

FIG

FIG WORKING WEEK 2017

Helsinki Finland

29 May - 2 June 2017

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Service Area Capability of Emergency Units Based on Traffic Accidents; Case Study of Samsun

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SAMSUN

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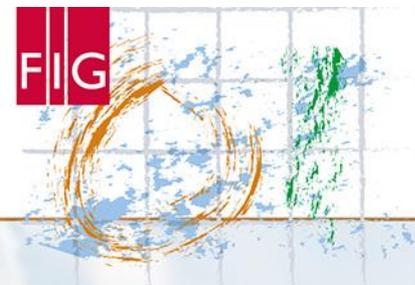


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Emergency

Accidents and emergency medical cases are a part of the human life. Studies have shown that 10% of deaths following an accident or injury take place in the first 3–5 mins, and 54%–60% within the first 30 mins. Thus, emergency services must send a vehicle to the scene of a medical emergency as fast as possible



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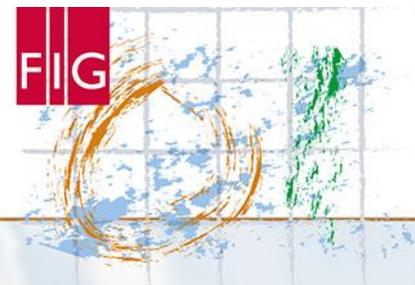


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Traffic Accidents

Depending on the increase in the number of vehicles, per year a millions of traffic accidents occur at the last decade. A thousands of humans die or injured in this accidents.



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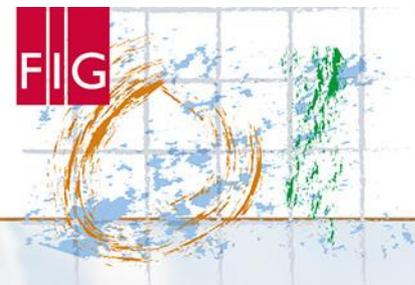


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When an accident occurred, ambulances and fire vehicles first come to mind as an emergency response team. It is having important role for performing emergency response facilities in a shortest time by the team of experts. Besides expert teams and modern equipments, real time instant conditions must be considered.



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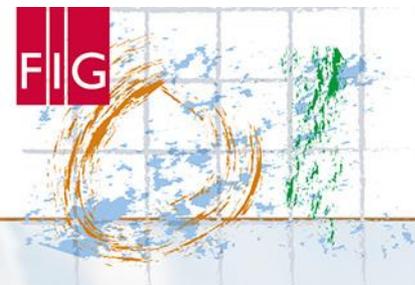


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Response Time



The response time is a critical component in the control and mitigation of an emergency incident. The response time is the manageable segment of time within the entire sequence, it includes alarm answering time, alarm processing time, turnout time, travel time and initiating action/intervention time.

Most of the factors affecting travel time cannot be controlled, but determining the best locations of medical emergency stations and fire stations for a particular area could reduce the response time.



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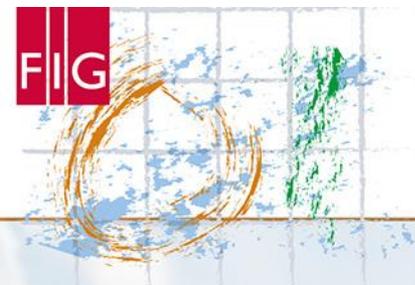


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The ambulance industry has suggested that emergent ambulance responses meet a response time criterion of **≤ 8 mins** for at least 90% of all calls (Pons and, Markovchick, 2002). Pell et al (2001) calculated that a reduction in response time from 14 mins to 8 mins in 90% of all calls would increase survival following cardiac arrest from 6% to 8%.

Response time is one of the most important indicators of preventing the damages and injuries caused by fire as in emergency cases. According to the NFPA after 8 minutes the fire starts to extend outside the room without sprinklers where it began. In this study 8-minute response time was used.



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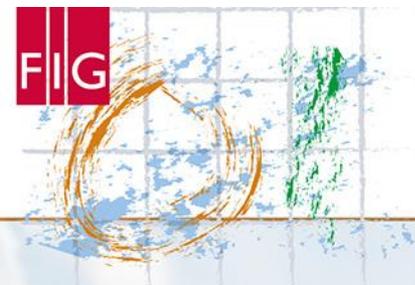


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Average Speed



Travel time is the major factor which affect the response time. But, travel time is affected by various factors; such as traffic volume, driver habits, quality of road networks, etc. Average travel speed is one of the most important factors which affect the travel time.

In this study average speed of the different type of roads were determined using vehicle trace system data. The vehicle trace systems collect the position, speed, maximum speed, driver name of the vehicles etc. Average speeds were determined using three months vehicle tracking data for four types of road; main road, street, branch road and alley.

Road Type	Fire Resque (km/h)	Ambulance (km/h)
Main Road	40	50
Street	30	37.5
Branch Road	25	31.25
Alley	15	18.75



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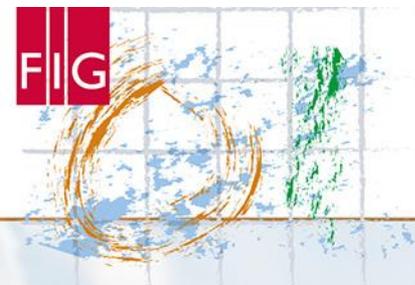


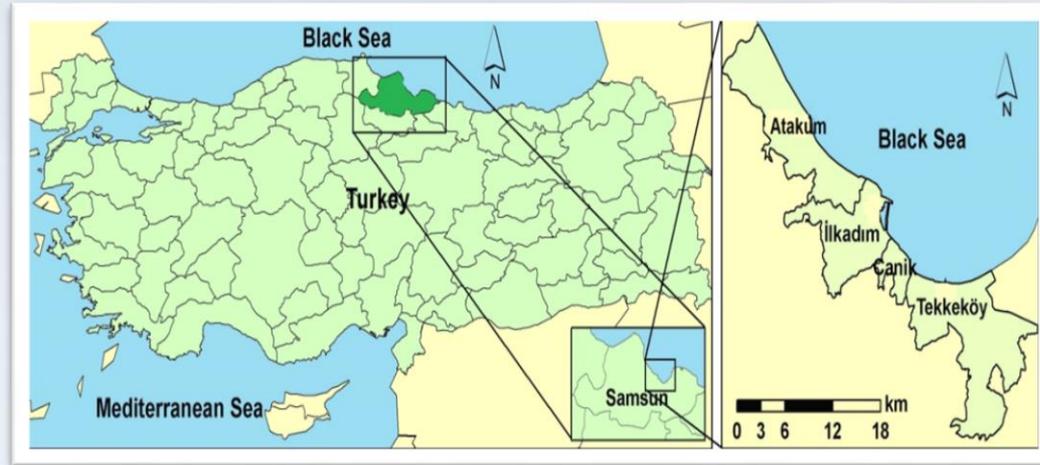
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Study Area



This study was undertaken in Samsun city, which consists of the four districts; Atakum, İlkadım, Canik and Tekkeköy for the traffic accidents resque cases.

Districts	Population	Area (km ²)
Atakum	158031	351
İlkadım	317085	155
Canik	95560	264
Tekkeköy	49579	326



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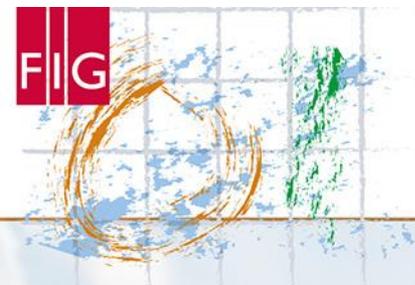


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Emergency Stations and Cases

This study was included nine ambulance stations and three fire stations. Detailed address data (i.e. local district and street) were obtained for all emergency ambulances and fire brigades traffic accidents call out locations. The positional data of the ambulance stations, fire departments and emergency calls were also digitized and uploaded into the ArcGIS 10.1 software and evaluated together according to the response time coverage area.



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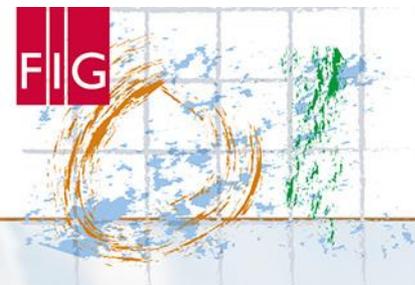


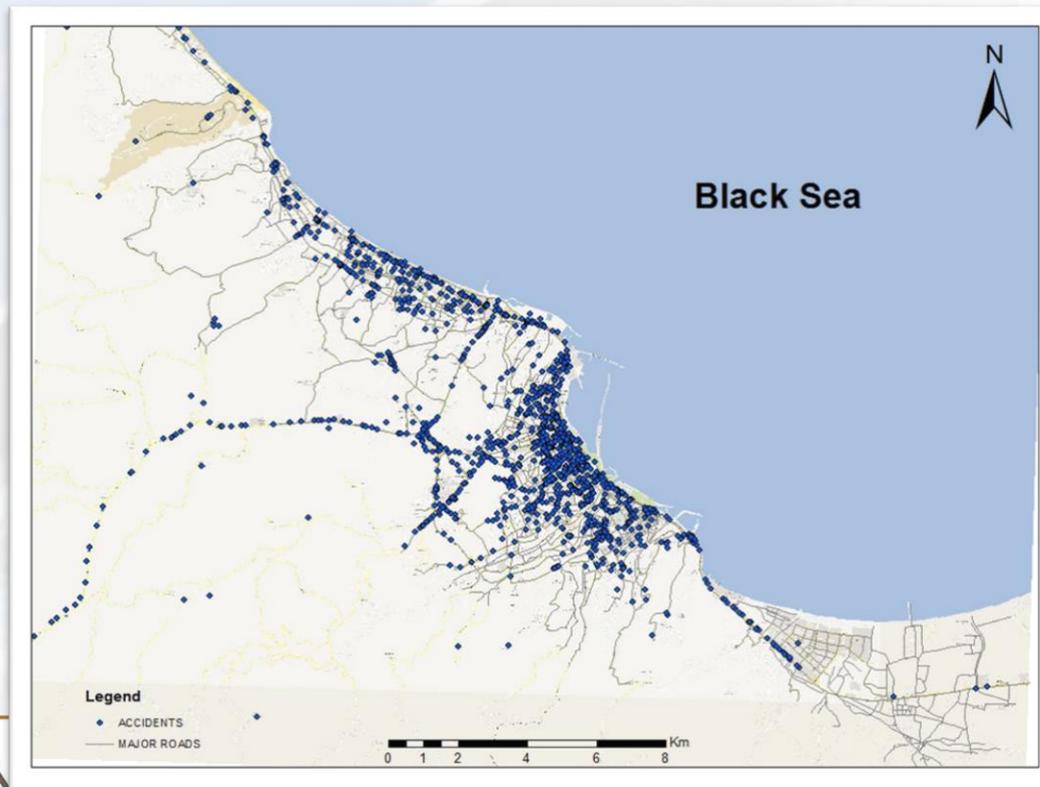
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1509 traffic accidents occurred in 2014. According to statistics about 1500 accidents occur each year in center of Samsun and hundreds of people injured and dozens of them lost their lives in this accidents.



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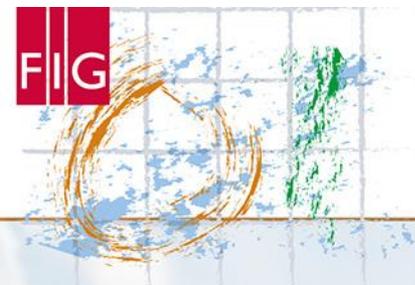


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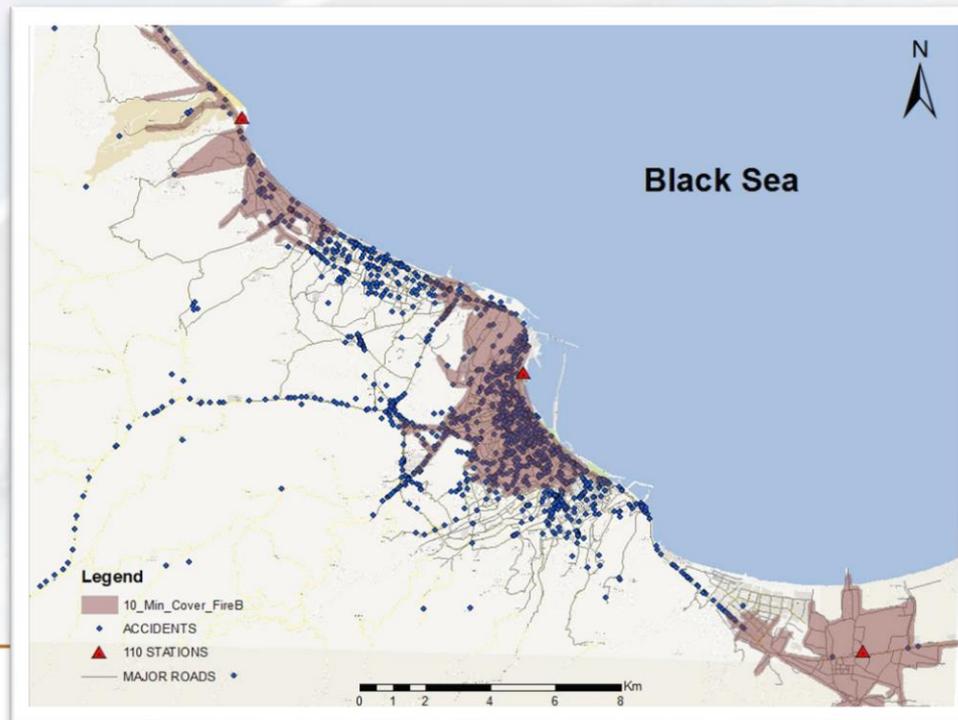
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Fire Stations Coverage

Fire Stations can response 914 per 1509 accidents, its shows us that %60,56 coverage.



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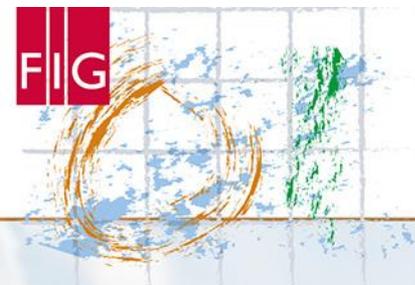


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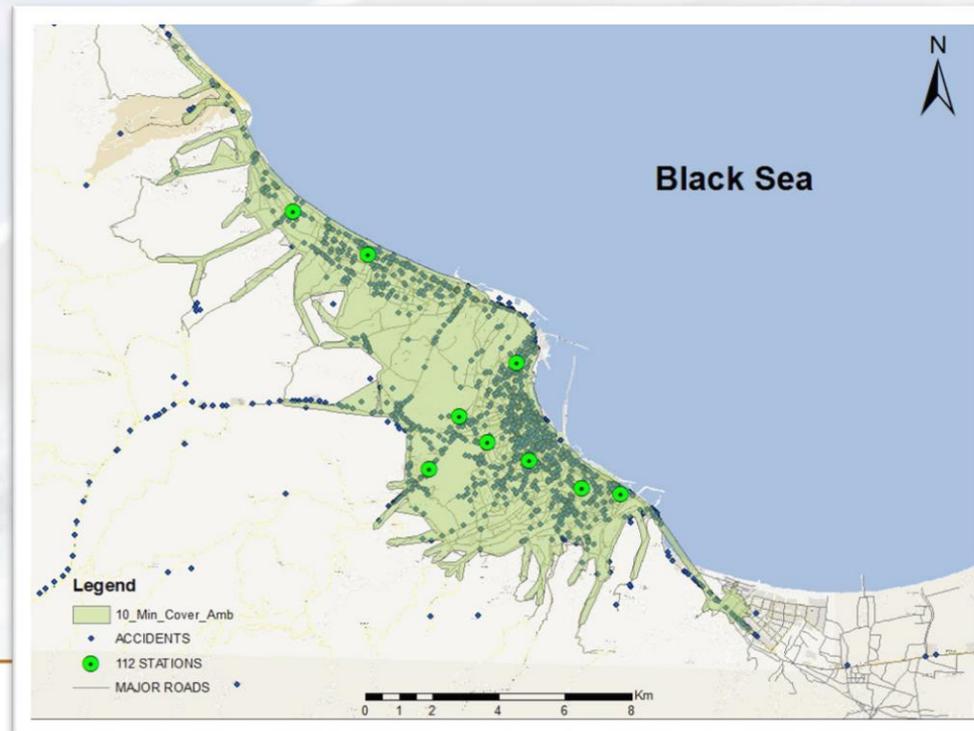
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Ambulance Stations Coverage

Ambulance Stations can response 1401 per 1509 accidents, its mean that **%92.84** coverage.



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Trimble

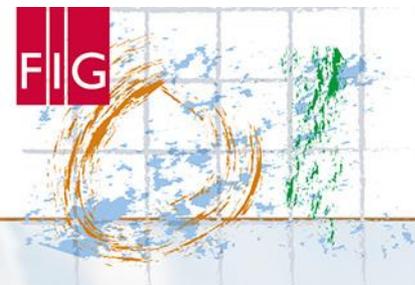


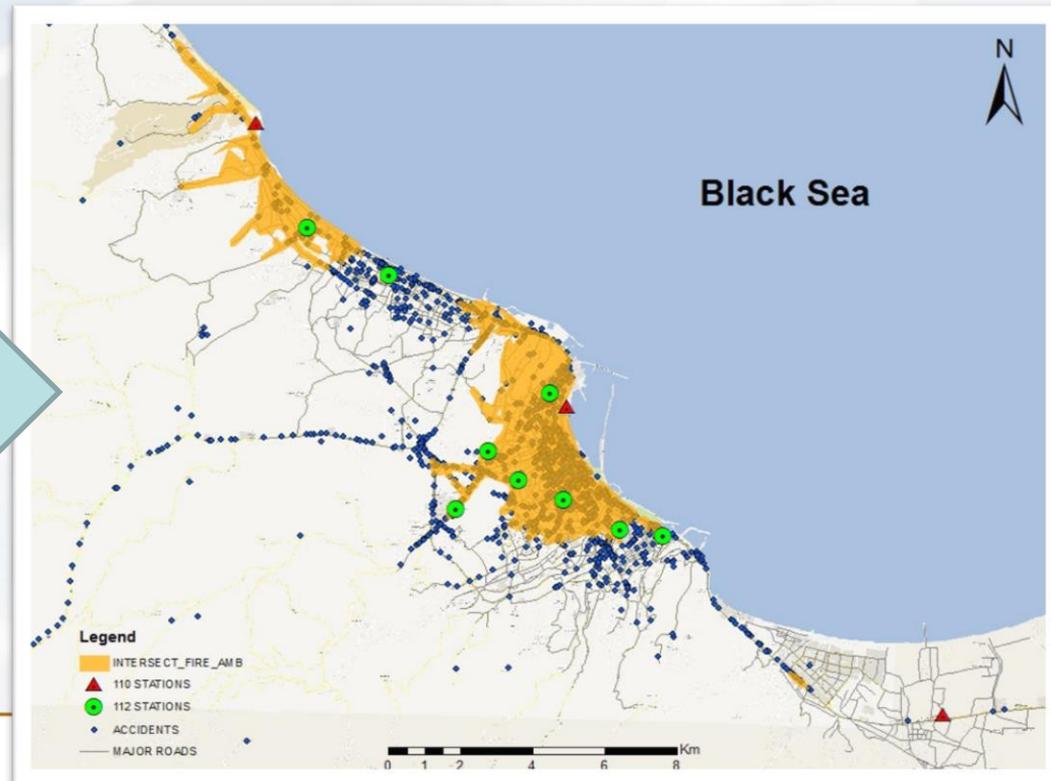
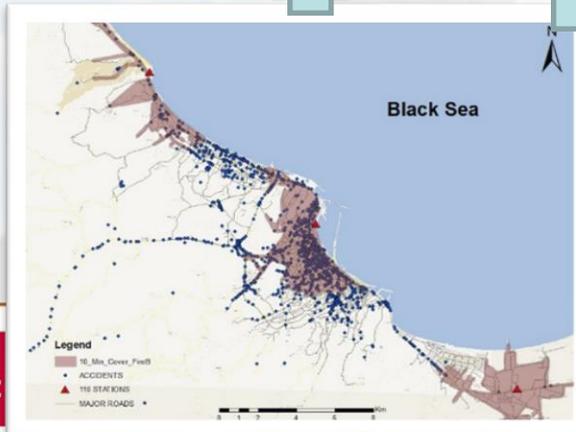
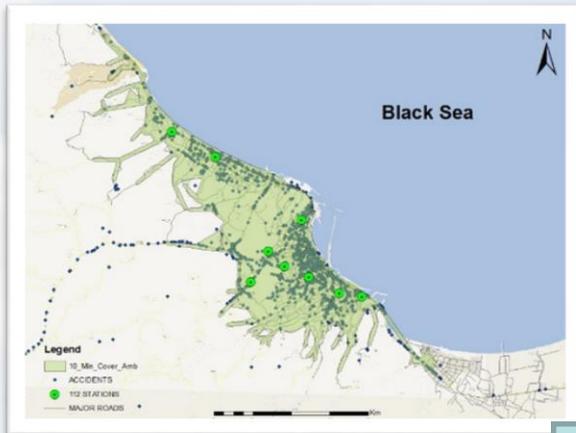
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Intersection Area Coverage %59.50



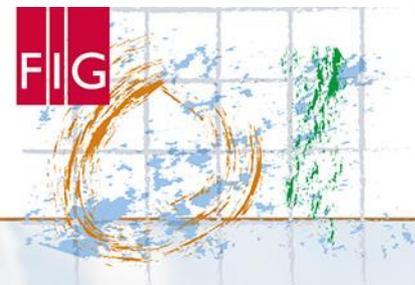


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Results of intersections of coverages areas 898 accidents are in coverage area but 611 accidents out of bounds. %40.49 of accidents are in risky area.

	Cases (per 1509)	Rate (%)
Fire Stations	914	60.56
Ambulance Stations	1401	92.84
Combine	898	59.50



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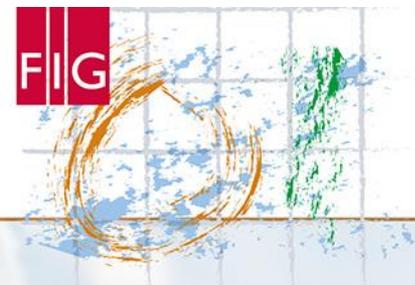


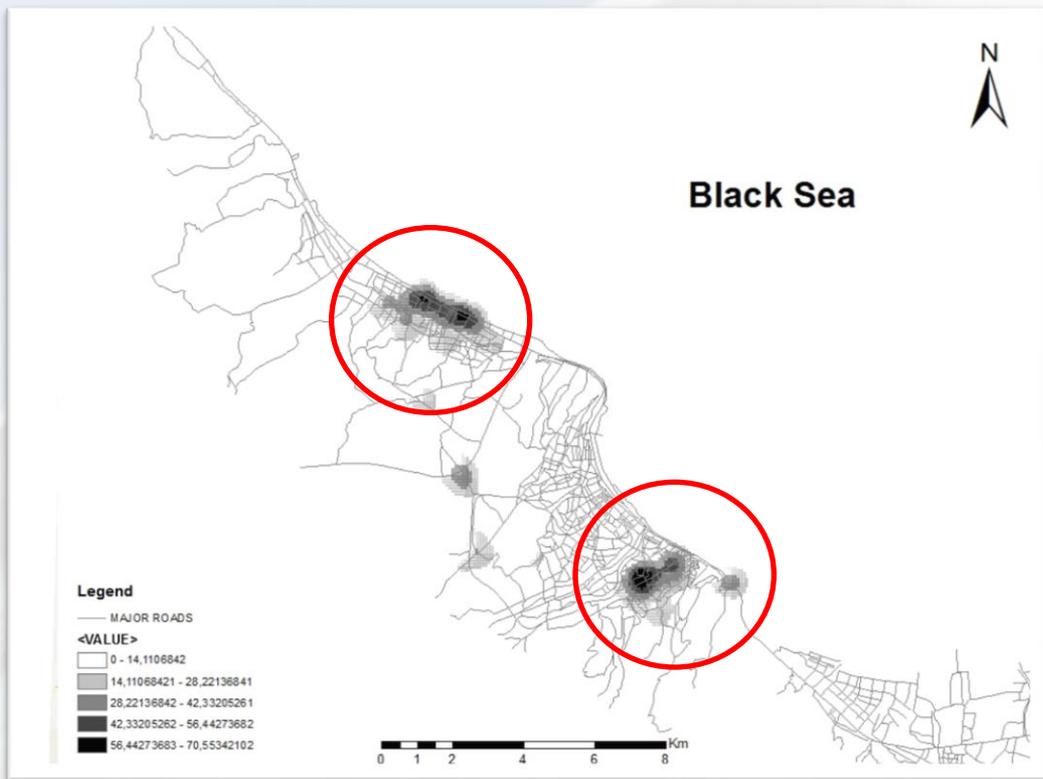
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Non Reachable Areas



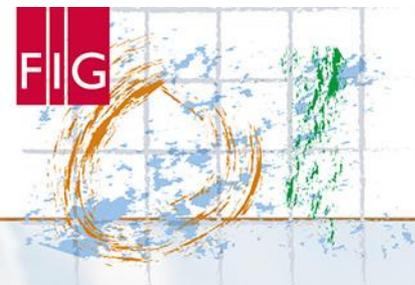


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Results

The primary goal of this study was to evaluate the coverage area of the existing medical emergency and fire stations and to determine the need for new stations according to the response time approach which was determined from the previous work in the literature.

Result of study non-reachable areas determine with density analysis and this indicate new station needs.



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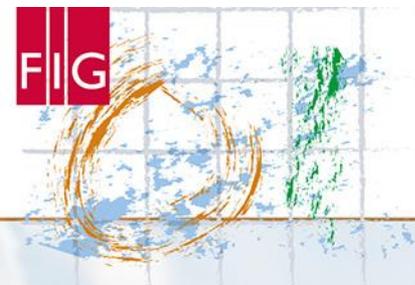


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Thank for your attention.

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