The Danube Accident Emergency Warning System in operation

György G. Pintér and Hans J. G. Hartong¹

Background

The “Environmental Programme for the Danube River Basin” (EPDRB) was launched in this region with the basic principle to promote the co-operation and efforts of the Danube riparian countries in developing measures to overcome environmental problems of the region. Considering the growing needs at the important water users (first of all at drinking water intakes) along the river to get early warning about accidental water pollution incidents, short term priority was given in 1992 to develop an effective Accident Emergency Warning System (AEWS) in the Danube Basin.

The development work of this regional system has been designed and carried out by the Accident Emergency Warning System AEWS Sub-Group of the Task Force of the EPDRB, composed of experts from nine Danube riparian countries at the beginning in 1992. Essential technical support has been provided for this activity by several international consultants bringing in the practical experiences coming from the many years’ successful operation of the International Rhine Alarm System and also the recently developed system for the Elbe River. This professional support significantly contributed to the development activities, as well as the intensive co-operation of the participating Danube riparian countries. The Danube Programme Coordination Unit in Vienna provided continuous management for the implementation, which was financed by the PHARE programme of the European Commission. The Danube AEWS has been put into operation in April 1997.

Establishment of the System

The objective of the Danube AEWS is to communicate immediate information about sudden changes in water characteristics, like the effects of accidental water pollution incidents, or unpredictable changes in water level, with special attention to transboundary impacts (Hartong et. al. 1994, ENWAP 1999). Providing early information on such emergency situations, the Danube AEWS can contribute to the protection of the aquatic environment and important surface water uses in the Danube riparian countries, and can substantially support the pollution control activities of the responsible local authorities.

An essential feature of the set-up of the Danube AEWS is that it is in accordance with the relevant and adopted multilateral conventions and declarations, as well as on the existing bilateral agreements between the neighbouring countries of the River Basin. The most important among them is the International Convention for the Protection

¹ Authors:
György G. PINTÉR, Senior Consultant, Institute for Water Pollution Control of VITUKI Plc.
H-1091 Budapest, Kvassay Jenő u. 1. Hungary
Hans J.G. HARTONG, Consultant, HKV Consultants, P.O.Box 2120, 8203 AC Lelystad, the Netherlands
and Sustainable Use of the Danube River signed in 1994 and entered into force in October 1998. Since that time the Danube AEWS is operated by the Danube countries under the responsibilities of the International Commission for the Protection of the Danube River (ICPDR).

The basic elements of the Danube AEWS are the National Centres (called Principal International Alert Centres: PIAC-s) established in each riparian country, equipped with international satellite communication system to provide fast information exchange between the PIAC’s. Another essential element of the system is the supporting institutional background (local and central level) in each country. The main principle of the set-up of the system is one PIAC for each participating country. Exception is Ukraine, which has two PIACs because of its special geographical location in the river basin.

The Danube AEWS has 12 PIACs in the river basin at present:

**Upper Danube Basin:**
- PIAC-01 : Passau, Germany;
- PIAC-02 : Tulln, Austria;
- PIAC-03 : Brno, Czech Republic;

**Middle Danube Basin:**
- PIAC-04 : Bratislava, Slovakia;
- PIAC-05 : Budapest, Hungary;
- PIAC-06 : Ljubljana, Slovenia;
- PIAC-07 : Zagreb, Croatia;

**Lower Danube Basin:**
- PIAC-08 : Bucharest, Romania;
- PIAC-09 : Sofia, Bulgaria;
- PIAC-10 : Kishinev, Moldova;
- PIAC-11 : Uzgorod, Ukraine;
- PIAC-12 : Ismail, Ukraine.

In the middle part of the Danube Basin there is unfortunately a territorial "gap" in the system due to the lack of co-operation concerning the Yugoslavian stretch of the river, the design of the Danube AEWS however easily allows the integration of the missing areas in the future.
The basic role of the PIACs is to co-ordinate emergency warning at international level. In case of an accidental spill having transboundary impact on the Danube or one of its tributaries, the PIAC of this country sends an early message (warning) to the PIAC(s) of the downstream country(ies), consisting of the available information on the characteristics and expected impacts of the pollution incident. Standard forms have been adopted for sending the early information between the PIACs. The System at present deals only with water pollution problems, but in the future the sphere of activities could be extended to cover other environmental hazards, like flood or ice for example.

To perform this task during the emergency periods three units are co-operating closely in each PIAC:

- **the Communication Unit** (working on a 24 hours basis to receive and handle messages/warnings without delay);
- **the Expert Unit** (to assess the effects, or impacts of a reported accidental pollution); and
- **the Decision-making Unit**, which is licensed with authority to make decisions on local, or international warnings.

The system is operational now in Germany, Austria, Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Romania and Bulgaria. The establishment of the PIACs in Moldova and Ukraine is to be completed and put into operation by the end of 1999 with the financial assistance of the TACIS programme.

**Tools for the PIACs to assist operation**

The *International Operations Manual* provides the necessary procedures for the operation of the system (*Manual 1997*) in case of alert situations, like the routing of warning messages, the standard message forms, etc. The *IPS Information Processing System* at the PIACs creates, sends and displays the international satellite messages in the native language of each country. The annually updated *Data-bank of Dangerous Chemicals* is also available at the PIACs, including about 15 thousand chemicals, more than 200 thousand material names, and provides data on identification, nature of hazards, emergency response measures, characteristics on toxicology and ecology and water related effects.

To support the activities of the Expert Units on transboundary pollution impact assessments, these Units are equipped with the data bank of dangerous chemicals and also the Danube Basin Alarm Model (*DBAM 1997*). Direct access to national water quality and hydrological data banks are generally available at the PIACs to assist the expertise activities on pollution incidents.

**Danube Basin Alarm Model (DBAM)**

One of the most important tools for the PIACs of the Danube AEWS is the model system of DBAM, which is capable to simulate the propagation of a polluted water body along the Danube and its tributaries in the River Basin. Assessment of the time of travel and maximum concentrations of the polluted plume can be predicted for selected sections of the river system.

The development of the DBAM (following the concept of the Rhine Alarm Model) was carried out by an international Consortium led by VITUKI Plc., as the PHARE project
EU/AR/303/91 of the Applied Research Programme of the EPDRB. The first release of the DBAM model has been evaluated by the ad-hoc “DBAM Working Group” of the AEPWS Expert Group and based on the findings the required improvements has been already completed, and the model system has been distributed for all the PIACs in January 1999.

**Operation of the Danube AEWS**

Since the operation of the Danube AEWS (April 1997), only limited number of accidental river pollution incidents were recorded by the system, less than expected (AEWPS 1999). The main reason of this fact is, that the Danube AEWS is explicitly designed to deal with transboundary water pollution cases only. Due to this philosophy the system does not deal with the local pollution incidents with minor importance, which occurred in many cases within the co-operating countries of the Danube River Basin.

The accidental water pollution incidents registered by the System until the end of October 1999 are summarised in the following table, illustrating also the main characteristics of the incidents as well as the actions of the different PIACs:

<table>
<thead>
<tr>
<th>No</th>
<th>Site of accident Date</th>
<th>Affected River</th>
<th>Pollutant</th>
<th>International satellite messages</th>
<th>Trans-boundary Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hungary (Százhalombatta) 04.10.1997</td>
<td>Danube</td>
<td>Oil</td>
<td>PIAC-05 “Warning”, “End”</td>
<td>H: None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PIAC-07 (Croatia) PIAC-08 (Romania)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Czech Republic (Breclav) 08.12.1997</td>
<td>Dyje</td>
<td>Salt</td>
<td>PIAC-03 “Warning”, “End”</td>
<td>Cz: None</td>
</tr>
<tr>
<td>3</td>
<td>Hungary (and Slovakia) 11.02.1998</td>
<td>Danube (common river stretch)</td>
<td>Oil</td>
<td>PIAC-05 “Info?”</td>
<td>PIAC-04 (Slovakia)</td>
</tr>
<tr>
<td>4</td>
<td>Hungary (Budapest) 26.05.1998</td>
<td>Danube (common river stretch)</td>
<td>Pesticide</td>
<td>PIAC-05 “Warning”, “End”</td>
<td>PIAC-07 (Romania)</td>
</tr>
<tr>
<td>5</td>
<td>Hungary (and Slovakia) 04.11.1998</td>
<td>Danube (common river stretch)</td>
<td>Oil</td>
<td>PIAC-05 “Info?”</td>
<td>PIAC-04 (Slovakia)</td>
</tr>
<tr>
<td>6</td>
<td>Bulgaria (and Romania) 13.01.1999</td>
<td>Danube (common river stretch)</td>
<td>Oil</td>
<td>PIAC-09 “Warning”, “End”</td>
<td>PIAC-08 (Bulgaria)</td>
</tr>
<tr>
<td>7</td>
<td>Romania (and Bulgaria) 15.01.1999</td>
<td>Danube (common river stretch)</td>
<td>Detergent</td>
<td>PIAC-08 “Warning”</td>
<td>PIAC-09 (Bulgaria)</td>
</tr>
<tr>
<td>8</td>
<td>Slovakia (and Hungary) 26.01.1999</td>
<td>Danube (common river stretch)</td>
<td>Oil</td>
<td>PIAC-04 “Info?”</td>
<td>PIAC-05 (Hungary)</td>
</tr>
<tr>
<td>9</td>
<td>Romania 12.03.1999</td>
<td>Crisul Repede/ Sebes Körös</td>
<td>Oil</td>
<td>PIAC-08 “Warning”, “End”</td>
<td>RO: Yes</td>
</tr>
<tr>
<td>10</td>
<td>Austria 21.05.1999</td>
<td>Leitha/Lajta</td>
<td>Phenols</td>
<td>PIAC-02 “Warning”</td>
<td>PIAC-05 (Hungary)</td>
</tr>
</tbody>
</table>

The “Yes” or “No” statements in the last column of the table indicate, that polluted water body entered into the country downstream of the site of the incident, or not.
The “Info?” means that “Request for Information” message was sent to the upstream country looking for data on the observed pollution, and the symbol “(??)” indicates that the water pollution has been observed by one of the parties only.

To ensure smooth operation during emergency periods and to meet the requests of the co-operating countries in this field, regular training and possibilities to exchange experiences were provided for the PIAC’s personnel. A Phare project (Carl Bro 1998) assisted these activities by the arrangement of a training session at RIZA in Lelystad, and a tour to visit the Rhine Alarm System in the Netherlands and Germany, and also the International Commission for the Rhine in Koblenz. The comprehensive “PIAC Simulation Workshop” was also arranged by this project, which proved to be a very efficient meeting for experts from 10 Danube countries. Opportunity was provided to the personnel of the neighbouring PIACs to exercise the necessary actions in case of an emergency situation caused by accidental water pollution incident. The Workshop paid special regards to the evaluation of polluting impacts using the DBAM model-system and to the use of the data bank of dangerous chemicals.

The experts of PIAC-05 in Budapest tested the DBAM model system for simulating the pollution impact of a previous serious water pollution incident, the accidental spill into the Danube last year (see item No. 4 of the Table above). From a chemical factory downstream of Budapest in Hungary toxic pesticide (κ-cipermetrin) entered into the Danube in May 1998, causing significant fish-kills and drinking water supply problems in some of the neighbouring villages. The following actions were made by the PIAC-05 in connection of this important water pollution incident:

- Based on the first observation data warning messages were sent towards PIAC-07 (Croatia) and PIAC-08 (Romania). Ukraine also requested information about the incident, which was sent by fax.
- Due to the processes of dilution and decomposition during the long travel time, the concentration of the pollutant in the river was only near the magnitude of the detection limit at the border section of Hungary. As transboundary impact was not taken place, PIAC-05 sent “End of Alert” messages to PIAC-07 and PIAC-08.
- Downstream country Croatia confirmed the lack of transboundary river pollution impact.

Using the actual data on this pollution incident (Dan02Rep 1998), the movement of the polluted water body along the Hungarian stretch of the Danube was simulated and the superposition of model-runs is illustrated in Figure 2. The simulated maximum concentrations in time provided a really characteristic picture on the propagation of the pollutants in the river. On the other hand however, the magnitude of maximum concentration proved to be somewhat higher than the actually observed value in the lowermost border-section of the river in Hungary.
Figure 2. Simulation of pollutant propagation by DBAM

Ongoing development activities

The AEPWS Expert Group defined activities for further development and improvement of the AEWS, its structures and its tools. Basically the activities are to assure the sustainability of the system. Special attention is paid for the improvement of the flow of information during alert situations on the national level, the regular upgrade and improvement of tools, like the IPS and the DBAM. Essential part of the further development activities the calibration of the DBAM, the exchange of PIAC experts and meetings of PIAC staff on a regional basis in the basin and the regular testing of the state of the AEWS.

Funded by the TACIS Programme of the European Union, Moldova and Ukraine are now able to meet their international obligations under the Danube River Protection Convention in the establishment of the Danube AEWS in their parts of the Danube basin. The commissioning of the PIACs in Kishinev, Uzgorod and Ismail is to be completed in 1999.

Bosnia-Herzegovina is not yet part of the Danube AEWS. However proposals have been made to include the Bosnian part of the basin into the structures of the AEWS, and these are now currently under discussion by the political entities of Bosnia-Herzegovina.

Acknowledgements

The authors wish to express their appreciation for the intensive and co-operative involvement received from the members of the AEPWS Expert Group and the very good atmosphere of work. The Danube Programme Coordination Unit and the PHARE Programme are very much appreciated for their financial assistance and professional support given. Input from both sides in the form of ideas, expertise and
co-operation have enabled the proposed set-up of the AEWS to be really implemented. The continuous and effective management support provided by the International Secretariat of the ICPDR for the AEPWS Expert Group is also appreciated.

References


Abstract

The Danube AEWS (Accident Emergency Warning System) is now in operation since April 1997 with the co-operation of 11 Danube countries. One National Centre called PIAC (Principal International Alert Centre) has been established in each riparian country, except Ukraine where the special geographical location needed two of this Centre. The objective of the System to provide early information about transboundary accidental water pollution incidents, to assist this way the responsible local Authorities and water users in the downstream country to make the necessary preventive actions in time. Satellite communication system, Danube Basin Alarm Model and data-bank on dangerous chemicals are the most important tools for the Units of each PIAC (Communication, Expertise and Decision-making), which are acting during emergency periods on standardised operation technique ensured by the International Operations Manual. Results of the Danube AEWS operation is discussed, including an example on the impact assessment using the DBAM model system. The most important development activities also are briefly summarised.