
- Goggles giving complete protection to eyes
- Plastic or synthetic rubber gloves
- Eyewash bottle with clean water

IMMEDIATE ACTION BY DRIVER - Notify police and fire brigade

- ✓ Stop the engine
- ✓ No naked lights. No smoking
- ✓ Put on protective equipment before entering danger area
- ✓ Mark roads and warn other road users
- ✓ Keep public away from danger area
- ✓ Keep unwind

SPILLAGE

- Stop leaks if without risk
- Use explosion proof electrical equipment
- Contain or absorb leaking liquid with sand or earth or other suitable material
- prevent liquid entering sewers, basements and workpits. Vapour may create explosive atmosphere
- Warn everybody - Explosion hazard
- If substance has entered a water course or sewer or been spilt on soil or vegetation, advise police

FIRE

- Keep container(s) cool by spraying with water if exposed to fire
- Extinguish with waterspray, foam or dry chemical
- Do not use water jet

FIRST AID

- If substance has got into eyes, immediately wash out with plenty of water. Continue treatment until medical assistance is provided
- Remove contaminated clothing immediately and wash affected skin with soap and water
- Seek medical treatment when anyone has symptoms apparently due to inhalation, swallowing or contact with skin or eyes

Additional information

24 HOUR EMERGENCY TELEPHONE NUMBER:

HI No. : 33
UN No. : 1114

Examples of Emergency Response Guides

POLICE AND EMERGENCY RESPONDERS' HAZARDOUS MATERIALS POCKET RESPONSE GUIDE

TO USE THIS GUIDE - review this side for general recommendations when you are first on scene at a hazmat incident.

REVIEW SIDE 2 - for a brief description of the types of hazards and example materials associated with each of the U.S. DOT placards.

- Immediately notify dispatcher that you are involved in a possible hazardous materials accident. Provide the following minimum information about the incident:
- THE EXACT LOCATION
- TYPE OF VEHICLE INVOLVED
- INITIAL PRESENCE OF HAZARDOUS MATERIALS (PLACARDS, PANELS, etc.)
- PRESENCE OF FIRE, SPILLED LIQUIDS, OR VAPOR LEAKS
- KNOWN INJURIES
- DO NOT ATTEMPT TO RESCUE INJURED OR RETRIEVE DOCUMENTATION UNTIL SITUATION IS ASSESSED.
- Note the type of placards and numbers present. If possible, look for rectangular orange panels and note number. These numbers are UN/NA numbers and will aid in identification of the contents.
- Carefully observe the incident before approaching. Be alert to signs of leakage such as sounds of escaping gas, evidence of liquid leak, odd smells, vapour clouds.
- Approach accident scene from the upwind side. Do not park in the potential path of leaking materials. DO NOT DRIVE INTO VAPOR CLOUDS. REMEMBER, VEHICLES ARE AN IGNITION SOURCE.
- Initially isolate the accident scene for a radius of 250 feet to allow room for response personnel. If cargo involved in fire or fire probable, evacuate to a radius of 500 feet to allow firefighters additional working clearance. Adjust distances as conditions warrant.
- DO NOT USE FLARES in the vicinity of the incident. Flammable vapors may be present.
- Prohibit traffic from passing through the incident. Do not allow bystanders to congregate around the incident.
- Note wind direction. Note if material is running into sewers, waterways, ditches. If possible estimate the quantity of material leaking. Pass this information to your dispatcher or responding fire units.
- When isolating accident scene, give priority to removing persons from oncoming smoke or vapor.
- Do not step in pools of liquid or any unfamiliar material. Avoid contact with any chemical material.
- Do not open trailers of hazardous cargo. Trailers may contain hazardous vapors or loose cargo which may cause death or injury.

NOTE: Liquid oxygen may mix with asphalt to create a highly shock sensitive explosive. Do not come in contact with liquid oxygen contaminated asphalt under any circumstances. It may detonate even under foot. Completely isolate contaminated asphalt.

ASSOCIATION OF AMERICAN RAILROADS
BUREAU OF EXPLOSIVES
50 F STREET, N.W. - WASHINGTON DC 20001 - (202) 639-2222

POLICE AND EMERGENCY RESPONDERS'
HAZARDOUS MATERIALS POCKET RESPONSE GUIDE

CLASS 1 (EXPLOSIVE)
Liable to donation under appropriate circumstances such as fire or shock. Usually stable if not involved in fire or not moved. Do not handle unless trained and equipped. Division 1.1 – Mass Explosion Hazard, Division 1.2 – Explosion Hazard with Fragmentation, Division 1.3 – Radiant Heat and/or Violent Burning Hazard, No Blast Hazard, Division 1.4 – Small Hazard of Ignition or Initiation During Transport, Division 1.5 – Mass Explosion Hazard but Very Insensitive, Division 1.6 – Extremely Insensitive with No Mass Explosion Hazard.

CLASS 2 (FLAMMABLE, NON-FLAMMABLE, POISON GAS)
CLASS 2, DIVISION 2.1 (FLAMMABLE GAS) – Compressed gasses which are flammable. May also be toxic or corrosive. Vapours may travel considerable distance to a source of ignition and flash back to the source. Many of these gasses are heavier than air and will tend to spread close to ground level. Examples: Propane, Butane and welding gasses such as Acetylene.
CLASS 2, DIVISION 2.2 (NON-FLAMMABLE GAS) – Compressed gasses which are not flammable. May also be corrosive or toxic. These gasses may suffocate by oxygen displacement. While not flammable, some of these gasses may support and even accelerate a fire. High-pressure containers can rocket or throw shrapnel if exposed to fire or ruptured. Examples: Anhydrous Ammonia, Compressed Air, Nitrogen, Argon, Carbon Dioxide.
CLASS 2, DIVISION 2.3 (POISON GAS) – Extremely toxic compressed gas or high vapour pressure liquid. Even low level exposure to vapour or fumes may result in serious injury or death. May be flammable and/or corrosive as well. Examples: Chlorine, Hydrocyaniac Acid, Phosgene, Ethylene Oxide.

CLASS 3 (FLAMMABLE and COMBUSTIBLE LIQUIDS)
One of the most common hazardous materials classifications including gasoline, some alcohol, paints, thinners, etc. May be toxic and corrosive as well. Flammable liquids evolve vapours which will generally ignite readily when exposed to an ignition source. Some of these vapours may be harmful. Combustible liquids will burn but require some effort to ignite. They do not meet the criteria for any other hazard class (except Class 9) and range from paint thinners to heating oils. They are not regulated in shipping containers of 110 (417 liters) gallons or less.

CLASS 4 (FLAMMABLE SOLIDS)
This class includes materials which are FLAMMABLE SOLIDS (division 4.1), SPONTANEOUSLY COMBUSTIBLE MATERIAL and PYROPHORIC LIQUIDS (Division 4.2), and DANGEROUS WHEN WET (Division 4.3). These materials are liable through friction, contact with air, water or by self heating, to ignite and burn with great intensity or produce flammable gasses. Many are toxic if taken internally such as through contaminated food, contaminated cigarettes, or water. Usually highly reactive and if involved in a fire may burst their containers. Examples: Phosphorus, Sodium Metal, Calcium Carbide.

CLASS 5 (OXIDISERS AND ORGANIC PEROXIDES)
Very reactive with wood, oils, fuels, paper, or any organic material, to generate heat, ignite or explode. Will promote and accelerate fires to the point of possible explosion. Will react with skin and clothing. Usually does not present a vapour hazard unless reacting or involved in a fire. May decompose explosively upon heating or contamination. Examples: Hydrogen Peroxide, Potassium Permanganate, Ammonium Perchlorate, Dry Chlorine for swimming pools, Some fertilisers.

CLASS 6 (POISONOUS MATERIAL)
Toxic liquids or solids. Not highly flammable, but may be mixed in oil carriers. Not severely corrosive. Primarily toxic by skin contact or ingestion. May be toxic by inhalation of vapours or dust if dust is airborne or material is on fire. May be extremely poisonous and if exposure occurs death may result very quickly. Examples: Arsenic, Sodium Cyanide, Strychnine and many pesticides.

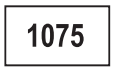
CLASS 7 (RADIOACTIVE)
Emits harmful radiation which cannot be detected without specialised instructions. High level materials are packed in such strong packages that leakage in a very low possibility. Medical materials are often shipped in small lead vessels. Low level wastes include debris contaminated with small amount of radioactive material. These included such items as clothing, paper, tools, etc. Do not handle these materials or handle broken packages.

CLASS 8 (CORROSIVE)
Acids or bases which may be in liquid or solid form. they will attack a variety of metals and will produce severe damage to skin or other tissues on contact. May react with other materials such as water to evolve heat and gasses. In a violent reaction, acids or bases may produce a large volume of corrosive vapours which may spread a considerable distance. Examples: Hydrochloric Acid, Sulphuric Acid, and Caustic Soda.

CLASS 9 (Miscellaneous Hazardous Materials)
Materials which do not fit another hazard class such as those which have an anaesthetic, noxious, or other similar property which could affect a flight crew: or hazardous substances or hazardous wastes which do not meet the definition of another hazard class or division. Examples: Acetaldehyde Ammonia, PCB's Sodium Chromate.

Indicates a Mixed Load of Hazardous Materials on board

Used in addition to placards to display UN/NA Number.



Important: These Placards/Labels reflect the requirements of US transport regulation. Please note that placards/labels could differ from country to country.

Note: Some materials (such as Poison by inhalation) may repute more than one placard or label

■ 4.2 Glossary

Accident – an unintended and unexpected event, occurring suddenly and causing damage to people, property or the environment.

Consignor – person, enterprise, etc, that hands over dangerous goods for transport.

Consequences – the results of an accident, expressed in quantitative or qualitative terms.

Consignee – person, enterprise, etc, to which dangerous goods are consigned; destination of a dangerous goods shipment.

Dangerous Goods – substances or articles which pose a significant risk to health, property or the environment when being transported and which are classified as dangerous goods in the UN Recommendations on the Transport of Dangerous Goods or in the corresponding international regulations on the transport of dangerous goods by sea, inland waterways, rail, road and air.

Emergency Response Plan – a formal plan which, on the basis of identified potential accidents and their consequences, describes how such accidents and consequences should be handled.

Frequency – the rate at which events (accidents) occur or are expected to occur. Frequency may be expressed as events/year, accidents/km, accidents/trip, accidents/tons transported and so on.

Hazard – a threat which could cause an accident (alternatively, risk source).

Hazardous materials – for the purpose of this publication, see Dangerous Goods.

Hazardous substance – an element, compound, mixture or preparation which constitutes a hazard by virtue of its chemical, physical or (eco)toxicological properties.

Incident – the result of a chain of events which could have led to an accident if it had not been halted (alternatively, near miss).

Likelihood – frequency or probability.

Probability – a number between zero and one that expresses the degree of belief concerning the possible occurrence of an event (accident) in relation to a given measure of exposure, e.g. time.

Risk – is here taken to mean the likelihood of an accident and the consequences for people, property and the environment.

Risk analysis – the systematic identification and evaluation of risk objects and hazards.

Risk management – all work relating to risk, e.g. administration, insurance, inventories, valuations, inspections, etc.

Risk object – a factory, warehouse, etc.; or, in the **TransAPELL** context a truck or even a road or railway containing a hazard or risk source. NB there may be more than one risk source within any one-risk object.

Risk source – see Hazard.

Risk zone – the area surrounding a risk object, which could be threatened by an accident.

Routeing – Here taken to mean any additional measures or restrictions – not applicable to non-dangerous goods shipments – meant to separate dangerous goods from threatened objects. Examples of spatial routeing restrictions are closure of certain roads to dangerous goods traffic. A temporal restriction may be a ban on dangerous goods vehicles in a tunnel during rush hours.

Safety distance – an estimate of the distance required between a risk object and surrounding threatened objects, needed to achieve a specified level of safety.

Safety survey – a detailed investigation and risk analysis of a system. Various courses of events are studied to show the effects of efforts to reduce risk levels by taking different preventive measures.

Scenario – here taken to mean a fictitious accident sequence or outcome, used for purposes of risk analysis, planning or training.

Shipper – see Consignor.

Shipping papers – see Transport documents.

Threatened object – people, environmental objects or property that are at risk from an accident due to a risk object in the vicinity.

Transport documents – here taken to mean such written documentation accompanying dangerous goods shipments as is required by the UN Recommendations on the Transport of Dangerous Goods or by the corresponding international regulations on the transport of dangerous goods by sea, inland waterways, rail, road and air.

■ 4.3 List of Acronyms

ADR – European Agreement concerning the international carriage of Dangerous goods by Road

BCH – Bulk Chemical Handling (Code of IMO)

CAER – Community Awareness and Emergency Response (code of Responsible Care Programme)

CEFIC – Conseil européen des fédérations de l'industrie chimique

CMA – Chemical Manufacturers Association

ECOSOC – (United Nations) Economic and Social Council

IAEA – International Atomic Energy Agency

IATA – International Air Transport Association

ICAO – International Civil Aviation Organisation

IMDG – International Maritime Dangerous Goods (Code of IMO)

IMO – International Maritime Organisation

OECD – Organisation for Economic Co-operation and Development

RIDS – Response Information Data Sheet

UNECE – United Nations Economic Commission for Europe

UNEP – United Nations Environment Programme

■ 4.4 Bibliography

APELL: Awareness and Preparedness for Emergencies at Local Level. UNEP IE, Paris, 1988

APELL for Port Areas. Consultation version. IMO on behalf of IMO and UNEP, London, 1996

APELL Annotated Bibliography. UNEP IE Technical Report 21. UNEP IE, Paris, 1994

APELL Worldwide. UNEP IE, Paris, 1995.

The Comprehensive Handbook of Hazardous Materials: Regulations, Handling, Monitoring and Safety. Sacarello, Hildegarde L A, US, 1994

Contingency Planning for Industrial Emergencies. Armenante P M, Van Nostrand Reinhold, New York, 1991

Dangerous Goods Regulations, 36th Edition. Effective 1 January 1995. International Air Transport Association (IATA), Montreal-Geneva, 1995

European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR). (ECE/TRANS/115, Vols. 1 & 2). UNECE, Geneva, 1996

Guidelines for the Safe Warehousing of Pesticides. International Group of National Associations of Manufacturers of Agrochemical Products (GIFAP), Brussels, 1988

Guidelines for chemical transport risk analysis. American Institution of Chemical Engineers, 1995

A Guide to Safe Warehousing for the European Chemical Industry. Conseil Européen des Fédérations de l'Industrie Chimique (CEFIC), Brussels, 1987

Guiding Principles for Chemical Accident Prevention, Preparedness and Response. OECD, Paris, 1992

Hazard Identification and Evaluation in a Local Community. UNEP IE Technical Report 12. UNEP IE, Paris, 1992

Hazardous Materials Transportation Risk Analysis: Quantitative Approaches for Truck and Train. William R. Rhyne, Van Nostrand Reinhold 1994.

Health Aspects of Chemical Accidents. OECD Environment Monograph No. 81 / UNEP IE Technical Report 19. OECD for IPCS, OECD, UNEP and WHO/EURO, Paris, 1994

International Convention for Safe Containers (CSC) 1972 (1992 Edition.) IMO, London, 1992

International Directory of Emergency Response Centres. OECD Environment Monograph 43 / UNEP Technical Report 8. OECD for OECD AND UNEP, Paris, 1991

International Maritime Dangerous Goods Code (IMDG Code). 1994 Consolidated Edition, including amendment 28-96 for implementation from 1 January 1997. IMO, London, 1996

Major Hazard Aspects of the Transport of Dangerous Substances. Report of the Advisory Committee on Dangerous Substances of the UK Health and Safety Commission. HMSO, London, 1991.

Manual for the classification and prioritisation of risks due to major accidents in process and related industries. Interagency Programme for the Assessment and Management of Health and Environmental Risks from Energy and Other Complex Industrial Systems (IAEA, UNEP, UNIDO, WHO). IAEA TecDoc 727. 2nd edition. IAEA, Vienna, 1996

1996 North American Emergency Response Guidebook. A guidebook for first responders during the initial phase of a hazardous materials / dangerous goods incident. Available in English, French and Spanish. U.S. Department of Transportation (US. DOT) / Transport Canada / Mexican Secretariat of Transport and Communications; Washington / Ottawa / Mexico City, 1996.

Recommendations on the Transport of Dangerous Goods; Tests and Criteria. 2nd edition. ST/SG/AC.10/11/Rev.2. United Nations, New York, 1995

Recommendations on the Transport of Dangerous Goods. 10th revised edition. ST/SG/AC.10/1/Rev.10. United Nations, New York, 1997

Report of the OECD Special Session on Chemical Accident Prevention, Preparedness and Response at Transport Interfaces. OECD Environment Monograph 94. OECD, Paris, 1995

Storage of Hazardous Materials. UNEP IE Technical Report 3. UNEP IE, Paris, 1990

Transporting Hazardous Goods by Road. OECD Road Transport Research Unit. OECD, Paris, 1988

Technical Instructions for the Safe Transport of Dangerous Goods by Air. 1997-1998 edition. Doc 9284-AN/905, International Civil Aviation Organisation (ICAO), 1996

TRANSCAER Guidance Manual*. Chemical Manufacturers' Association (CMA), US, 1993.

Users Guide to Hazardous Substance Data Banks Available in OECD Member Countries. OECD/GD (91)102. OECD, Paris, 1991

Users Guide to Information Systems Useful to Emergency Planners and Responders Available in OECD Member Countries. OECD/GD (91) 103. OECD, Paris, 1991.

LOUIS-JEAN
avenue d'Embrun, 05003 GAP cedex
Dépôt légal : 358 – Mars 2000
Imprimé en France