

<b>Threat Main Group:</b> Bombing attack
<b>Threat Subgroup:</b> EXP-01 small load (moving)
<b>City, Country:</b> Brussels, Belgium
<b>Operator:</b> STIB-MIVB
<b>Date/Period of time:</b> 22 March 2016, during morning rush hour (7:58 - 9:11 a.m.)
<b>Category according to VDV Guideline:</b> Catastrophe
<b>Location:</b> Train (and Airport)
<b>Incident summary:</b> Three coordinated suicide bombings occurred in Belgium: two at Brussels Airport in Zaventem and one at Maalbeek metro station, which is located near the European Commission headquarters in central Brussels. The bomb in the train (made from TATP explosives) exploded in the second carriage of a four carriage train as it started to leave the Maalbeek station. The attack took place about an hour after the bombings took place in Brussels Airport. The perpetrators belonged to the terrorist cell Islamic State (IS) of Iraq.
<b>Personal damage - number of injured persons:</b> > 300
<b>Personal damage - number of killed persons:</b> 32 (20 pers. in metro station, 12 pers. in the metro) + 3 suicide bombers
<b>Material damage:</b> No information available.
<b>Impact on operation:</b> After the explosion in Maalbeek at 9:11 a.m., Brussels Metro was subsequently shut down at 09:27. The station Maalbeek was closed for over a month following the attacks. On 25 April 2016, the Maalbeek station reopened again.
<b>Impact on structure:</b> Enormous damage of the train (and structure at the airport).
<b>Impact on user:</b> After the explosion in the train, the driver immediately stopped the train and helped to evacuate the passengers.
<b>Cascading effect:</b> After the attacks, the transport company in Brussels build an „ultra safety network“. Soon after the attacks, security was increased all over the world, particularly at airports, railway stations and other transport hubs (e.g. in China, Denmark, France, Germany, Greece, Indonesia, Ireland, Italy, Japan, Malaysia, Malta, the Netherlands, the Philippines, Thailand, the United Kingdom, and the United States).

**Sources:** [www.spiegel.de](http://www.spiegel.de), [www.tagesschau.de](http://www.tagesschau.de), [www.wikipedia.de](http://www.wikipedia.de),

**Photo(s):** (see below)



[www.news.com.au](http://www.news.com.au)



<http://crbtechreviews.com>

<b>Threat Main Group:</b> Bombing attack
<b>Threat Subgroup:</b> EXP-01 small load (moving) & EXP-04 on board
<b>City, Country:</b> London, UK
<b>Operator:</b> London Underground
<b>Date/Period of time:</b> 7 July 2005, during morning rush hour (8:50 – 9:47 a.m.)
<b>Category according to VDV Guideline:</b> Catastrophe
<b>Location:</b> Train, Bus, Running Tunnel, Station
<b>Incident summary:</b> Four Islamic suicide terrorists of the Secret Organization of al-Qaida in Europe separately detonated three bombs aboard London Underground trains across the city and later a fourth on a double-decker bus. The explosive materials were homemade peroxide-based devices packed in backpacks.
<b>Personal damage - number of injured persons:</b> 784
<b>Personal damage - number of killed persons:</b> 52 + 4 suicide bombers
<b>Material damage:</b> The respective subways and bus as well as the tunnel structure were totally destroyed. The attack caused an enormous damage of an underground station. Extent of property damage according to Global Terrorism Data Base: Major (likely > \$1 million but < \$1 billion).
<b>Impact on operation:</b> For most of the day, central London's public transport system was largely out of service following the complete closure of the Underground and the closure of the Zone 1 bus network. Not involved lines were reopened shortly after the attack. Bus services restarted at 4 pm on 7 July, and most mainline railway stations resumed service soon afterward.
<b>Impact on structure:</b> Destroyed tunnel structure and enormous damage of an underground station.
<b>Impact on user:</b> Evacuation of passengers at the incident sites (e.g. at Russel Square).
<b>Cascading effect:</b> After the explosion in the underground train ducts, people broke up in panic. A crisis unit was set up.
<b>Sources:</b> Global Terrorism Data Base; <a href="http://www.bbc.com">www.bbc.com</a> ; <a href="http://www.spiegel.de">www.spiegel.de</a>
<b>Photo(s):</b> (see below)



[www.asiansunday.co.uk](http://www.asiansunday.co.uk)



[www.centreofthepsyclone.wordpress.com](http://www.centreofthepsyclone.wordpress.com)

<b>Threat Main Group:</b> NRBC attack
<b>Threat Subgroup:</b> BC-NRBC 10
<b>City, Country:</b> Tokyo/Japan
<b>Operator:</b> Tokyo subway
<b>Date/Period of time:</b> 20 March 1995, during morning rush hour (7:00 – 8:10 a.m)
<b>Category according to VDV Guideline:</b> Catastrophe
<b>Location:</b> Train(s), Running Tunnel, Station
<b>Incident summary:</b> At the peak of the morning rush hour, five members of the Japanese cult “Aum Shinrikyo” launched a chemical attack on the Tokyo subway which is one of the world's busiest commuter transport systems. The chemical agent used (liquid sarin) was contained in plastic bags which each team then wrapped in newspaper. Each perpetrator carried at least two packets totalling approximately 9 liters of sarin.
<b>Personal damage - number of injured persons:</b> 50 injured, > 5500 with temporary (vision) problems
<b>Personal damage - number of killed persons:</b> 13
<b>Material damage:</b> No material damage.
<b>Impact on operation:</b> Complete shutdown of one line.
<b>Impact on structure:</b> No impact.
<b>Impact on user:</b> Evacuation of thousands of people.
<b>Cascading effect:</b> No information available.
<b>Sources:</b> Internet: Global Terrorism Data Base, <a href="http://www.dw.com">www.dw.com</a> , <a href="http://www.history.com">www.history.com</a> ; <a href="http://www.tag24.de">www.tag24.de</a>
<b>Photo(s):</b> (see below)



[www.britannica.com](http://www.britannica.com)



[www.newsweek.com](http://www.newsweek.com)

<b>Threat Main Group:</b> Mass shooting
<b>Threat Subgroup:</b> MS-03 in station
<b>City, Country:</b> Munich, Germany
<b>Operator:</b> Münchner Verkehrsgesellschaft (MVG)
<b>Date/Period of time:</b> 22 July 2016, 5:30 p.m. - 2 a.m.
<b>Category according to VDV Guideline:</b> Crisis/Catastrophe
<b>Location:</b> Shopping Center, assumed in metro stations
<b>Incident summary:</b> The shooting occurred in the vicinity of the Olympia shopping mall in Munich. The shooting took place at a fast food restaurant near the shopping mall. The gunman, later identified as 18-year-old german-iranian guy, died nearby from a self-inflicted gunshot wound to the head. His motive for the shooting was racism and mobbing.
<b>Personal damage - number of injured persons:</b> 36
<b>Personal damage - number of killed persons:</b> 9 + 1 perpetrator
<b>Material damage:</b> No material damage.
<b>Impact on operation:</b> According to the instructions of the police, the local public transport was stopped. No bus and metro service for 8 hours due to the fact that the police assumed more than one perpetrator. On 23 July at 1 a.m. the public transport system in Munich were reopened. The central station been closed for several hours.
<b>Impact on structure:</b> No impact.
<b>Impact on user:</b> Evacuation of Munich's central station. Users could not use part of the public transport for several hours.
<b>Cascading effect:</b> No information available.
<b>Sources:</b> <a href="http://www.muenchen.de">www.muenchen.de</a> ; <a href="http://www.stern.de">www.stern.de</a> , <a href="http://www.abendzeitung-muenchen.de">www.abendzeitung-muenchen.de</a>
<b>Photo(s):</b> (see below)



[www.salzburg.com](http://www.salzburg.com)



[www.tz.de](http://www.tz.de)



[www.nachrichtenexpress.com](http://www.nachrichtenexpress.com)



[www.wikimedia.org](http://www.wikimedia.org)

<b>Threat Main Group:</b> Fire
<b>Threat Subgroup:</b> FI-01 Small fire
<b>City, Country:</b> Berlin, Germany
<b>Operator:</b> BVG
<b>Date/Period of time:</b> 29 December 2017
<b>Category according to VDV Guideline:</b> Emergency
<b>Location:</b> Tunnel
<b>Incident summary:</b> A fire broke out in the technic room which is located under the train platform. The fire could be extinguished very quickly. It was caused by burning paper in the technic room.
<b>Personal damage - number of injured persons:</b> 0
<b>Personal damage - number of killed persons:</b> 0
<b>Material damage:</b> No material damage.
<b>Impact on operation:</b> One metro line was temporally closed.
<b>Impact on structure:</b> No structural damage.
<b>Impact on user:</b> Evacuation of one station. Passengers were not in a risky situation.
<b>Cascading effect:</b> No information available.
<b>Sources:</b> www.berlin.dem, www.bt-berlin.de
<b>Photo(s):</b> (see below)



[www.bild.de](http://www.bild.de)

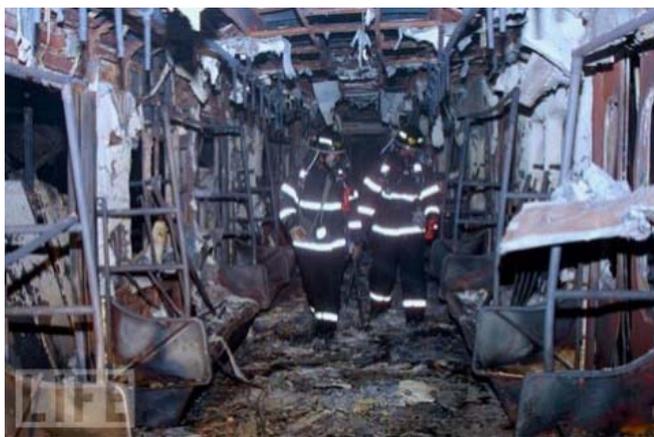
<b>Threat Main Group:</b> Fire
<b>Threat Subgroup:</b> FI-03 Big fire
<b>City, Country:</b> Daegu, South Korea
<b>Operator:</b> Daegu Metropolitan Subway
<b>Date/Period of time:</b> 18 February 2003, during morning rush hour (9:53 a.m.), fire duration: 3 hours
<b>Category according to VDV Guideline:</b> Catastrophe
<b>Location:</b> Train, Station
<p><b>Incident summary:</b> During a suicide attempt, a mentally ill man set a subway train on fire. The man lighted the fire during the morning rush hour while the train drove into the station. He spreaded the flammable liquid all over the ground. Within few minutes, the fire spread to all six coaches and to a second train that had entered the station from the opposite direction. Most of the passengers died in the second train, because they were trapped in.</p> <p>The complete burning of a total of 12 subway coaches generated intense heat and poisonous smoke filled the entire station. The platform had no sprinklers. The fire was suppressed at 1:30 p.m. Due to the intensive and toxic smoke and high temperatures, the rescuers could not enter the station before 4:00 p.m.</p>
<b>Personal damage - number of injured persons:</b> 147
<b>Personal damage - number of killed persons:</b> 192
<b>Material damage:</b> No information available.
<b>Impact on operation:</b> The duration of restricted operation is unknown.
<b>Impact on structure:</b> The subway station did not suffer major structural damage except for the extensive spalling of the tunnel roof above the central portion of the train, exposing two layers of steel reinforcement. The non-structural damage included the complete destruction of the platform basement and the smoke contamination throughout the station. In addition, two subway trains with a total of 12 passenger coaches were completely destroyed.
<b>Impact on user:</b> People were trapped in the subway, because the doors were closed. The seats caught fire, sent up toxic fumes, that is how most passengers died during this incident.

**Cascading effect:** There were no fire protection and no sprinklers at the platform level, this caused intensive smoke emission. Inadequate emergency equipment also worsened the disaster. Daegu subway trains were not equipped with fire extinguishers and the stations lacked sprinklers and emergency lighting. Many victims became disoriented in the dark, smoke-filled underground station and died of asphyxiation looking for exits. Emergency ventilation systems were also proved inadequate.

Fire and subway officials in the charred station, where all the victims were killed or injured, described faulty emergency signals, poor communications and misjudgements on the part of subway workers with little or no training in how to cope with such a situation. On the 23rd February 2003 it was revealed that at the machine and equipment control centre of the Daegu Subway Corporation at the time of the Daegu Subway Fire, the warning message of 'fire,' and the alarm were not working, but the employees ignored it.

**Sources:** [www.nytimes.com](http://www.nytimes.com); [www.worldhistoryproject.org](http://www.worldhistoryproject.org); [www.mace.manchester.ac.uk](http://www.mace.manchester.ac.uk)

**Photo(s):** (see below)



[www.railssystem.net](http://www.railssystem.net)



[www.bbc.co.uk](http://www.bbc.co.uk)



[www.eastvalleytribune.com](http://www.eastvalleytribune.com)

<b>Threat Main Group:</b> Fire
<b>Threat Subgroup:</b> FI-04 Cable fire
<b>City, Country:</b> Düsseldorf, Germany
<b>Operator:</b> Rheinbahn
<b>Date/Period of time:</b> 03 November 2011, during morning rush hour (8:15 - 10:30 a.m.)
<b>Category according to VDV Guideline:</b> Emergency
<b>Location:</b> Tunnel
<b>Incident summary:</b> A driver of a metro noticed a burning cable at tunnel wall. He informed immediately the control centre of Rheinbahn, they provide this information immediately to the fire department centre. The fire brigade could extinguish the fire easily. After changing the cable connections, the line were reopened.
<b>Personal damage - number of injured persons:</b> 0
<b>Personal damage - number of killed persons:</b> 0
<b>Material damage:</b>
<b>Impact on operation:</b> Restricted operation during the morning rush hour. Three stations were closed due to the cable fire. The metros had to stop immediately in the stations. All seven metro lines were temporary closed down. During this time the Rheinbahn provide a bus replacement service with 25 busses. After two hours the tunnel system of 6,9 km were opened for public transport. The metro schedule was completely out of order which caused many delays.
<b>Impact on structure:</b> No structural damage.
<b>Impact on user:</b> 10.000 passengers were affected by the cable fire. Three stations were evacuated. With loudspeaker announcements the Rheinbahn provide information to users. Employees of the Rheinbahn were guiding the users to the exists.
<b>Cascading effect:</b> No information available.
<b>Sources:</b> www.nrz.de, www.rp-online.de, www.express.de
<b>Photo(s):</b> (see below)



[www.rp-online.de](http://www.rp-online.de)



[www.express.de](http://www.express.de)

<b>Threat Main Group:</b> Collison
<b>Threat Subgroup:</b> DM-01 with obstacles
<b>City, Country:</b> Vienna, Austria
<b>Operator:</b> Deutsche Bahn (DB)
<b>Date/Period of time:</b> 23. September 2016
<b>Category according to VDV Guideline:</b> Emergency
<b>Location:</b> Running tunnel
<b>Incident summary:</b> An ICE got stuck in the tunnel "Stierschweiffeldtunnel" because of a collison with an obstacle. A Russian train lost a door on the track and the ICE drove over it. The door stucked in the bogie of the train and it had stop. 70 fire men were involved.
<b>Personal damage - number of injured persons:</b> 0
<b>Personal damage - number of killed persons:</b> 0
<b>Material damage:</b> No information available.
<b>Impact on operation:</b> One route (Westbahnstrecke) was blocked for several hours. The passengers were brought with busses to the next station, where they could take the next train. Several trains were rerouted/redirected.
<b>Impact on structure:</b> No structural damage.
<b>Impact on user:</b> 287 passengers had to be evacuated with the help of the fire brigade (70 fire men). It took 45 minutes to evacuate the passengers to the emergency exit. The evacuation procedure went well and disciplined.
<b>Cascading effect:</b> No information available.
<b>Sources:</b> www.usertirol24.com
<b>Photo(s):</b> (see below)



[www.noen.at](http://www.noen.at)

<b>Threat Main Group:</b> Technical failure
<b>Threat Subgroup:</b> TF-08 loss of power supply
<b>City, Country:</b> Moscow, Russia
<b>Operator:</b> Moscow Metro
<b>Date/Period of time:</b> 15 July 2014, during morning rush hour (8:40 a.m.)
<b>Category according to VDV Guideline:</b> Catastrophe
<b>Location:</b> Tunnel
<b>Incident summary:</b> The train derailed between Slaviansky Boulevard and Park Pobedy (Victory Park) stations in the west of the city. A loss of electrical power has caused the derailling. The derailment also caused a massive power outage on the line; another train, which was located in the tunnel at the time of accident some 200 metres from Slavyansky Bulvar, was also stuck, and passengers had to be evacuated.
<b>Personal damage - number of injured persons:</b> 160 (estimated)
<b>Personal damage - number of killed persons:</b> 24
<b>Material damage:</b> No information available.
<b>Impact on operation:</b> The derailment closed one of the heaviest-travelled lines of the Moscow Metro, the Arbat-Pokrovsky line. The line carries about 733.000 passengers per day. Trains between the two stations were suspended for at least two days. It took around 24 hours to eliminate the damage caused by the accident.
<b>Impact on structure:</b> No information available.
<b>Impact on user:</b> More than 1150 people were evacuated from the tunnel between the two metro stations. Surviving passengers, who were unable to cross the debris, were evacuated through several construction drifts leading to the surface shaft. The station "Park Pobedy" is one of the deepest metro station in Moscow, 84m underground, which made the rescue operation particularly hard. The escalators are over 100 m long and take several minutes to reach the surface. All passengers were evacuated from the affected stations by midday.
<b>Cascading effect:</b> Panic broke out among the passengers. Some of them took the emergency hammers and smashed their way out. They were accompanied through the tunnel by construction workers. Passengers walked through the tunnel to safety.

**Sources:** [www.nytimes.de](http://www.nytimes.de); [www.theguardian.com](http://www.theguardian.com); [www.tass.com](http://www.tass.com)

**Photo(s):** (see below)



[www.japantimes.co.jp](http://www.japantimes.co.jp)



[www.cnn.com](http://www.cnn.com)

<b>Threat Main Group:</b> Hoax
<b>Threat Subgroup:</b> HX-01 Explosion
<b>City, Country:</b> Moscow, Russia
<b>Operator:</b> Moscow Metro
<b>Date/Period of time:</b> 13 September 2017
<b>Category according to VDV Guideline:</b> Crisis
<b>Location:</b> Station
<b>Incident summary:</b> A wave of anonymous hoax bomb threats (65 calls) hit the cities across Russia. The calls were reportedly made via the internet. A criminal investigation has been launched into the wave of hoax calls. But all of them proved to be false.
<b>Personal damage - number of injured persons:</b> 0
<b>Personal damage - number of killed persons:</b> 0
<b>Material damage:</b> No material damage.
<b>Impact on operation:</b> Three stations were closed and evacuated. The duration of restricted operation is unknown.
<b>Impact on structure:</b> No structural damage.
<b>Impact on user:</b> The bomb hoaxes lead to evacuation of 100.000 people in stations, public buildings, airports, universities, hospitals and hotels.
<b>Cascading effect:</b> No information available.
<b>Sources:</b> www.theguardian.com
<b>Photo(s):</b> (see below)



[www.theguardian.com](http://www.theguardian.com)

<b>Threat Main Group:</b> Durability issues
<b>Threat Subgroup:</b> ND-01 Flooding
<b>City, Country:</b> Manhattan, USA
<b>Operator:</b> Metropolitan Transit Authority (MTA)
<b>Date/Period of time:</b> 29 October 2012
<b>Category according to VDV Guideline:</b> Catastrophe
<b>Location:</b> Running Tunnels, Stations
<b>Incident summary:</b> Hurricane Sandy swept across New York, New Jersey and Connecticut. Sandy's impacts included the flooding of the New York City Subway system, of many suburban communities, and of all road tunnels entering Manhattan except the Lincoln Tunnel.
<b>Personal damage - number of injured persons:</b> unknown
<b>Personal damage - number of killed persons:</b> > 90 (in general, not in underground systems)
<b>Material damage:</b> The Metropolitan Transportation Authority (MTA) estimates that Sandy caused \$5 billion dollars in losses: \$4.75 billion in infrastructure damage and a further \$246 million in lost revenue and increased operating costs
<p><b>Impact on operation:</b> The raging waters seriously affected the city's subway system and the region's transportation network: Trains didn't run for days, seven subway tunnels and six bus garages were flooded and many stations submerged, signals and switches were fried. The hurricane caused a complete network shut down for up to four days. The biggest problems took place in tunnel connecting Manhattan to Queens and Brooklyn under the East River.</p> <p>Three years after the hurricane, repairs are still underway across the system, which some say remains vulnerable.</p> <p>The MTA announced that all subway, bus and commuter rail service would be suspended, beginning at 7 p.m. EDT on October 28 and expected to continue suspension through at least October 30. All PATH train service and stations were shut down at 12:01 a.m. October 29. 200 National Guard troops were deployed in the city. All bus carriers at the Port Authority Bus Terminal closed at 3 a.m. October 29.</p>
<b>Impact on structure:</b> The flooding caused corrosion to the signal systems of the trains. Some pieces of equipment just needed to be cleaned, others must be replaced. To order or deliver this equipment needed some time.

**Impact on user:** No information for underground systems available.

**Cascading effect:** After the hurricane, there had been a few new inventions. One of them is Flex-Gate, a big sheet of waterproof fabric designed to cover subway entrances and keep the water out.

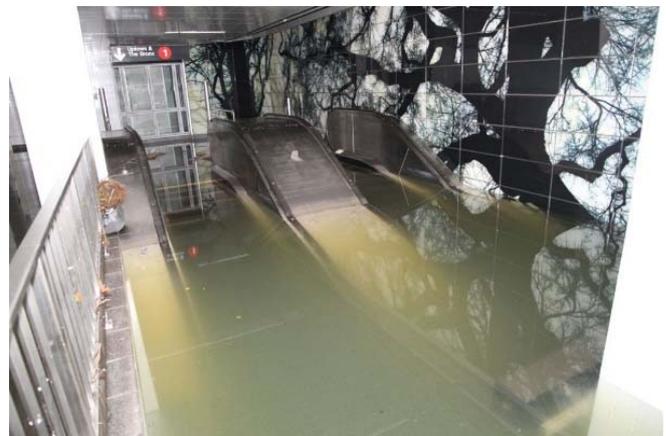
The NY subways system is used by around five million commuters a day. The closing of the network had massive repercussions for the city's economy.

**Sources:** [www.nytimes.com](http://www.nytimes.com), [www.huffingtonpost.com](http://www.huffingtonpost.com)

**Photo(s):** (see below)



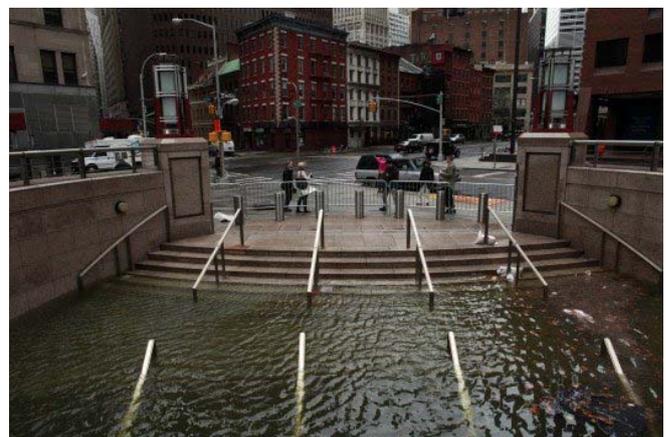
[www.nuw.softpedia.com](http://www.nuw.softpedia.com)



[www.blogs.ei.columbia.edu](http://www.blogs.ei.columbia.edu)



[www.gaytoday.com](http://www.gaytoday.com)



[www.archdaily.com](http://www.archdaily.com)

<b>Threat Main Group:</b> Flooding
<b>Threat Subgroup:</b> ND-01 Flooding
<b>City, Country:</b> Prague/Czech Republic
<b>Operator:</b> Pražské metro
<b>Date/Period of time:</b> 12. & 13. August 2002
<b>Category according to VDV Guideline:</b> Crisis
<b>Location:</b> Subway Shaft, Running Tunnels, Stations
<b>Incident summary:</b> In August 2002 Prague was flooded. It was one of the biggest natural disasters and the worst flood Prague experienced since 500 years. Especially the underground system was affected.
<b>Personal damage - number of injured persons:</b> unknown
<b>Personal damage - number of killed persons:</b> 17 people (in general, not in underground systems)
<b>Material damage:</b> 280 Mio €
<b>Impact on operation:</b> All three metro lines were affected, especially Line B (yellow line). Parts of the network were closed for several months. The stations in the city centre could not be used anymore. Passengers had to use busses and tramways, which were often crowded during rush hour. A part of the underground system and first stations were reopened after two months. Line C was reopened the first. In line B, repair work lasted the longest. It took seven months to reopen all metro stations.
<b>Impact on structure:</b> Big part of the network was damaged; 18 stations and tunnel with track length of 20 km (39% of the entire route) were flooded. Not only the station close to the river Moldau were damaged, but also stations which were far away from the river (see picture below). Several electrical equipment, cables, 107 escalators and 23 elevator had to be renewed.
<b>Impact on user:</b> No information available.
<b>Cascading effect:</b> No information available.
<b>Sources:</b> www. mdr.de
<b>Photo(s):</b> (see below)



[www.radio.cz](http://www.radio.cz)