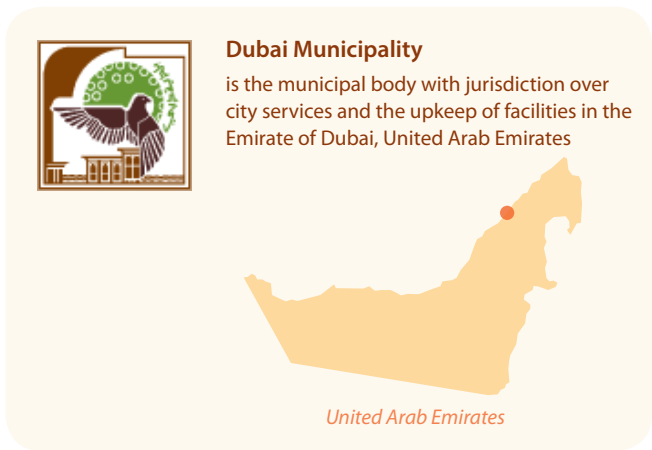


Early Warning System

DUBAI MUNICIPALITY

Tender:	IMS Road Weather Information System
1st extension:	Sandstorm Forecasting System
2nd extension:	Early Warning System
Client:	Dubai Municipality
Contractor:	Unique System FZE



IMS Road Weather Information System

After a serious car accident in March 2008, Dubai Municipality decided to purchase and install a fog early warning and forecasting system. MicroStep-MIS has been chosen by Dubai Municipality to realize this project. We have managed to build a unique and complex Road Warning System for the Municipality of Dubai. The system was installed in 2009 and is operating properly till today.

"MicroStep-MIS decided to use Biral's SWS100. In spite of the fact that at the time of the tender it was a fairly new product, we had an excellent long-term experience with the HSS series of sensors; therefore we expected the SWS100 would be of a similar quality. After long-term operation we can confirm that our expectations were fulfilled. We haven't had any problems with the installed visibility sensors," says Jozef Omelka, Managing Director, MicroStep-MIS.

IMS Road Weather Information System consists of meteorological stations strategically located alongside the

highways. Specialized cutting-edge hardware equipment and software continuously analyze the weather and visibility and provide inputs for the forecasting models.

The system integrates:

- 8 Automatic Road Weather Stations
- 5 Existing weather stations
- Offshore Buoy

The data-center performs a continuous monitoring & analysis and provides a comprehensive up-to-date online data 24 hours a day.

"The information is used by government departments, initially by Dubai Police and Coastal Guards. It helps them to take appropriate action in case of low visibility and fog. They are able to warn drivers about fog conditions in order to prevent road accidents," confirmed Mohammad Mashroom, Director of Survey Department of Dubai Municipality for Gulf News.



Real-time weather and forecast information

The actual values of temperature, relative humidity, rainfall, water level, as well as, wind speed & direction in different parts of the Municipality are provided every two minutes, ensuring up-to-date data for the traffic safety. Road stations improve timeliness of maintenance actions, increase winter maintenance efficiency, and minimize the traveling public's exposure to hazardous weather-related roadway conditions.

Modeling and Forecasting

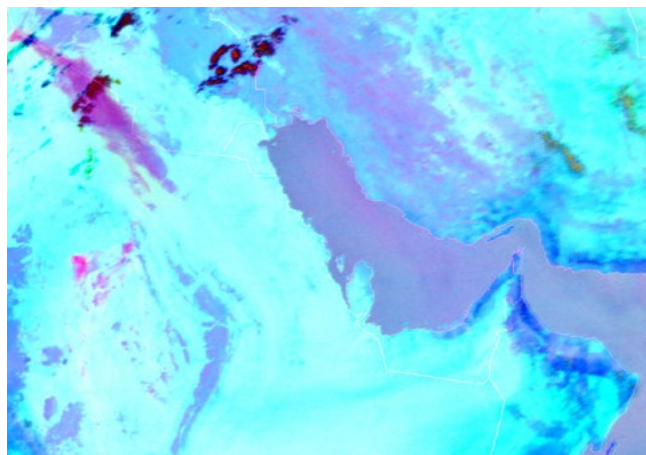
The fog forecasting models provide a local visibility forecast and prediction of fog evolution in the traffic areas. It further provides an early warning of possible formation of water fog.

The system provides excellent results. In a one year test, the forecasts creation, supported by all components of the system, achieved success in fog forecasting at 95% (the probability of detection score) with only 18% of false alarms.



From the media:

- Khaleej Times – Dubai gets own fog monitoring stations
http://www.khaleejtimes.com/displayarticle.asp?xfile=data/theuae/2012/January/theuae_January65.xml§ion=theuae&col=
- Gulfnews – New system to prevent fog-related accidents
<http://gulfnews.com/news/gulf/uae/environment/new-system-to-prevent-fog-related-accidents-1.960903>
- Ame Info – Dubai Municipality delegation visits Slovakia to study about fog control
<http://www.ameinfo.com/281444.html>



Comparison of predicted sandstorm (on the left) with satellite image (on the right) 02.10.2013 10:00 UTC

Sandstorm Forecasting

In spite of the fact that sandstorms occur naturally, they can pose a great health hazard to human societies living near the desert regions. A sandstorm is a situation occurring when the horizontal visibility is reduced due to the sand and dust in the air below 1000 m.

Our challenge was to predict the dust event which reduces visibility below 3000 m at least 2 hours in advance. Sand and dust in the air during such situations can cause inconvenience to people with respiratory health problems. The problem is exacerbated in the Arabian Peninsula as it experiences frequent sandstorms.

This was the main reason behind Dubai Municipality starting the sandstorm prediction project. It was an extension to the existing Fog Monitoring and Forecasting

System. The system is based on a 3D weather prediction model. It is further integrated with a model for sand source areas that were transported by wind and settled.

Eng. Mohamed Mahmoud Mashroom, the Director of Survey Department of Dubai Municipality commented on this occasion *"We are very proud of the results of this project which is not only useful to our department but also to the whole nation and for the people living here."*

Sandstorm modelling is part of the web based Dubai Municipality visibility monitoring system which consists of:

- 15 AWS (2 of the stations are sea buoys)
- UDCS/CLDB Database
- Weather prediction model
- Fog prediction model
- Sandstorm prediction model

Smartphone application

Najm Sohail, is the name of the Weather Early-Warning application that visualizes sandstorm forecast in Dubai with a lead of up to two days.

Thanks to this mobile application, people can now anticipate dust/sand storm conditions in Dubai, 48 hours in advance with just a click on their smart phones.

The mobile application aims at helping residents to pre-plan their outdoor activities, inform allergy and asthma sufferers about potential health risks, and also warn motorists about the visibility conditions on the roads.



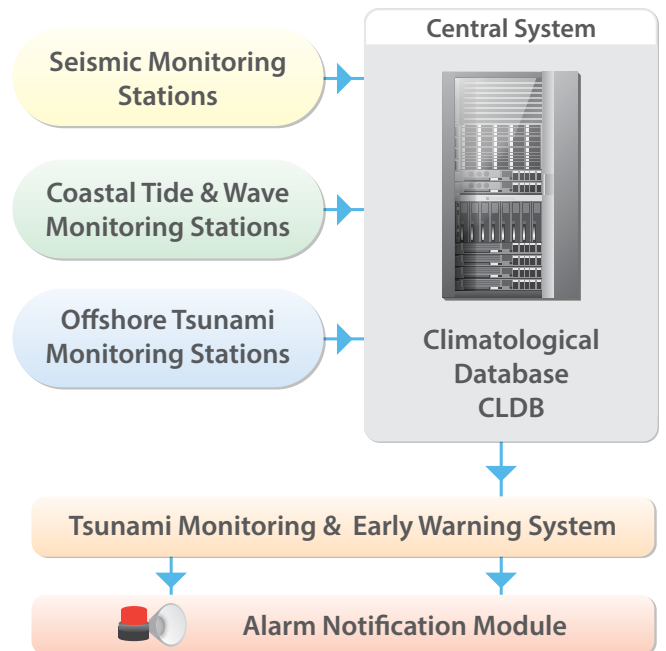
On the left: Decreased visibility due to the sand and dust in the air at Al Mamzar station on 16.03.2014
 On the right: Normal visibility at Al Mamzar station on 17.03.2014

Tsunami Early Warning System

Tsunami is a series of waves in a water body caused by the displacement of a large volume of water. Earthquakes, volcanic eruptions, landslides, and other disturbances above or below water all have the potential to generate a tsunami. A 100 year historical database indicates that an average of 6 tsunamis occur per year and are able to carry their destructive power across large coastal areas.

The Tsunami Monitoring System is composed of

- Seismic monitoring stations
- Coastal tide & wave monitoring stations
- Offshore tsunami monitoring stations
- Central station for integrated Tsunami Monitoring & Early Warning System with central data collection and a database established at the Dubai Municipality
- Development of Tsunami monitoring & tidal model for tides & surface current



Radar Installation

Mini Meteorological Radar MMR is a unique portable X-band weather radar that provides real time insight into a weather situation for a range up to 200 km.

The radar by MicroStep-MIS more than satisfies the needs of Dubai Municipality for rain monitoring. It can be further used for watersheds management, global warming adaptation strategies, flood protection, operative weather forecast, and aviation safety.

Thanks to the MMR, it is possible to measure cyclones and nowcast the local storms that cannot be predicted by the modelling system.



Tidal Modeling

The model used by the DM is a numerical Model (hydrodynamic model) which is associated with a numerical grid covering a specific spatial domain to predict the motion of the water.

Output includes water surface elevation, position Information, and current velocity. The model output fileformat is in a form known as 'NetCDF'.



Seismic Modeling

Seismological monitoring system is a package of products for data acquisition, archival, and management of seismic networks.

The system provides a comfortable access to regular tasks in seismic network operation.



Challenge

- Improve safety by comprehensive fog predictions
- Rapid development, integration & delivery

Our solution

- Unique and highly complex system
- Emerging technology installation
- Monitoring & forecasting solution preventing road accidents
- Alerts on low visibility due to sandstorm in advance

Achievements

- Wide utilization of the system
- High success in predictions
- Fast delivery
- Fully operational system which provides sand event forecast 48 hours in advance
- Helps to prevent road accidents & take precautions