

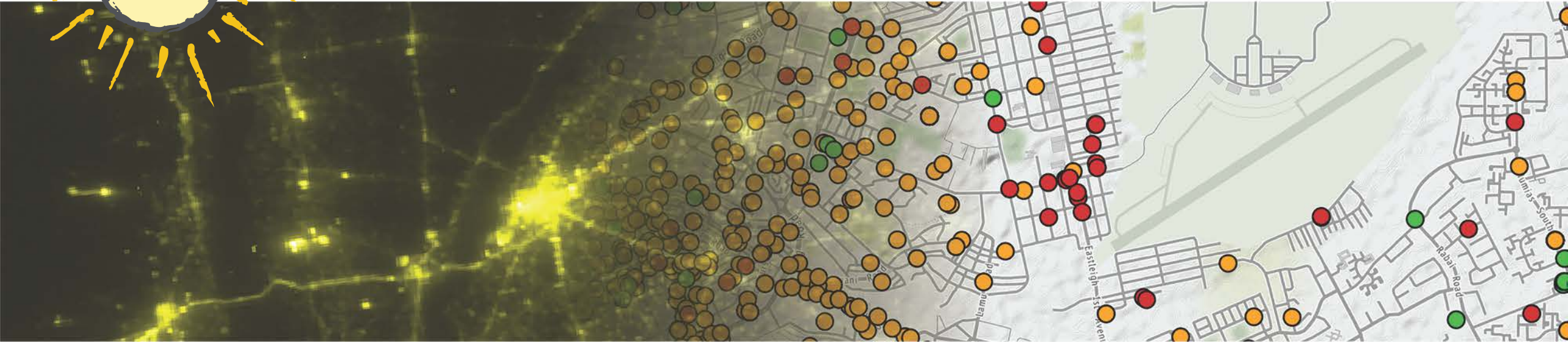


IE CONNECT FOR IMPACT

Transforming the Growth Potential
of Transport Investments

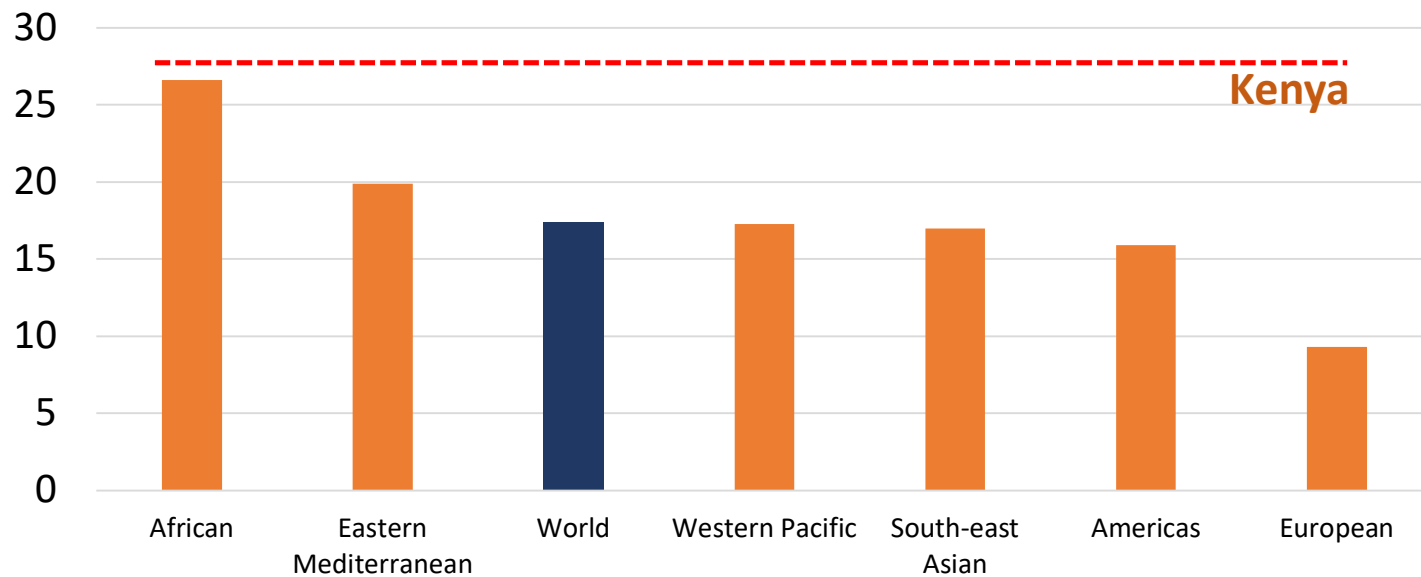
smarTTrans: Investing in analytics to save lives

Lupe Bedoya, Arianna Legovini, Sveta Milusheva
and Rob Marty

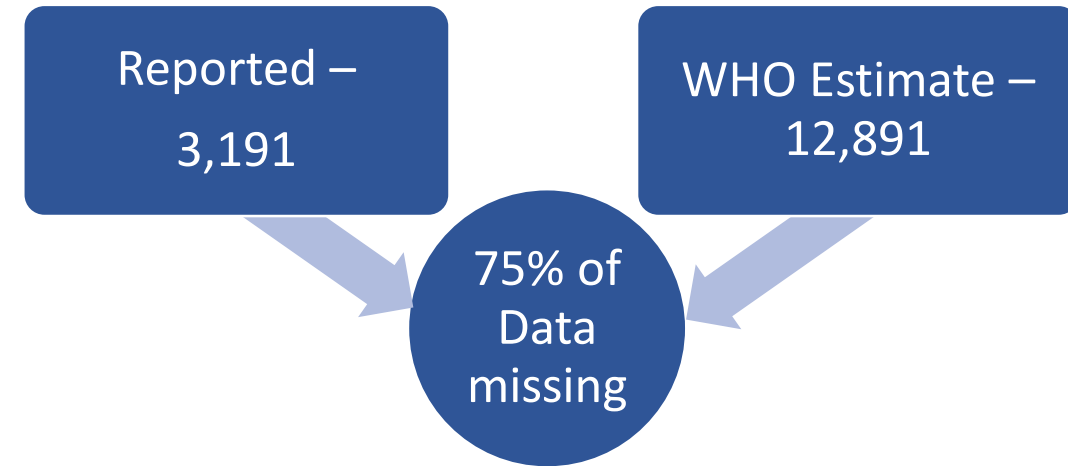


Kenya is among the deadliest in roads worldwide but there is inadequate data to address the problem

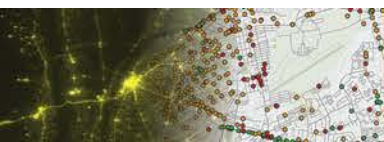
Road Traffic Fatalities per 100,000



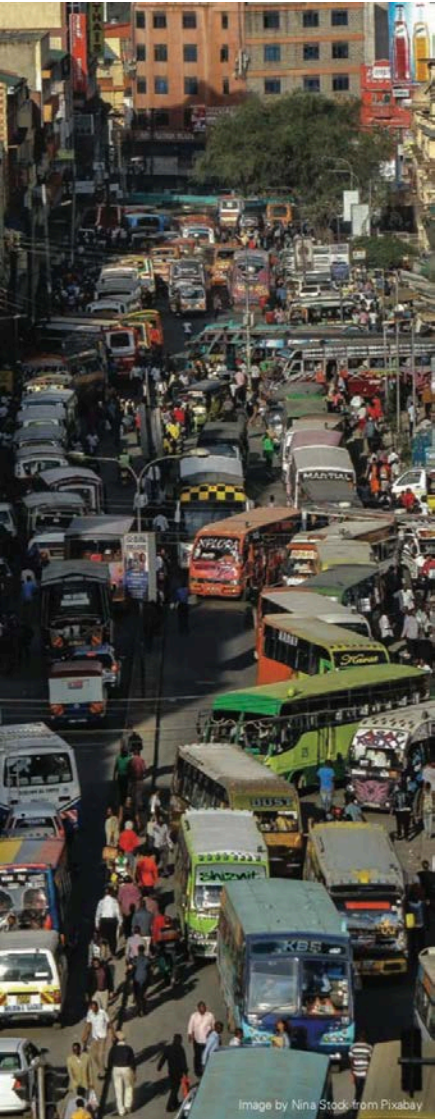
Kenya Road Traffic Fatalities (2013)



How do we design policies without adequate data and monitoring on the problem?



Build Data System to Understand Crashes



Build multiyear dataset of crashes using **administrative data** and **crowdsourcing**

Combine crash data with other information, such as **traffic speed**, **land use**, etc.

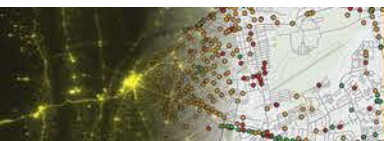
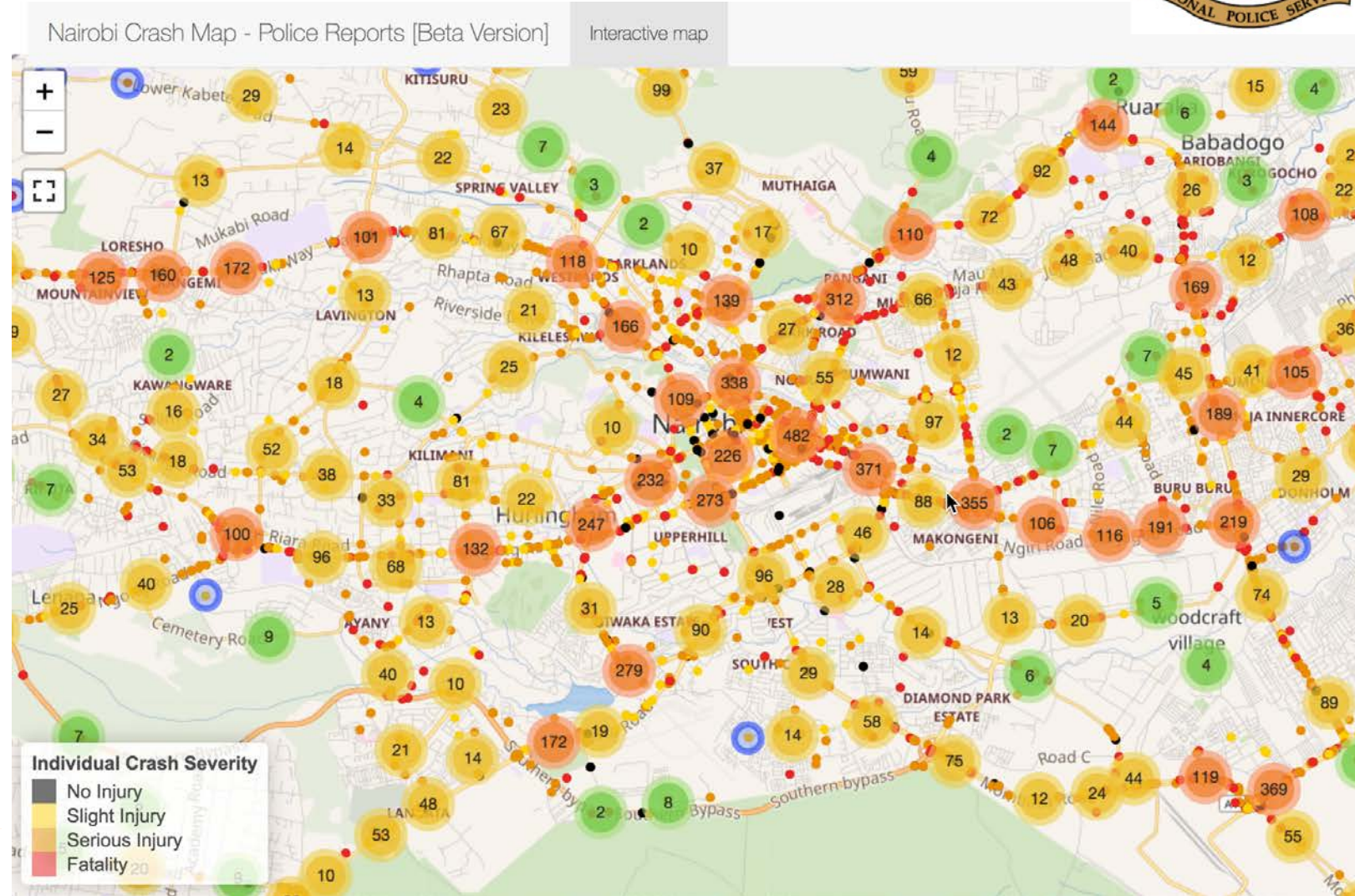
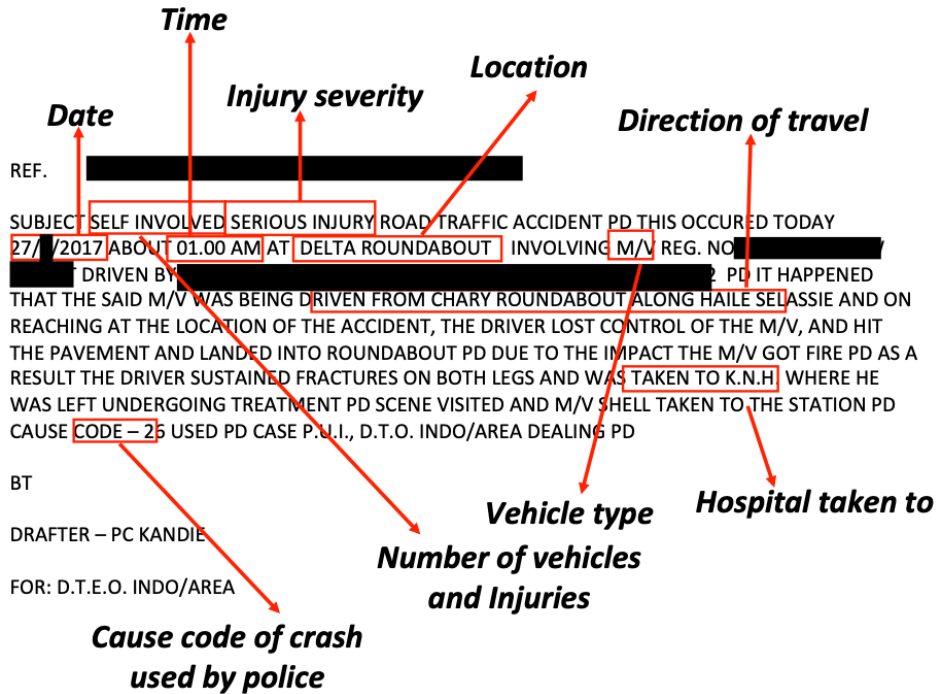
Use data system to understand **where** and **why** crashes occur

Evaluate impact of road infrastructure on crashes & crash fatalities



Administrative Data: Digitize Police Records

Scanned and digitized over 10,000 police reports across Nairobi's 14 stations



Twitter

- Scraped all 734,795 tweets from Ma3Route 2012-2018
- Manually coded 1 year of tweets determining which report a crash & locations of reported crashes
- Developed machine learning algorithm that identifies and geo-locates unique crashes
- 30,000 crash Tweets identified



Ma3Route @Ma3Route · 15 Dec 2017

18:19 Major accident on Thika Road, just past Roysambu on your way to Githurai. Traffic jam from Garden City. Police on site via @Chap_De

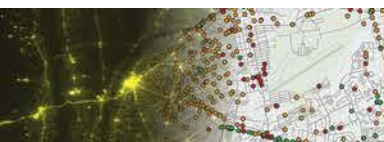
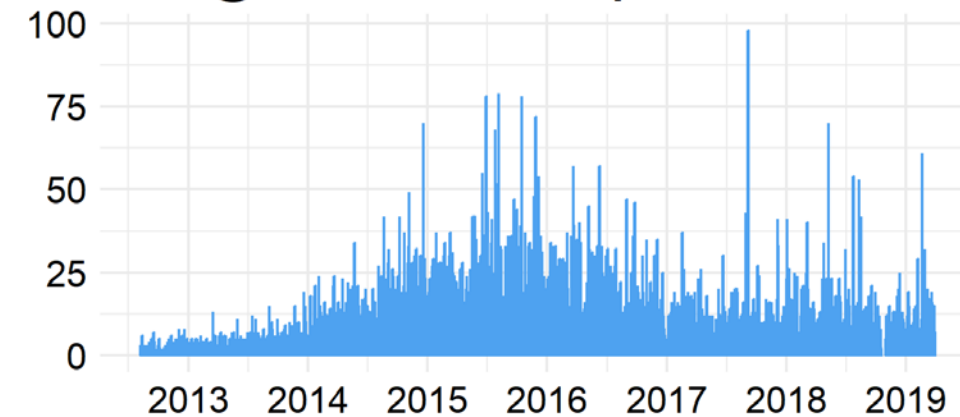
Location but not of crash location



Ma3Route @Ma3Route · 7 Nov 2014

Accident at Uhuru Gardens man knocked down traffic snarl up @CapitalFm_Kenya ma3 via @iano504

Daily Number of Tweets from @Ma3Route that Report a Crash



Tweet Validation Through Boda Bodas

Partnering with Senty motorcycle
delivery drivers

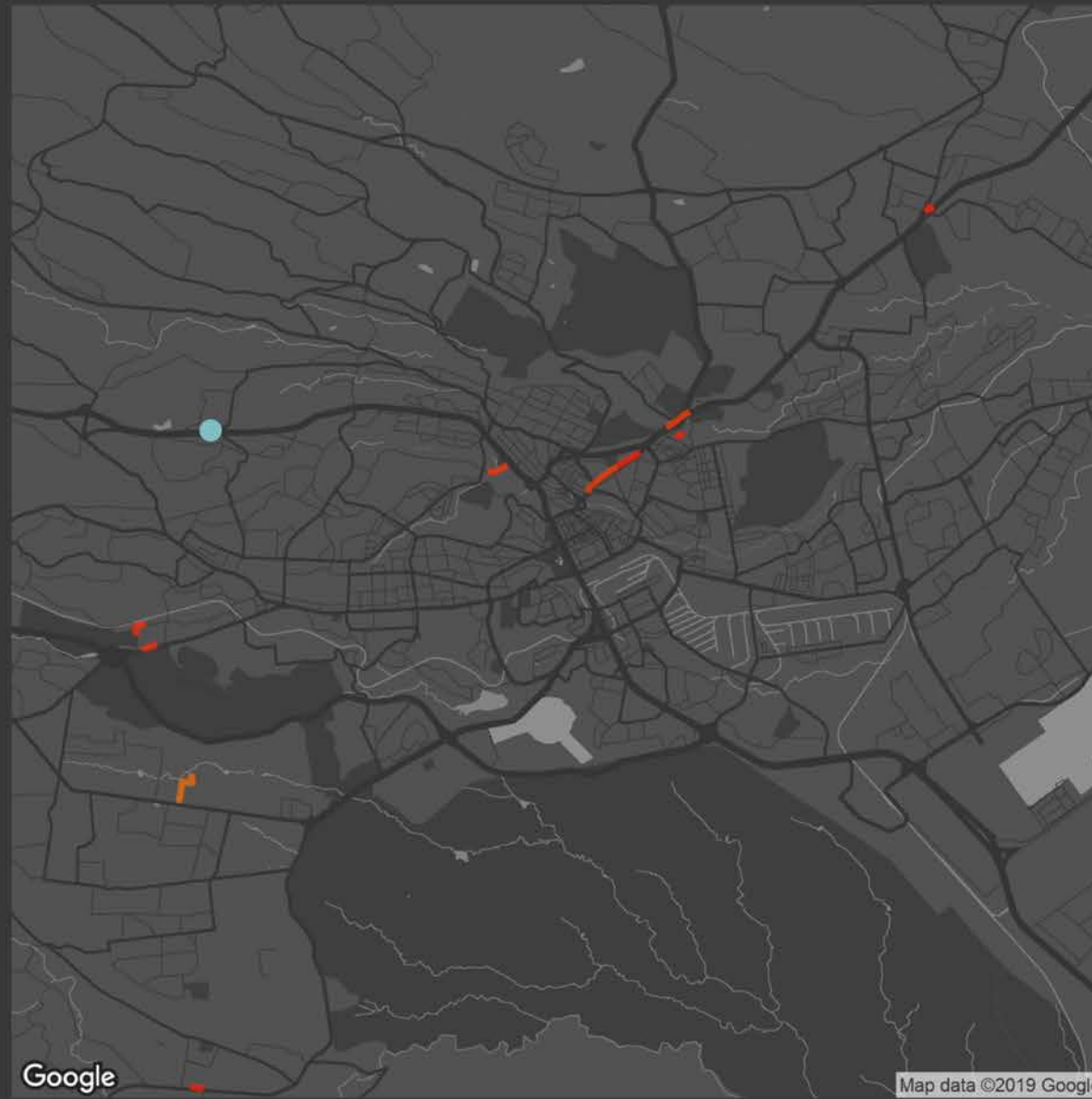
Tweets processed in real time and sent
to drivers for verification

93% of tweets verified by drivers
correctly correspond to a crash near the
estimated location

Used Senty drivers to report on
crashes they saw while driving



Waze Data



Speed of Jams (km/hr)

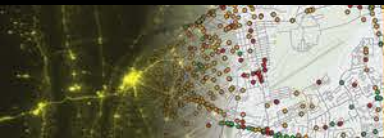


Alert Type

- Accident
- Jam
- Road Closed
- Weather Hazard

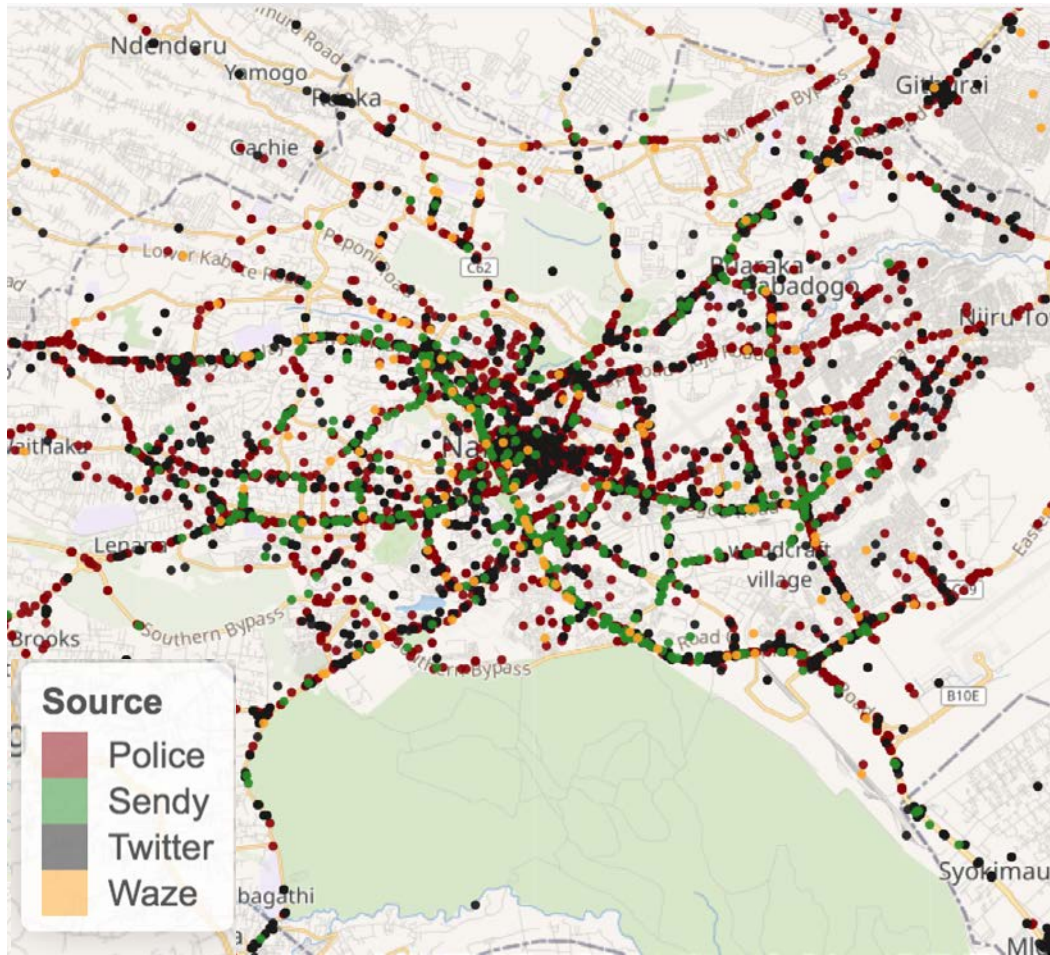
Google

Map data ©2019 Google



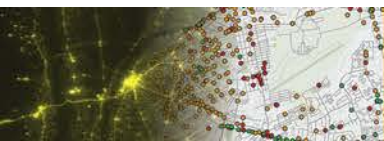
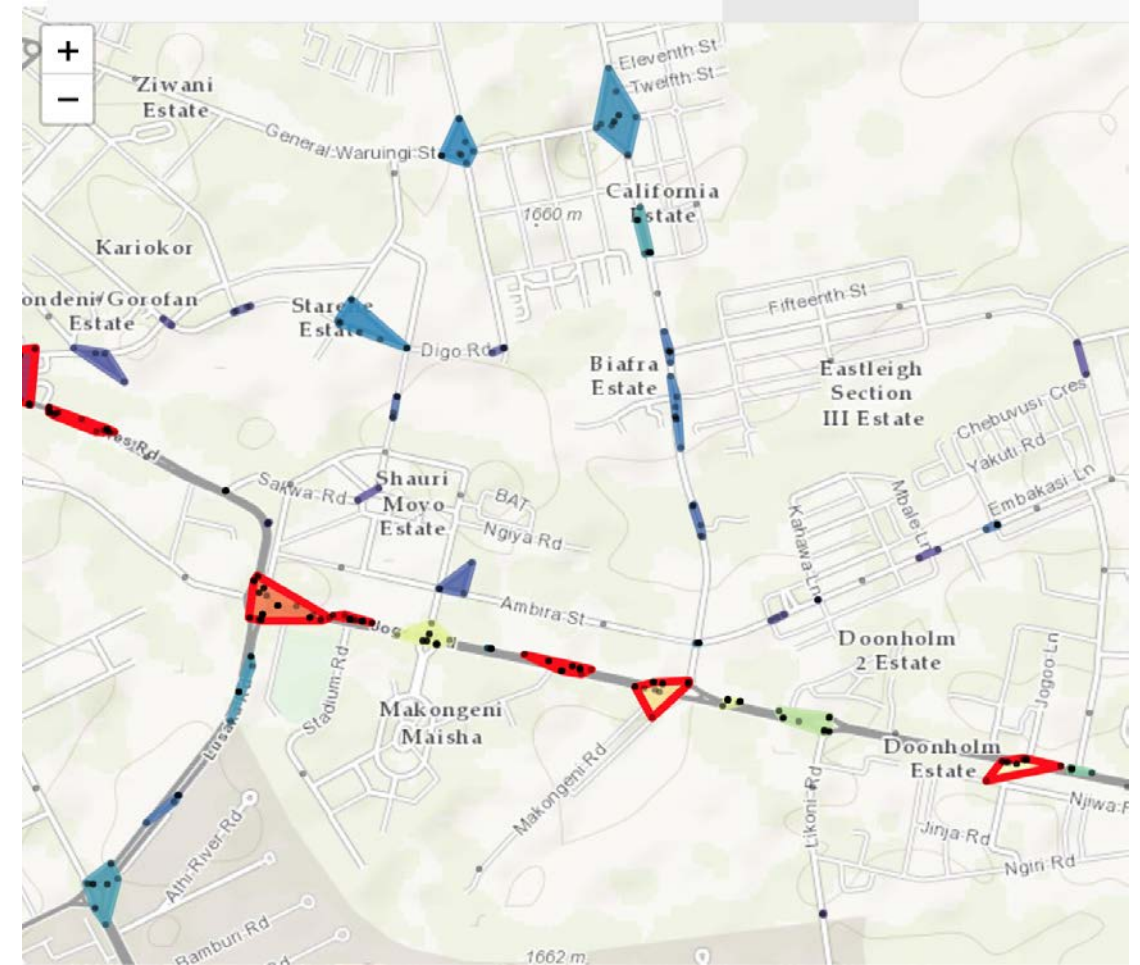
Build a Multi-year Dataset with Crash Locations

Crashes may be reported by more than once source. Cluster crash reports into unique crashes



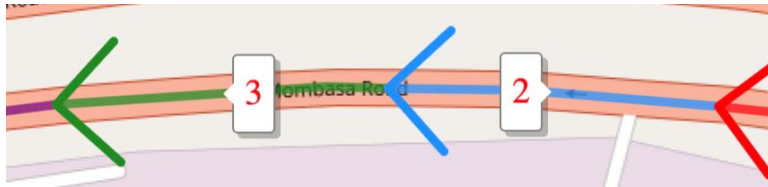
Identify Crash Clusters & Blackspots

Cluster crashes within 100 meters of each other to identify clusters where crashes are typically caused by the same factors



Add Data from Other Sources

Survey and Videos to Capture Physical Attributes, Vehicle Flow & Pedestrian Behavior



Survey 100 meter segments that comprise blackspots

- Presence and quality of **sidewalks**
- Presence and type of **pedestrian crossings**
- Do **pedestrians** cross at informal areas
- **Land use** such as commercial activity, industrial/manufacturing
- **Road characteristics** such as number of lanes, presence of markings on the road

Speed, Traffic and Road Characteristics



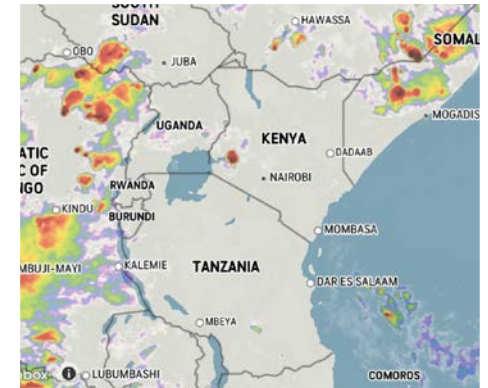
- Average speed at time of crash
- 85th percentile speed every hour from January 2018



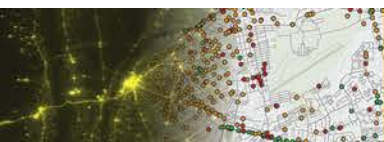
- Road closures
- Hazards (pothole, Car stopped, etc)
- Traffic Jams

Weather and Land Use

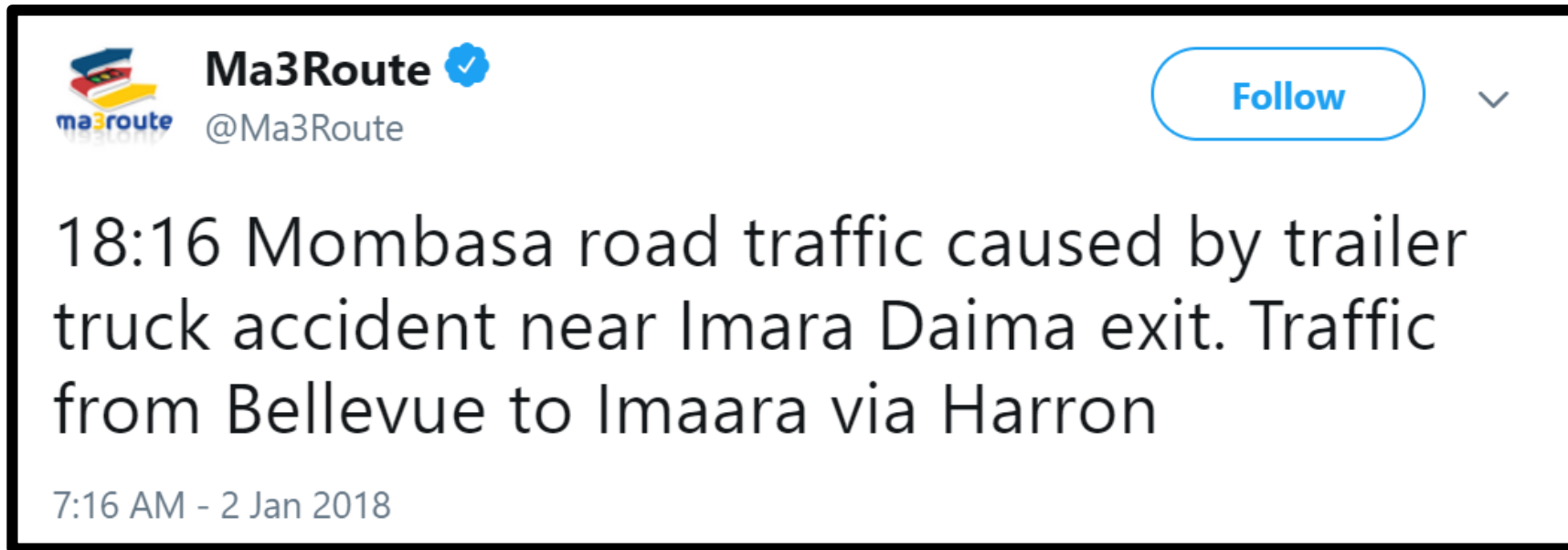
Hourly weather data from AccuWeather






Land use data from Google Maps



Bringing it All Together: Case of Crash & Crash Data

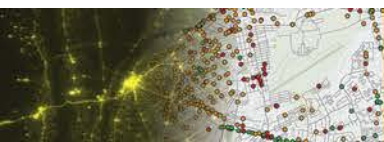


The image shows a screenshot of a tweet from the account Ma3Route (@Ma3Route). The tweet text reads: "18:16 Mombasa road traffic caused by trailer truck accident near Imara Daima exit. Traffic from Bellevue to Imaara via Harron". The tweet is dated "7:16 AM - 2 Jan 2018". The Ma3Route profile picture is a logo with the text "ma3route" below it. To the right of the profile name is a "Follow" button and a dropdown arrow.

 **Ma3Route** 
@Ma3Route [Follow](#) 

18:16 Mombasa road traffic caused by trailer truck accident near Imara Daima exit. Traffic from Bellevue to Imaara via Harron

7:16 AM - 2 Jan 2018



Bringing it All Together: Case of Crash & Crash Data

Crash on Jan 2, 2018 at 17:30 on Mombasa Road near Imara Daima Stage.

- Reported by Police & bystanders via Twitter
- 1 pedestrian fatality & 1 pedestrian injured

Extract Information from Police Report

FM: DIVTRAFF **EMBAKASI**

TO: DISGEN K.P.S [R]. VIG OPS/POLTRAFF NBI [R]. COUNTY COMMANDER/O.C TRAFFIC NBI AREA [R]. DIVPOL EMBAKASI

REF: [REDACTED] **02/01/2018**

SUBJECT: **FATAL ROAD TRAFFIC ACCIDENT** PD THIS OCCURED TODAY **02/01/2018** AT AROUND **17.30** HRS ALONG **MOMBASA ROAD** AT **IMARA DAIMA STAGE** INVOLVING M/V [REDACTED] TRAILER BEING DRIVEN BY ONE NAMELY [REDACTED] AND [REDACTED] IN COMPANY OF ANOTHER [REDACTED] PEDESTRIAN NAMELY [REDACTED] YRS PD IT HAPPENED THE SAID M/V WAS BEING DRIVEN FROM THE CITY [REDACTED] HEADING TOWARDS MLONGO GENERAL DIRECTION PD ON



Ma3Route @Ma3Route · 2 Jan 2018

18:54 **There's an accident at Imara Daima junction, only one lane passing through,** that's why th~more → ma3route.com/update/668049 via @msalabaa



Ma3Route @Ma3Route · 2 Jan 2018

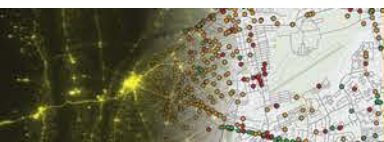
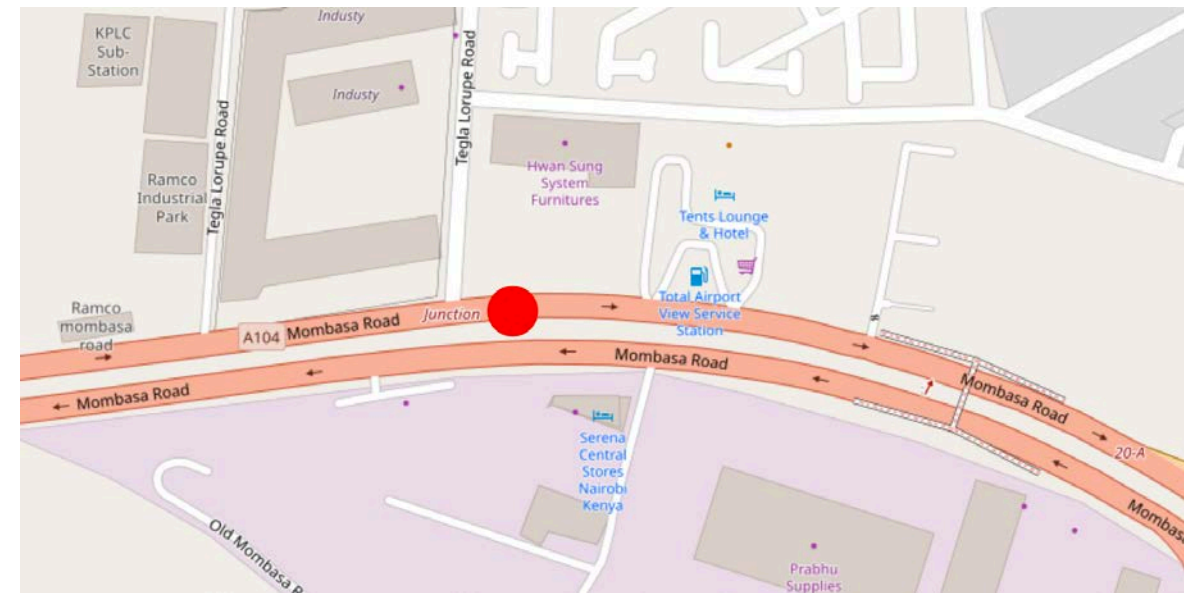
18:16 **Mombasa road traffic caused by trailer truck accident near Imara Daima exit. Traffic from Bellevue to Imaara** via Harron



1



1

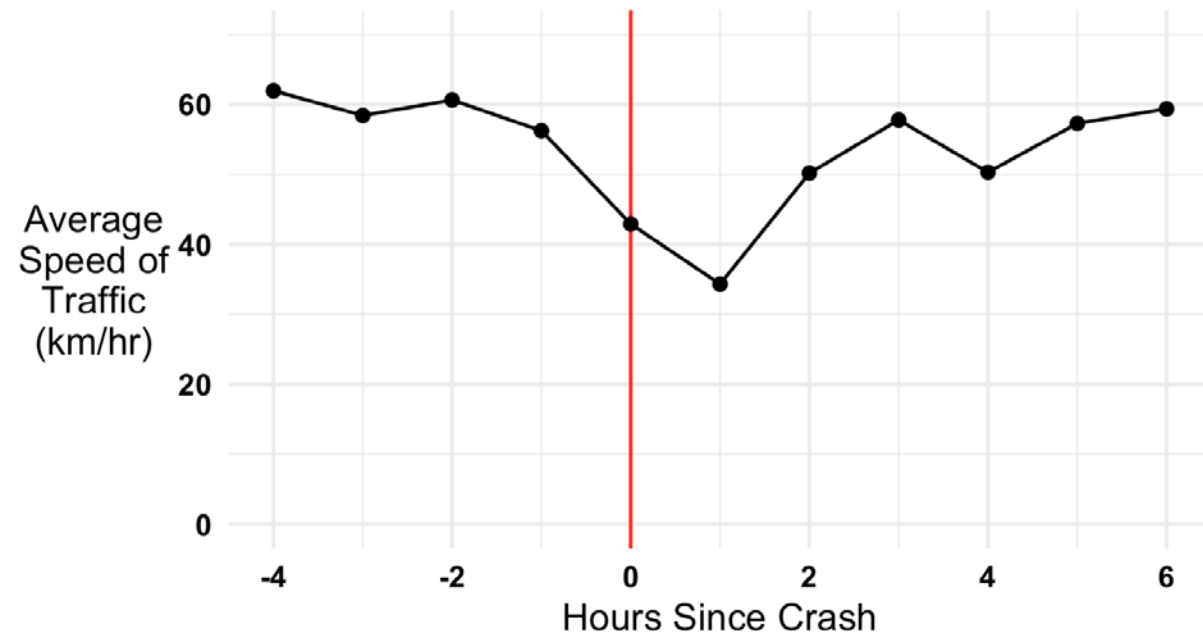


Bringing it All Together: Case of Crash & Crash Data



Use data from Uber to understand average **traffic speed** before and after the crash.

The official speed limit at the crash site is 50 km/hr. In the hours before the crash, the average car was speeding by 10 km/hr



Use historic **weather data** to understand weather conditions around the time of the crash



It was raining around the time of the crash

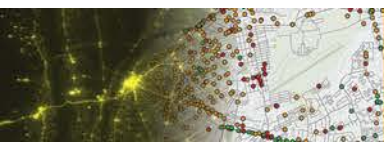
Time that crash occurred

5:00 pm		70 °F	Rain showers. Broken clouds.
6:00 pm		70 °F	Broken clouds.



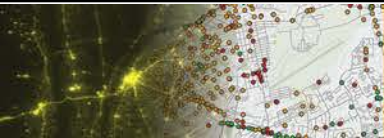
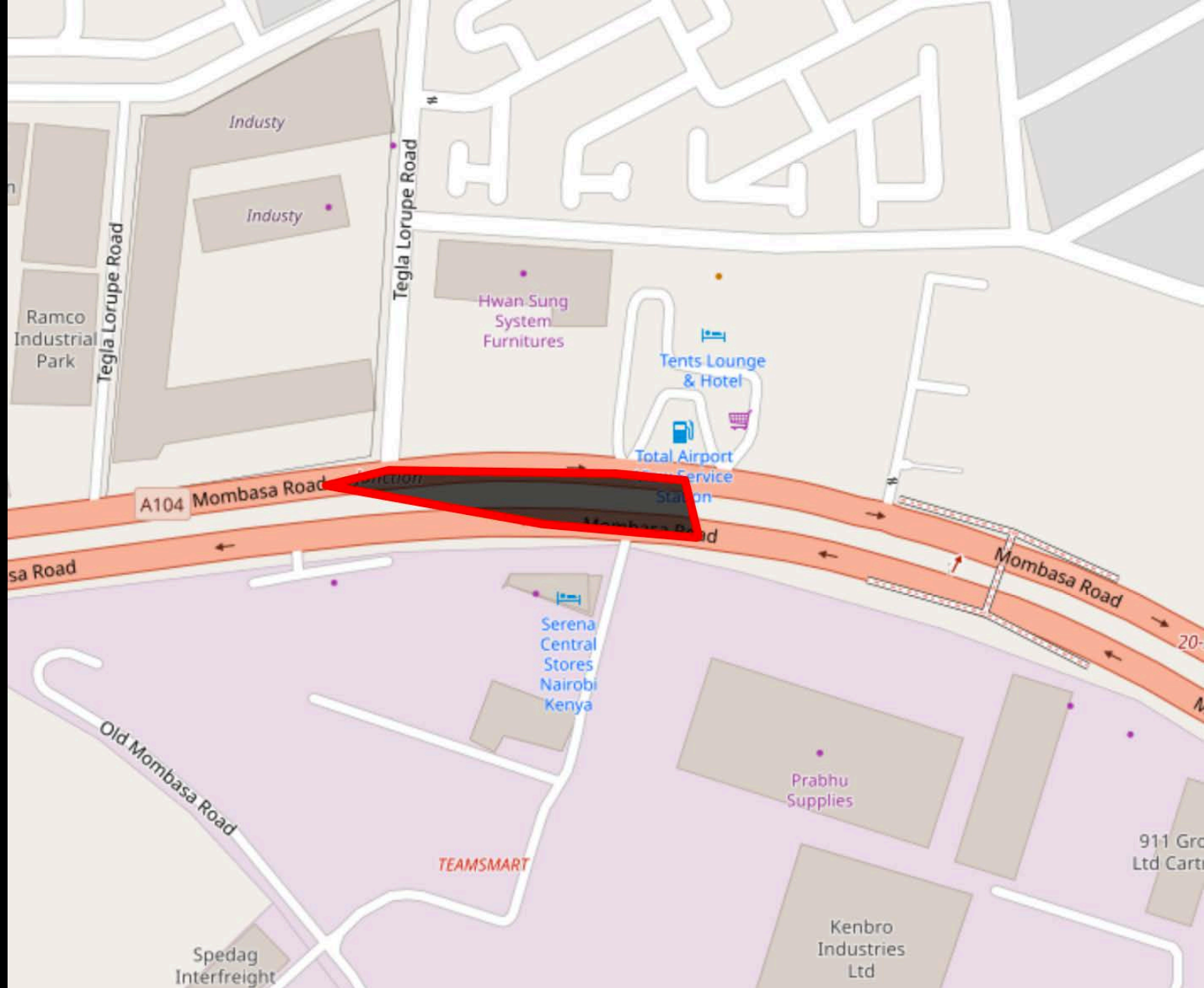
Use Google Maps data to understand the **land use** around the crash area.

The crash occurred within 100 meters of a matatu stage, 9 retail stores and an office building



On this **300 meter** stretch of road, **64 crashes** and **27 fatalities** have been reported by the police since 2012.

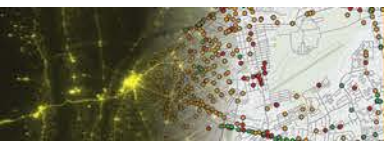
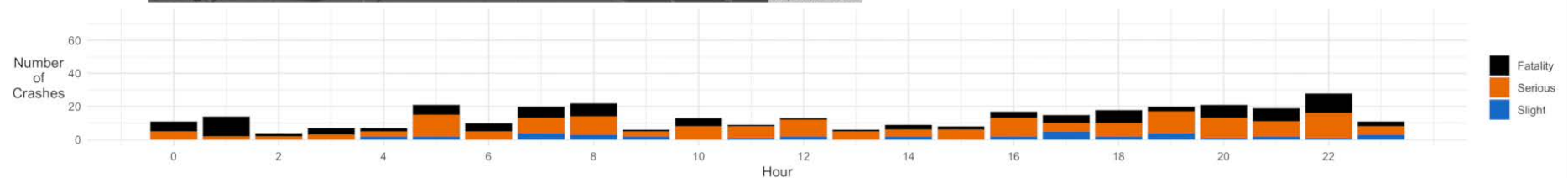
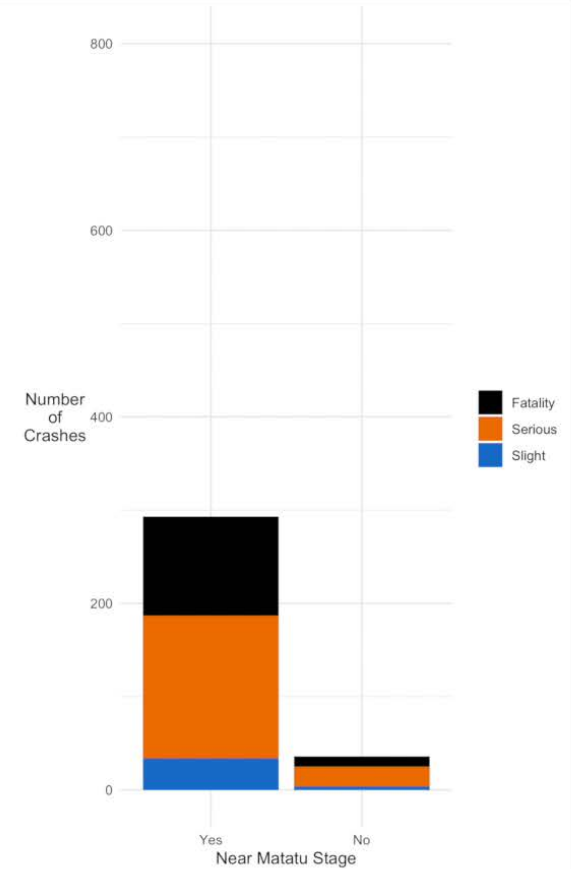
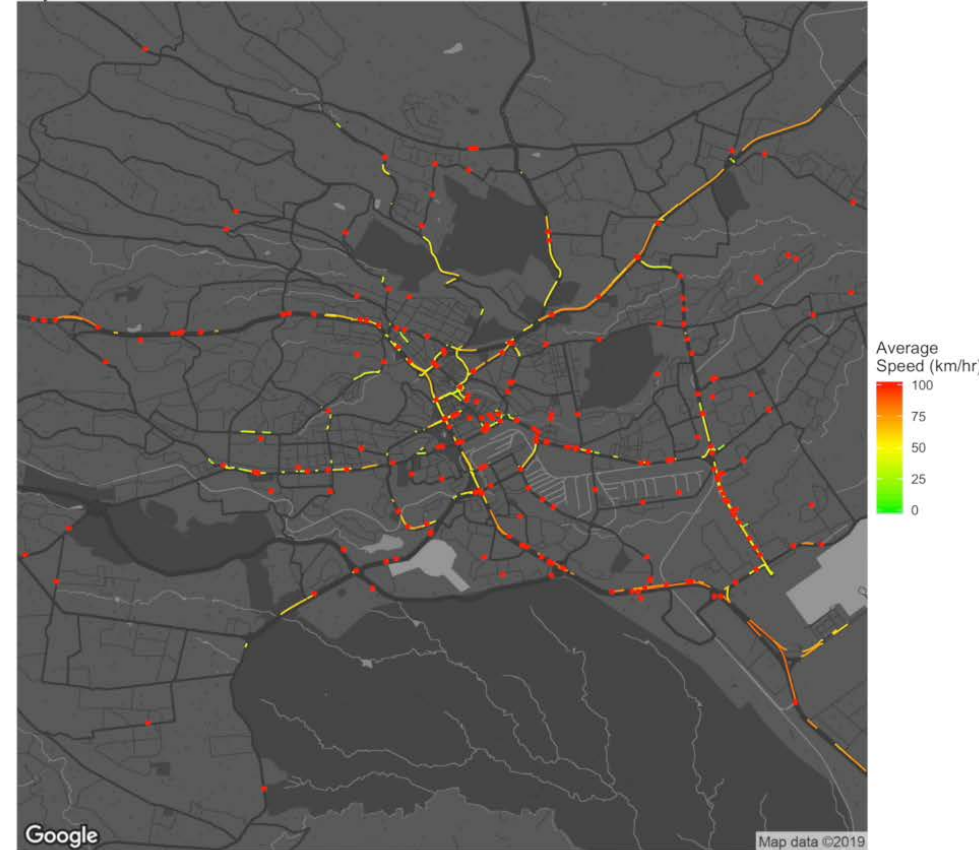
Pedestrians are often a victim. **75% of crashes** involved a pedestrian and **85% of fatalities** were pedestrians.



Summary of Actionable Results

- **200 blackspots** represent 55% of deaths
- Depending on time of day, 50-90% of fatalities and injuries occur on roads where **average traffic is traveling above speed limit**
- 35% of fatalities and 30% of injuries happen **within 20 meters of a matatu stage**
- Deaths and injuries are concentrated from **5am – 8am and 5pm - midnight**

Day and Time: 2018-04-10 00:00:00



Evaluate Road Infrastructure



Evaluate impact of past road infrastructure using data on time and location of installing past road infrastructure (eg, crosswalks)

Work with government agencies to **develop, implement and evaluate** a series of road safety interventions

Thank you

