"ORGAMIR" – DEVELOPMENT OF A SAFETY SYSTEM FOR REACTION OF AN EVENT WITH EMISSION OF HAZARDOUS AIRBORNE SUBSTANCES - LIKE A TERROR ATTACK OR FIRE - BASED ON SUBWAY CLIMATOLOGY"

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1. Introduction

Millions of people use public transportation every day. The large number of individuals in the confined space of a subway system, especially during rush hours, makes these systems vulnerable to terrorist attacks. In the OrGaMIR project (Cross-organisational danger defence for the protection of men and critical infrastructures by means of prevention and reaction), a system is developed, which will allow the assessment of the prevailing or anticipated contamination of a subway system with hazardous airborne substances. This will enable the stakeholders to take decisions, which may possibly save lives, on a more reliable and informed basis. An overview of the different component is shown in figure 1.

General Goals:

- visualisation of the dispersion of dangerous substances in subway systems and stations
- provision of context-dependent information for decision support
- improvement of teamwork between fire brigade, paramedics and subway operating company
- development of guidelines for the structural design of subway systems in order to minimize the dispersion of dangerous substances

Figure 1: Schematic overview of the different component of the overall project OrGaMIR

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**Scientific Goals:**

- better understanding of the climatologic conditions inside tunnel systems
- dispersion visualisation in closed architectures
- deduction of recommendations for action from the integration of data of various data sources

The OrGaMIR project has an interdisciplinary character. In order to meet all the requirements, which arise out of the complex field of application, a joint project with a scientific and application oriented consortium was formed (tab. 1).

Table 1: Members of the project consortium of OrGaMIR

<table>
<thead>
<tr>
<th>Members of the consortium</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>University of Paderborn</td>
<td>Information processing &amp; management</td>
</tr>
<tr>
<td>Ruhr University, Bochum</td>
<td>Tunnel climatology</td>
</tr>
<tr>
<td>Eduard Züblin AG</td>
<td>Subway construction</td>
</tr>
<tr>
<td>Institute for Microtechnology GmbH</td>
<td>Sensor technology</td>
</tr>
<tr>
<td>Ingenieurbüro Lohmeyer GmbH &amp; Co. KG</td>
<td>Simulation of dispersion</td>
</tr>
<tr>
<td>Indanet GmbH</td>
<td>Public transportation control centre management</td>
</tr>
<tr>
<td>A fire brigade</td>
<td>End user</td>
</tr>
<tr>
<td>Friedrich Schiller University of Jena</td>
<td>Crisis management / psychology</td>
</tr>
<tr>
<td>A subway operating company</td>
<td>End user</td>
</tr>
</tbody>
</table>

3. THE SUB-PROJECT TUNNEL CLIMATOLOGY

Aim of the project tunnel climatology within the OrGaMIR project is to provide reliable information on the current and upcoming air flow and dispersion conditions inside a subway system (tunnels and stations). Comprehensive knowledge of this is indispensable for a simultaneous analysis of the dispersion of airborne toxins (gases, dust, fog) in case of an incident and a basic requirement for all decisions and activities regarding the rescue operation.

Scientific and technical goals of the project

The project tunnel climatology supplies the data base for the overall project. The knowledge gained in previous research campaigns on the system-specific air flow regime, which develops in every subway system independent of the train traffic, is to be applied in the overall project.

This includes:

- The setup of a measurement system for the registration of the current air flow conditions (fig. 2)
- The development of a model for the short-term prognosis of the stability of the prevailing air flow conditions and for the identification of danger zones.

In addition to this the sub-project will deliver:

- Information on the required number and sensible positioning of the sensors for the detection of CBNRE-substances.
- Information concerning a structural design of subway systems which help to minimize the dispersion of dangerous substances
4. SCENARIOS

The biggest obstacle in a rescue operation in a subway environment is the restricted access to the site of the incident. Today there is no information available on the parts of the subway system that are affected by an incident, such as neighbouring tunnels and stations, and which parts are not contaminated and allow access for the rescue teams and can be used as escape routes. In order to improve this situation and to reduce the number of persons affected, rescue teams and operating company need exact and reliable information on the current and imminent situation. Information distribution and coordination of organisational and logistic procedures is a task which must be met by a cross-organisational emergency task force which has to be set up under the lead of the fire department (fig. 3).
Figure 3: Example of information offered to the rescue teams -
Upper left: direction of air flow; upper right: overview about risky and safe areas: red means high danger, green means safe rescue area; lower left: wind direction outside the station; lower right: example for stability situation).