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How researchers use mobile location data to study transport usage and accessibility in Mozambique

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ABOUT THE RESEARCHERS

Dr. Satish Ukkusuri, Ph.D. is a Reilly Professor of Civil Engineering at Lyles School of Civil Engineering (Purdue University). His team partnered with Quadrant to acquire mobile location data, to enable their interdisciplinary research and studies around transportation networks, logistics, smart cities, etc.

Using geospatial data, Dr. Ukkusuri and his team of data scientists and scholars measure transportation usage and study mobility patterns in various cities of the world. They also use location data to calculate the impact of natural disasters and climate change on people and businesses across the globe. Their research is utilised by government agencies and organisations to design data-driven, sustainable development projects, and solve a myriad of socio-economic issues.

HIGHLIGHTS - GOALS

- Get location datasets for Southeast Africa
- Identify trip attraction and generation zones
- Assess transit usage and potential for growth
- Monitor traffic performance and congestion

HIGHLIGHTS - RESULTS

- Solved transit gaps in underserved areas
- Discover mobility patterns for better planning
- Assess travel modes and ease of travel
- Mapped demand and gap stats for authorities

OVERVIEW

Location data is often used by businesses to fuel growth, measure ROI, and make informed decisions by removing guesswork. More importantly, location data has proven beneficial in providing valuable insights on human mobility which help solve real-world social and economic issues. These insights have been instrumental in saving and improving lives, ensuring availability and utilisation of public services, and most recently in the assessment and management of a global pandemic. This case study discusses how professors and researchers at Purdue University utilise Quadrant's mobile location data to enumerate the availability and accessibility of transport in major cities of Mozambique and suggest improvements for public services and infrastructure.

CHALLENGES AND GOALS

For this particular use case, the team required data sets for specific regions of Mozambique, a country in Southeast Africa. Their search for a data provider with adequate coverage on the African continent led to their partnership with Quadrant.

Dr. Ukkusuri and his team intended to use mobile location data for transport analysis in the large and densely populated city of Maputo. Their goal was to identify regions with inadequate access to critical services and gauge the accessibility of public transportation to various social groups. They wanted to perform POI (Point-of-Interest) visitation analysis, and origin-destination (OD) matrix estimation to understand travel patterns of citizens.

While researchers sometimes use ground surveys as input for these types of analyses, they prove to be costly, time-consuming, and difficult to scale in this case. Moreover, the data points gathered by surveys are non-exhaustive and sparse, as they do not provide important geospatial attributes such as longitudes, latitudes, and timestamps.

SOLUTION

Dr. Ukkusuri and his team used mobile location data to understand various transportation-related insights, including trip attraction and generation zones, mode of travel, and congestion on corridors. They performed geospatial and human mobility analyses to suggest solutions, accessibility plans, and response strategies for traffic and transport issues.

Mobile location data helps researchers build deeper context around said issues and helps uncover valuable, actionable information by applying sophisticated models, such as POI visitation analysis, OD matrix estimation, Bayesian causal inference, and more.

Use Case: Transportation mobility analysis and assessment of social inequalities

The team used mobile location data from a region with a population of 2.86 million and measured the travel patterns between remote areas and the city. They determined which locations have poor access and availability of transit facilities, such as buses, metros, railways, and ferries. They also identified high footfall areas to understand transit demands and potential, ease of access to various POIs, congestion issues by area, and more.

The figure on the right is a graphical representation of an actual analysis conducted by Dr. Ukkusuri and his team. They have built machine learning tools based on clustering techniques to ingest the location data and attributes. They use POI visitation analysis, to highlight the challenges of people living in and around the Maputo province.
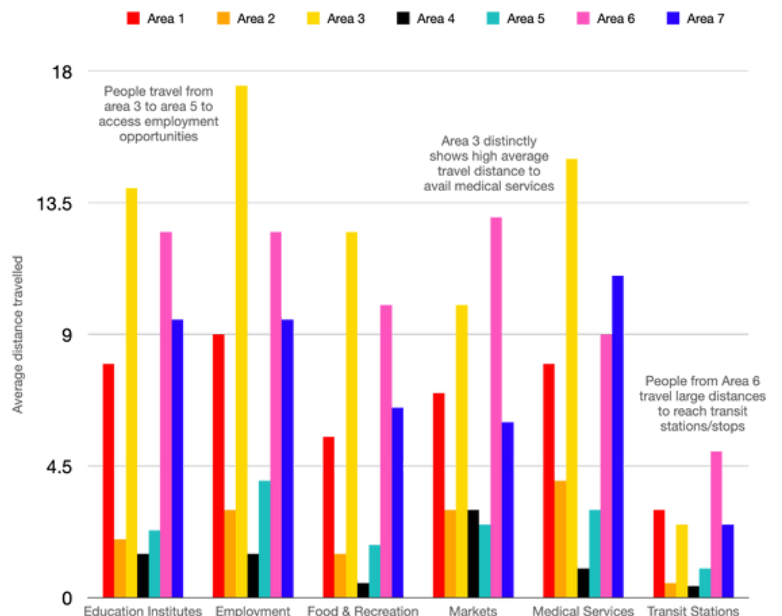
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BENEFITS

Dr. Ukkusuri and his team added Quadrant's geolocation data as a contextual layer to their POI visitation analysis, comprising of nine business categories. Combined with auxiliary datasets such as poverty maps, census data, road networks and infrastructure, administrative boundaries, etc, location data enabled them to identify socio-economic groups and their access to different modes of transportation. The researchers also calculated the number of transit trips generated during peak travel times to evaluate the ease of travel for various groups. The results of these analyses provide actionable intelligence to remedy the unequal distribution and availability of transit facilities. Some notable insights include...

Identify trends of transport availability and usage during peak hours.

Gauge ease of access to facilities and services for poorer regions

Measure average distances people need to travel for basic needs

Recognise underserved areas for infrastructure growth potential

Provide area administration with actionable insights to improve lives

Quadrant offers data in the African continent, which was valuable for us as this data is not readily available with many other data providers. We have combined Quadrant's location data with several datasets that we work with, and it has benefitted our research and studies. We are happy with our experience. The team at Quadrant is reliable, accommodating, and always open to feedback and we look forward to working with them for our upcoming data requirements.

~Dr S Ukkusuri - Reilly Professor of Civil Engineering (Purdue University)

Quadrant provides location data and location-based business solutions that are fit for purpose, authentic, easy to use, and simple to organise. We offer data from 200 countries, with 300+ million unique devices and 40+ billion events per month. Our data is verified, trustworthy, and ready to use - allowing businesses, organisations, and innovators to build tailored solutions for a myriad of real-world problems. To learn more about Quadrant's mobile location data, **talk to a data consultant today**!

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