Roadway crashes related to vision obstruction due to fog and smoke conditions constitute a challenge for traffic engineers. Previous research efforts only concentrated on the snow and rain related crashes. Statistics show that Florida is among the top three states in terms of crashes due to vision obstruction by fog/smoke. This research culminated in a comprehensive study of fog and smoke related crashes in the state of Florida.

The general characteristics of fog/smoke related crashes have been investigated in detail. For the comparison to clear visibility conditions, simple odds ratios (in terms of crash frequencies) have been introduced. The morning hours in the months of December to February are found to be the prevalent times for fog related crashes, for smoke it was May. Compared to crashes under clear-visibility conditions, the fog crashes tend to result in more severe injuries and involve more vehicles. Head-on and rear-end crashes are the two most common crash types in terms of crash risk and severe crashes.

The spatial analysis by GIS examines the locations of high trends of fog/smoke related crashes on state roads in the State of Florida. Statistical features of the GIS tool, which is used efficiently in traffic safety research, has been used to find the hotspots for the particular types of crashes that occur due to vision obstruction by fog/smoke. Several segmentation processes have been exhausted, and the best segmentation for this study was found to be dividing the state roads into 1 mile segments, keeping the roadway characteristics uniform. Taking into account the entire state road network, ten distinct hotspots were found that can be clearly associated with these types of crashes. However, no clear pattern in terms of area was observed, as it was seen that the percentage of fog/smoke related crashes in rural and urban areas are close.

For the injury severity analysis, a random effect model was used. The model in brief illustrates that the head-on and rear-end crash types are the two most prevalent crash types in fog/smoke conditions. Moreover, these severe crashes mainly occurred at higher speeds. Also they mostly took place on undivided roads, roadways without any sidewalk and two-lane rural roads. Increase of average daily traffic decrease the severity of fog/smoke related crashes.

Overall, this study provides the Florida Department of Transportation (FDOT) with specific information on where improvements must be made to have better safety conditions in terms of vision obstruction due to fog/smoke in the state roads of Florida. Also it suggests the times and seasons that the safety precautions must be taken or the fog/smoke warning systems to be installed, and the controlling roadway geometries that can be improved or modified to reduce injury severity of a crash due to fog or smoke related vision obstruction.

Major: Civil Engineering

Educational Career:  
Bachelor’s of Civil Engineering, BS, 2006, Bangladesh University of Engineering and Technology

Committee in Charge:  
Dr. Mohamed Abdel-Aty, Chair, Department of Civil, Environmental and Construction Engineering  
Amr Olofua, Department of Civil, Environmental and Construction Engineering  
Dr. Helai Huang, Department of Civil, Environmental and Construction Engineering

Approved for distribution by Dr. Mohamed Abdel-Aty, Committee Chair, on September 25, 2009.
The public is welcome to attend.