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Optimising the spatial distribution of fire stations in the urban sphere, a case study of Greater Accra Metropolitan Area

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Ghana

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Overview

1 Background

2 GIS, a solution in Emergency Management

3 Spatial distribution of existing fire stations

4 Coverage based on 3 factors

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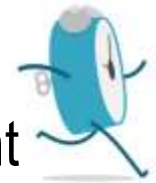
6 Conclusions & Recommendations

- Emergencies and disasters can happen without warning
- But you can be prepared

- The notion of every effective emergency response system is to respond to an emergency as soon as possible to reduce the loss of lives and property



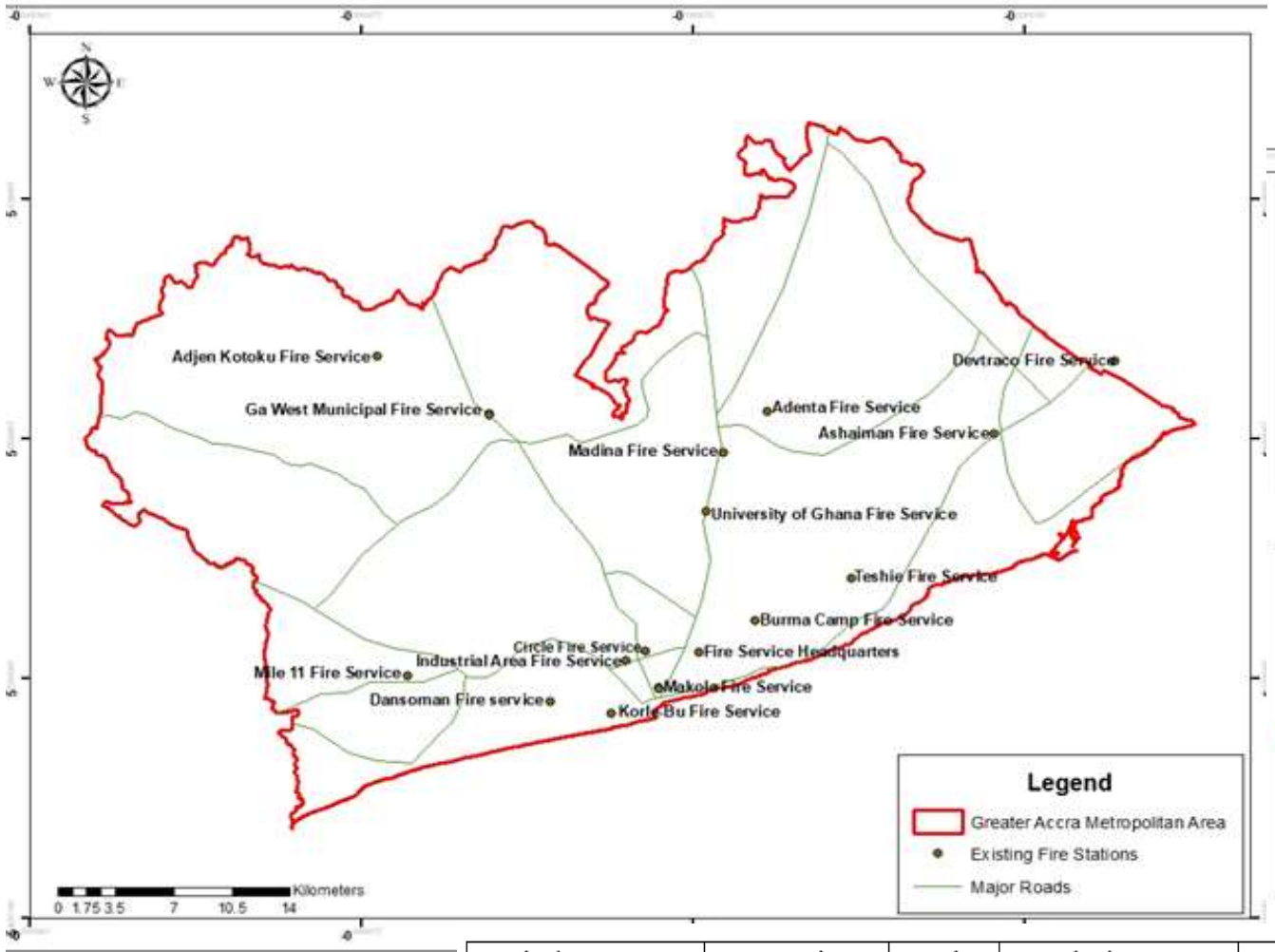
- Time is a crucial element in the development of an emergency response management systems especially in the event of a fire outbreak

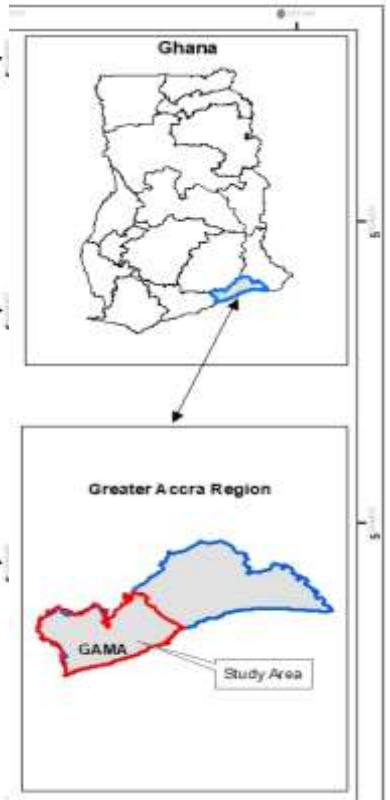
GIS, a solution in Emergency Management

- Emergency planning has been stimulated by recent improvements in geo-technological areas in which an increasing amount of spatial data is required for complex decision-making by emergency responders

- During a fire outbreak, much of the essential information has a spatial component, such as extents and locations of damaged areas, the locations of resources and services or safe transportation routes

Spatial distribution of existing fire stations





- Greater Accra Metropolitan Area (GAMA) is currently made up 28 districts.
- Rapid response to expanding metropolitan regions experiencing significant population increase and urban form change is a concern for fire authorities in Ghana.

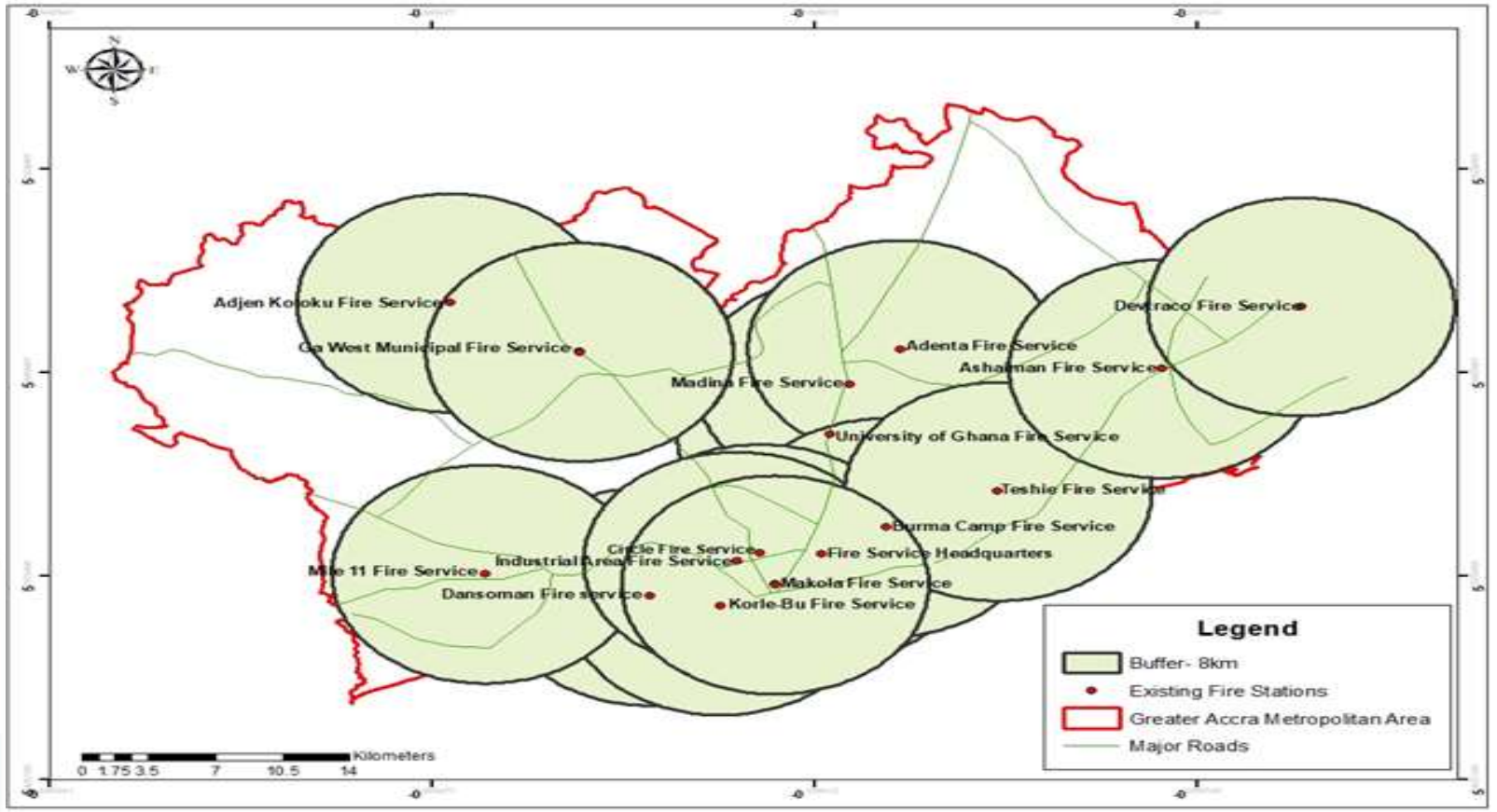
Period (Jan-Oct)	Domestic Fires	Bush Fires	Total Fire incident cases	Casualties Recorded
2019	1,822	608	4,623	222 (died)
2020	1,910	1,220	5,355	1,125 (injured)

Coverage criteria 1

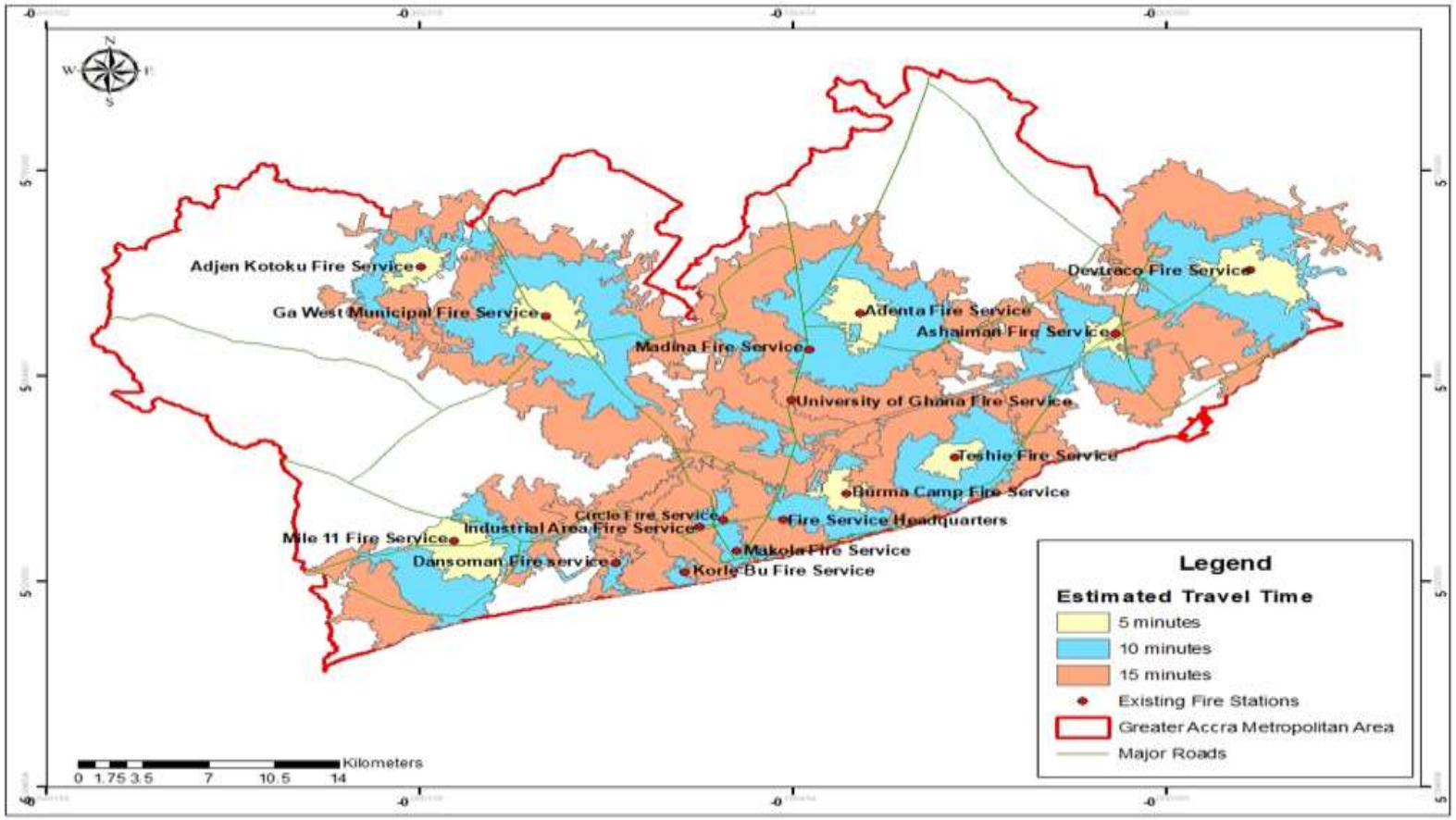
- Using international fire regulation standards, the maximum area coverage is 8 km from the nearest fire station.

Visual interpretation

- Not all areas are within coverage range.



Coverage criteria 2



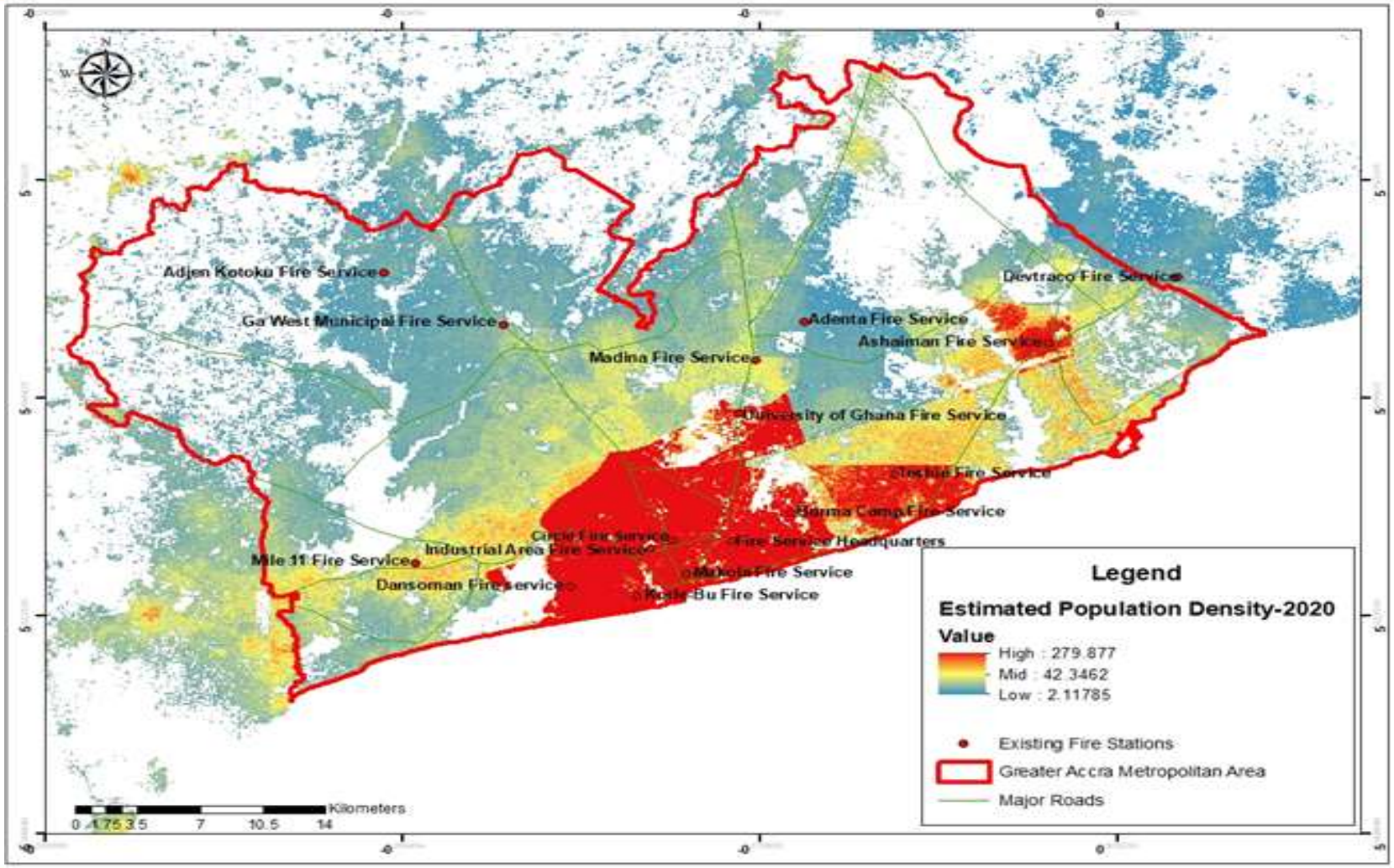
- Fire service stations are to respond to every fire incident within an optimal time of 5 minutes to prevent the damage to lives and property.

Interpretation

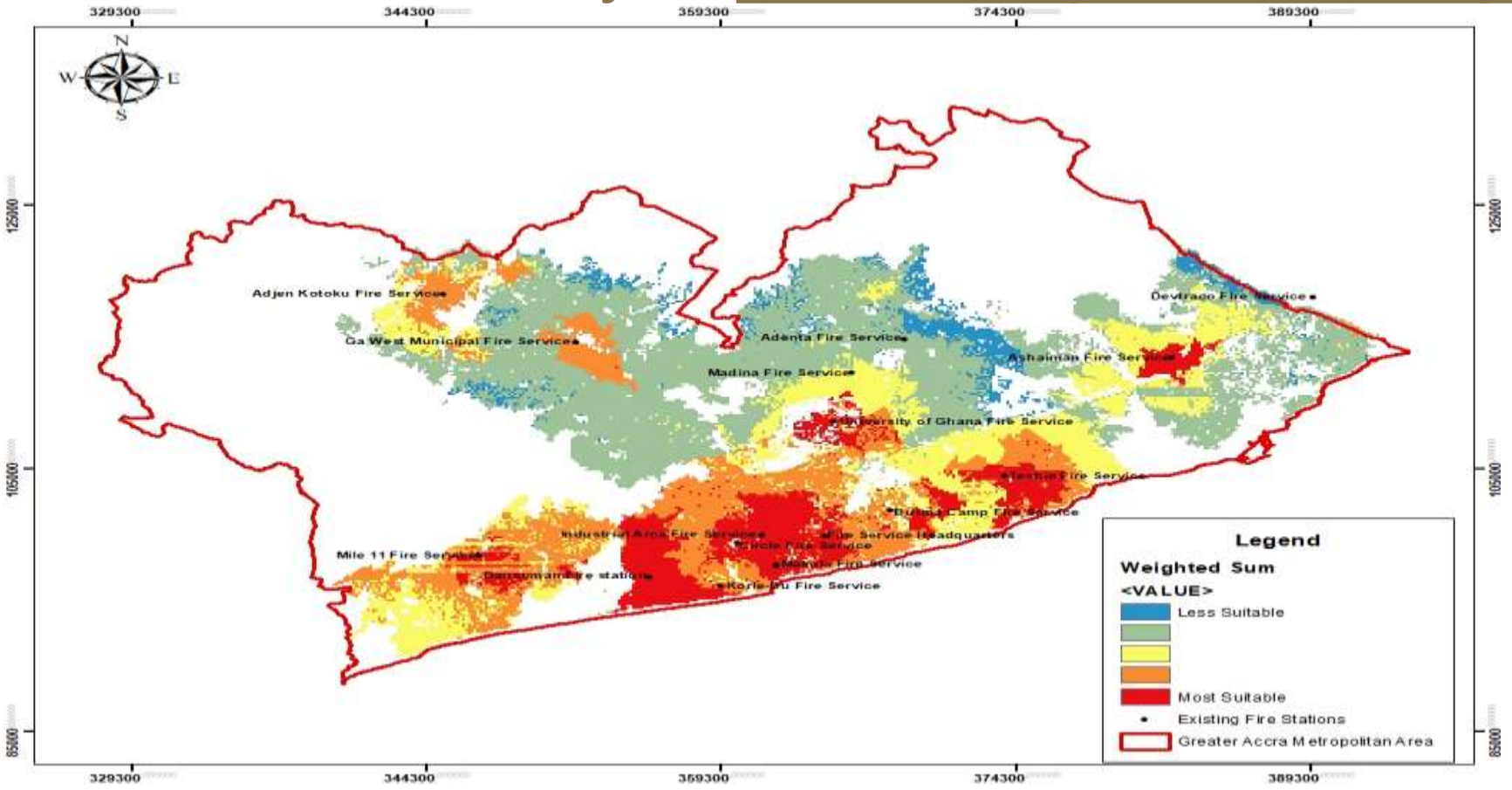
- Yellow regions represent areas of coverage within a 5 minute travel time which covers 8 kilometers and for a 10 minute travel time the average area covered is 2.8 kilometers and is represented in blue

Coverage criteria 3

- A more dense building coverage implies that highly populated regions typically have dwellings on relatively small areas and near to one other, increasing the likelihood of fires and the speed with which they spread.



Predictive analysis- *Site suitability map in locating new fire stations*



Areas identified to site new fire stations include:

- Kwabenya
- Achimota
- Lapaz
- Awoshie
- Gbawe
- Baatsona
- Tema New Town

Effective for fire disaster management and prevention in the GAMA to meet the growing demands of the urban environment

Conclusions & Recommendations

- Though an emergency never arrives with advance notice, we may use this location and GIS integrated mapping system to analyze the geographical position of current fire stations, analyze it, and forecast where new fire stations might be located to help reduce risks during fire outbreaks.