

## SenSE4Metro: A BI-NATIONAL MULTI-DISCIPLINARY PROJECT FOR MONITORING UNDERGROUND METRO ENVIRONMENTS IN DISASTER EVENTS

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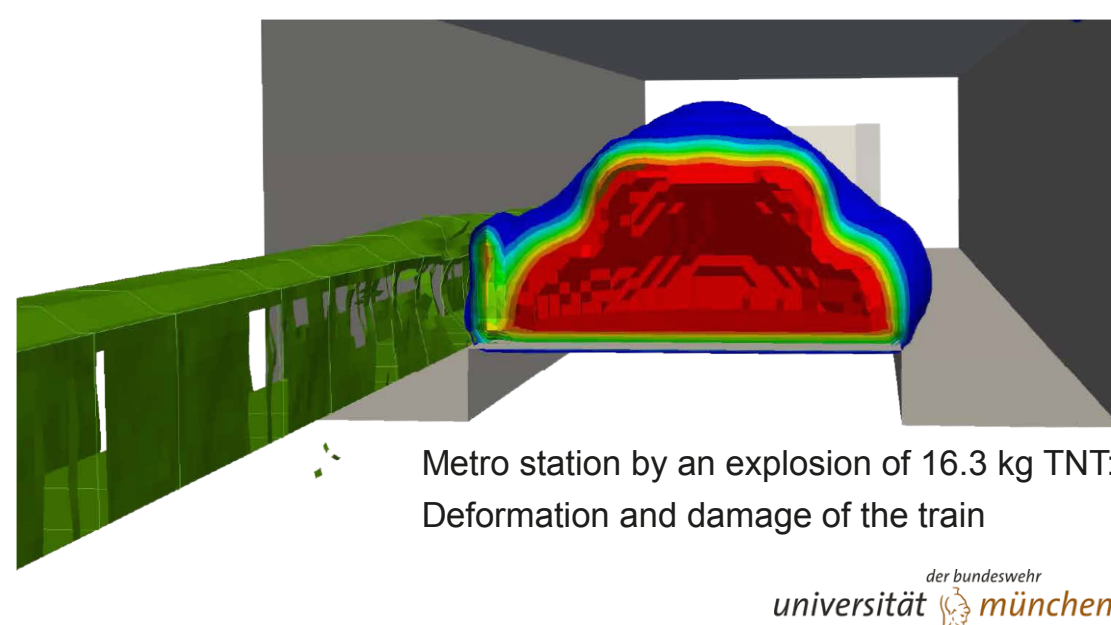
### OBJECTIVES

To improve the security of persons in urban underground trains and underground stations in emergency situations and catastrophes, resulting from:

- terrorist attacks on underground trains and train stations
- natural disasters such as earthquakes and flooding

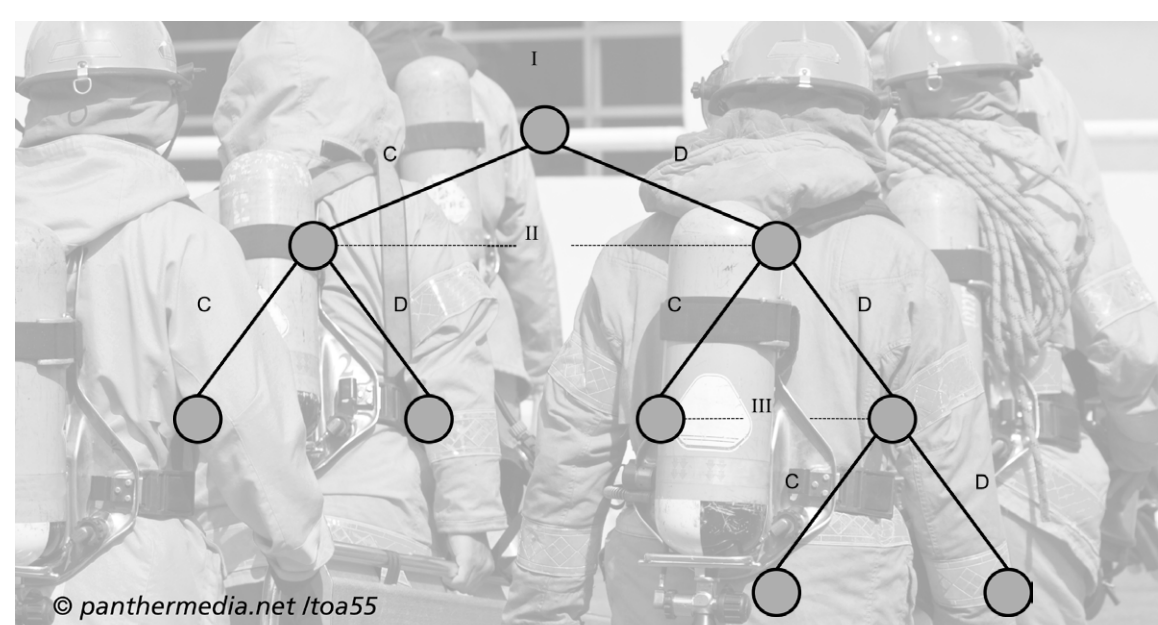
### VULNERABILITY ANALYSIS

Vulnerability studies of real-life underground infrastructure and numerical analysis of these structures under extreme loads inform design solutions for reducing the vulnerability and increasing the security of persons in underground structures.



### EXPERIMENTAL EXAMINATION

Laboratory-based behavioral games involving rescue forces and civilian groups assess the traits of altruism, cooperation and coordination in order to evaluate and improve rescue protocols and measures.



### STUDIES OF SOCIAL BEHAVIOR

The cross-cultural evaluation of social behavior during past emergency events is used to develop better eventspecific communications strategies before and during extreme events.



### SMERS

The **S**ecurity **M**anagement and **E**mergency **R**esponse **S**ystem is designed to deliver the necessary real-time information to the necessary parties in order to minimize casualties in emergency situations.

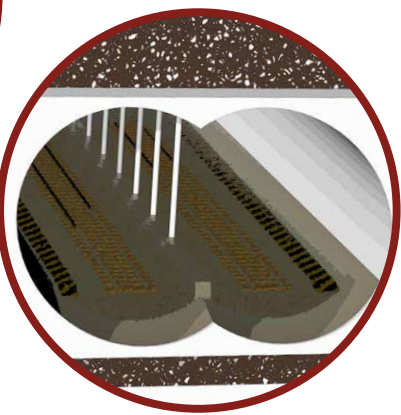
### Event Scenarios

SMERS is designed to respond to a variety of emergency event scenarios, including intentional attacks as well as natural disasters.

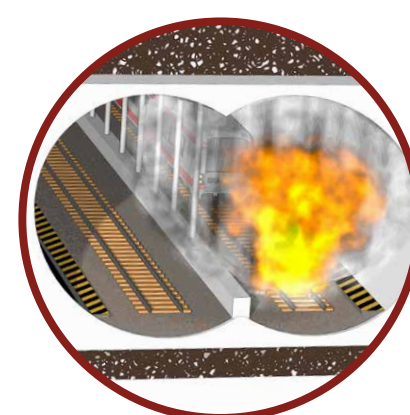
#### Earthquakes



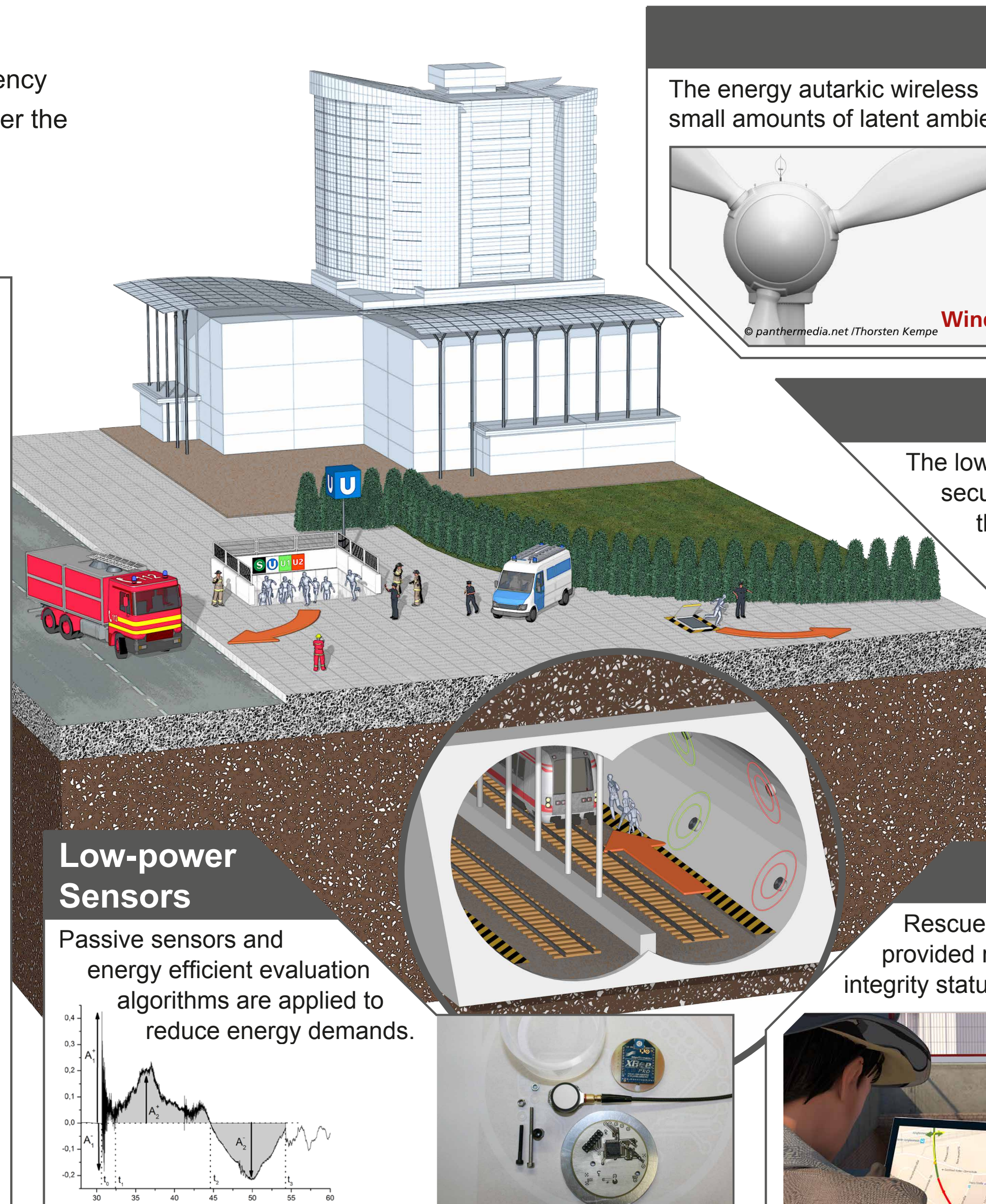
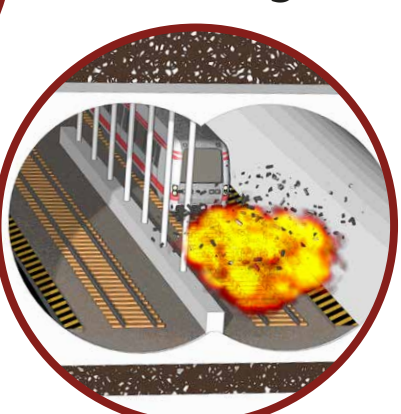
#### Flooding



#### Arson

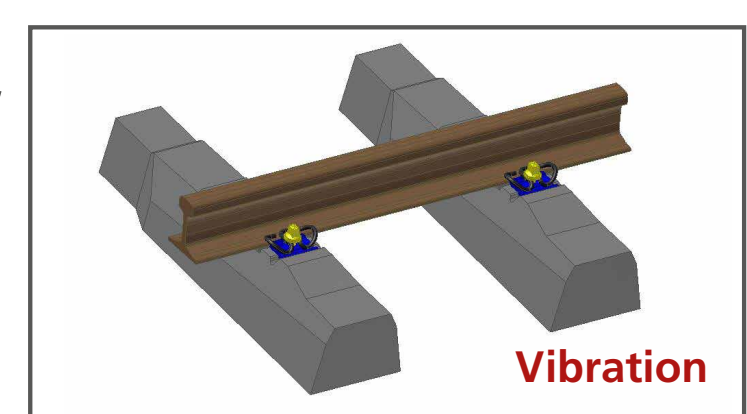


#### Explosive Bombing



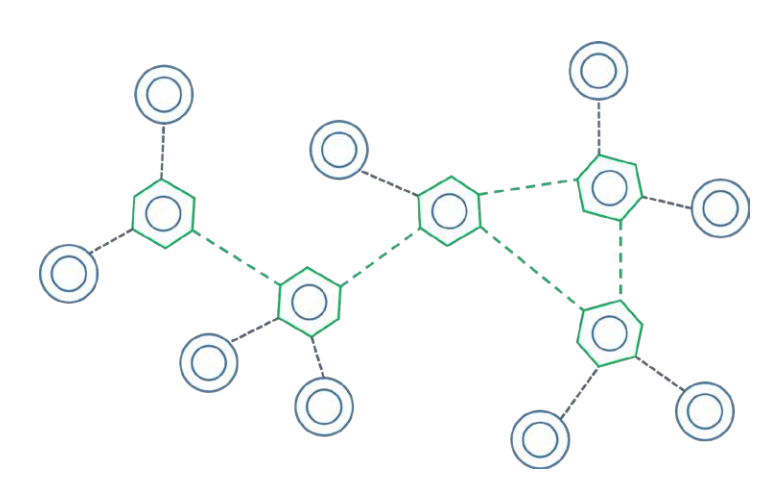
### Energy Harvesting

The energy autarkic wireless sensor nodes are powered by converting small amounts of latent ambient energy from the local environment.



### Wireless Sensor Network

The low-power WSN implements state-of-the-art security and reliability protocols for ensuring the transmission of critical infrastructure status to the central security system.



### User Interfaces

Rescue forces, operators and passengers are provided real-time event and train data, structural integrity status and optimized escape/access routes.



SPONSORED BY THE



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