Data Analytics Strategy For Transportation Equity

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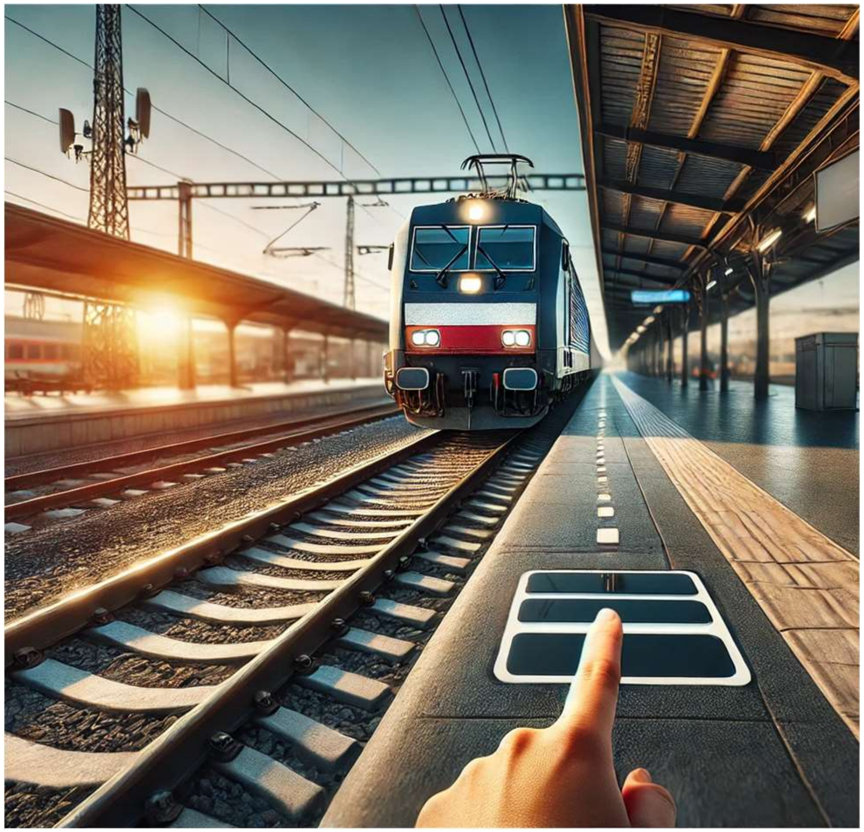
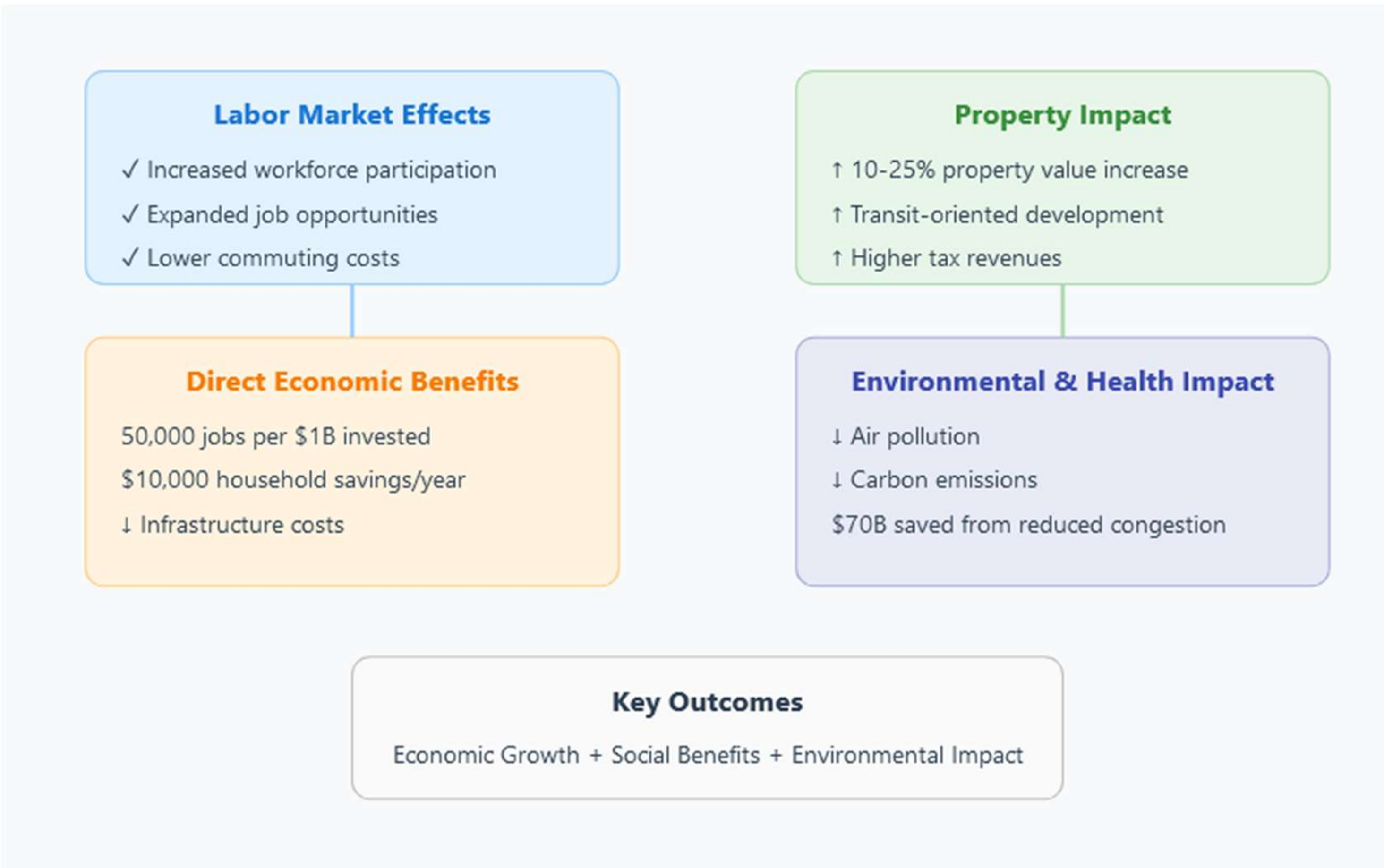


Overall Impact of Effective Public Transit in U.S



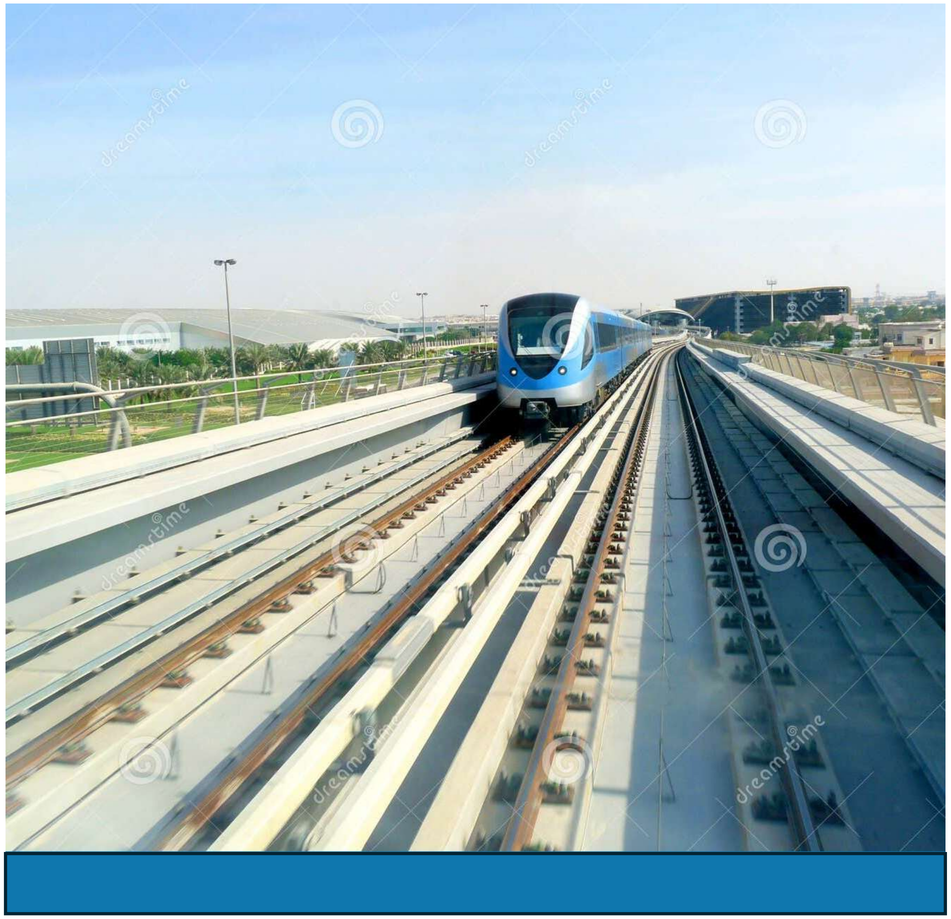
EXECUTIVE SUMMARY

Project Purpose

- **Client:** Integrated Travel Research and Development (ITRD), a non-profit organization.
- **Objective:** To develop a data analytics strategy to identify potential commuter rail station locations along Business Highway 83 in Hidalgo County, Texas.
- **Goal:** Build an elevated commuter rail from Mission to Brownsville to promote transportation equity and improve public transit efficiency.

Challenges

- Data acquisition and relevance: Difficulty in obtaining and validating necessary datasets.
- Managing and integrating large datasets: Ensuring accuracy and up-to-date information.
- Data preparation: Cleaning and preprocessing for regression analysis.
- Model design: Selecting appropriate factors for the regression model, including population density, land use, and transportation patterns.



Solutions

- Analyzed a 45-mile transit corridor and identified 14 optimal train station locations out of an initial 34 options.
- Categorized locations into five land-use types: Commercial, Educational, Transportation, Residential, and Mixed Use.
- Used a 0-10 scoring system to evaluate locations based on:
  - Amenity access
  - Highway connectivity
  - Intersection patterns
- Performed regression analysis to support station placement with statistical rigor.

Final Recommendation

- The 14 recommended locations feature:
  - High average traffic counts.
  - Proximity to major transportation hubs and key institutions.
  - Strategic placement at intersections of major roads and areas with mixed land use.
- Future evaluation should consider:
  - Population and employment projections.
  - Connectivity to other transportation modes.
  - Environmental and community impact.
  - Feasibility and costs for infrastructure development.

Sebastian
Arroyo City
Citrus City
Edinburg
Elsa
Alton
Doffing
Palmhurst
69C
69E
1 hr 5 min
66.7 miles
Rio Hondo
Arroyo Gardens-La Tina Ranch
Palmview
Mission
Alamo
San Benito
Bayview
South Padre Island
Laguna Vista
Progreso
Rangerville
100
Port Isabel
Reynosa
1 hr 26 min
68.1 miles
Olmito
Boca Chica Village
2
San Pedro
550
48
1B
97
South Point
El Conchillal
Santa Adelaida
El Ranchito y Refugio
Centro Recreativo Playa Bagdad
terna
Ideales de la Revolución
La Venada
Anáhuac
El Galaneño

POPULATION DISTRIBUTION OF HIDALGO COUNTY IN 2023

898471 Total Population

443792 Total Male Population

454679 Total Female Population

0.22 Margin of Error Total Population

0.28 Margin of Error Male Population

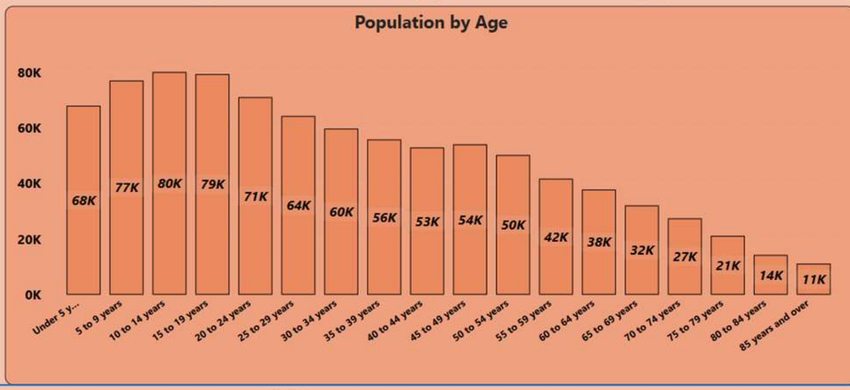
0.29 Margin of Error Female Population

30.9 MEDIAN POPULATION

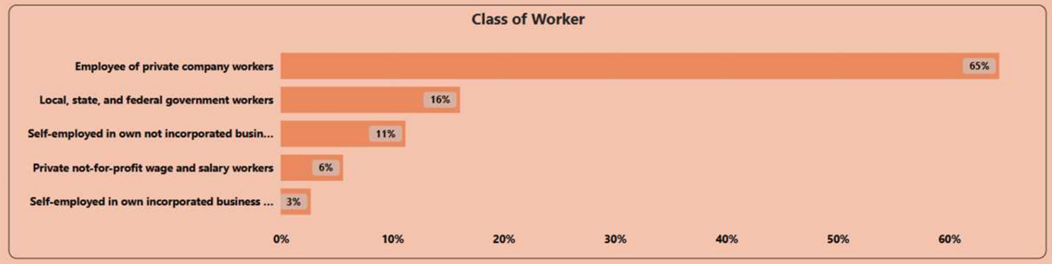
97.6 SEX RATIO (male per 100 females)

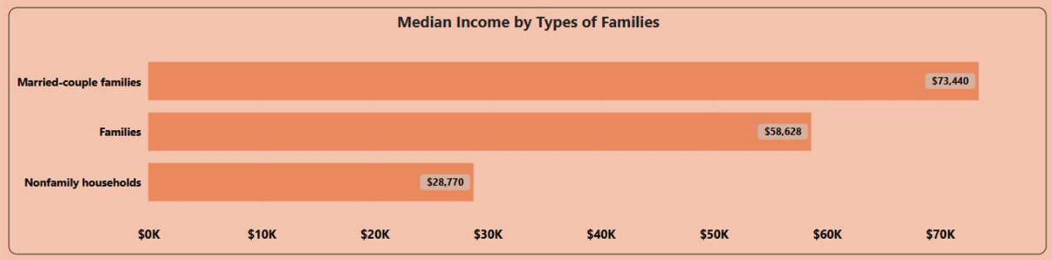
73.4 AGE DEPENDENCY RATIO

20.5 OLD AGE DEPENDENCY RATIO



SOURCE : census.gov





SOURCE : census.gov

HIDALGO COUNTY

365854 Total Population

55.1 Male Population %

44.9 Female Population %

268854 Car, Truck or Van

45047 Carpooled

789 Public Transportation

34060 WFH

SOURCE : census.gov

56.5% Employment Rate in Hidalgo County

62.6% Employment Rate in Texas

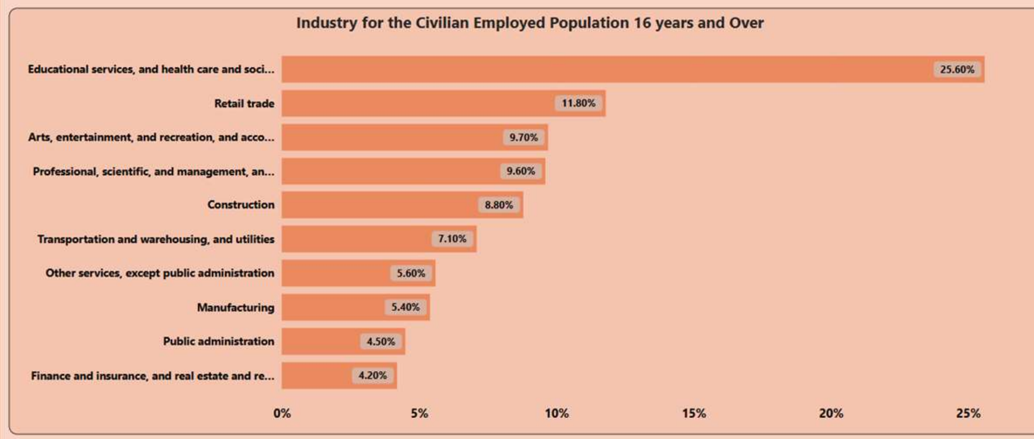
22.3 mins Average Travel Time to work in Hidalgo County

27.2 mins Average Travel Time to work in Texas

27.2% Poverty, All people in Hidalgo County

13.2% Poverty, All people in Texas

$53,661 Median Household Income in Hidalgo County



SOURCE : census.gov

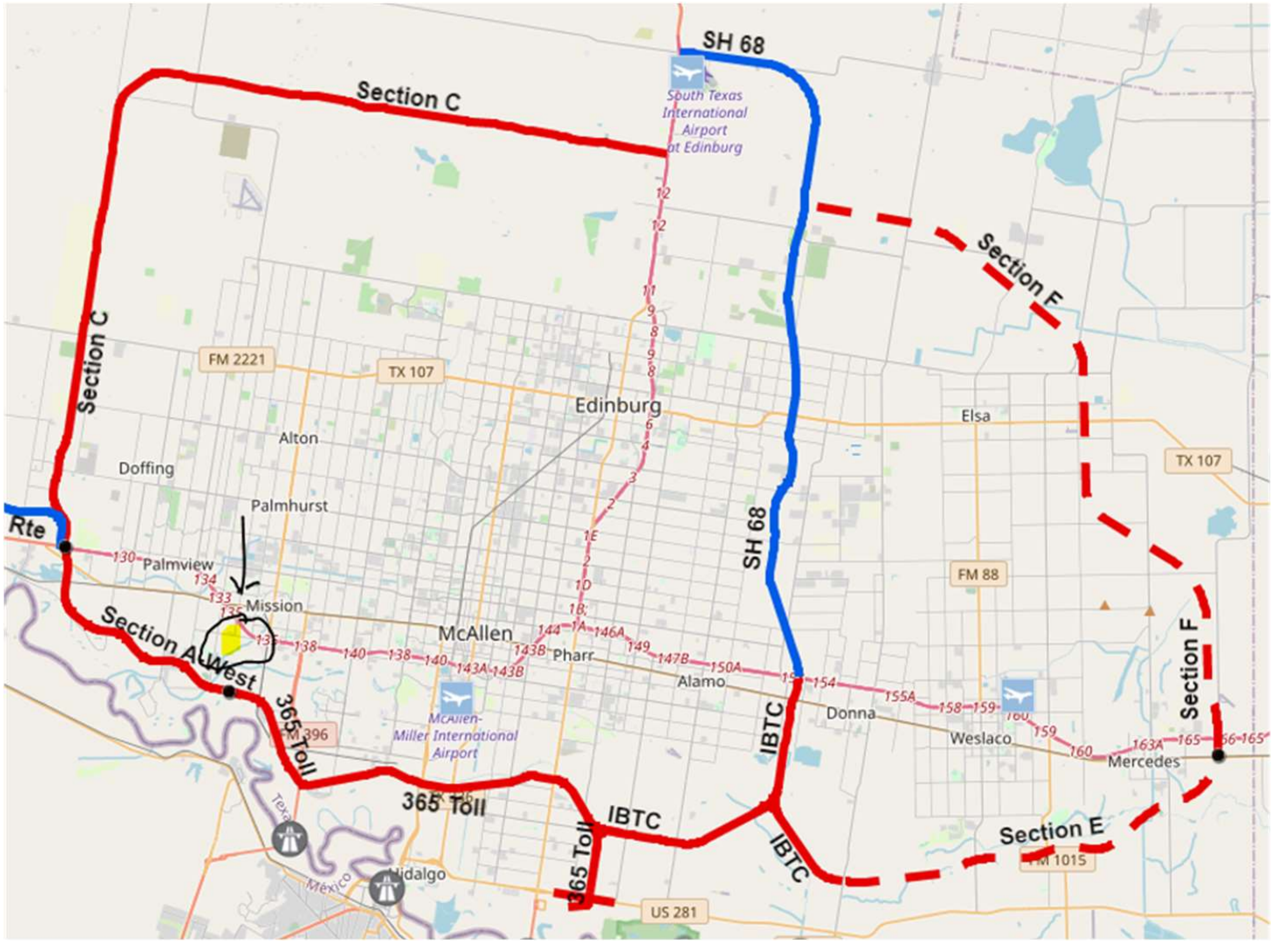
PROJECT BACKGROUND AND OBJECTIVES

About Our Client: Integrated Travel

- **Goal:** To promote transportation equity through accessible, affordable options for all individuals.
- **Focus:** Serve underserved communities, including indigenous and rural areas.
- **Approach:** "Rail for All" emphasizes sustainable, cost-effective rail retrofitting over costly high-speed rail.
- **Mission:** Since 2019, actively engaging communities, officials, and businesses through advocacy, outreach, and coalition building.

Objectives

- Assist ITRD in developing an elevated commuter rail between Mission and Brownsville along Business Highway 83 to promote regional transportation equity.



Hidalgo County 365 Loop

BUSINESS PROBLEM

The lack of an optimized commuter rail network in Hidalgo County, Texas, limits public transportation efficiency, resulting in challenges such as inadequate access to key locations, traffic congestion, and insufficient connectivity for residents.

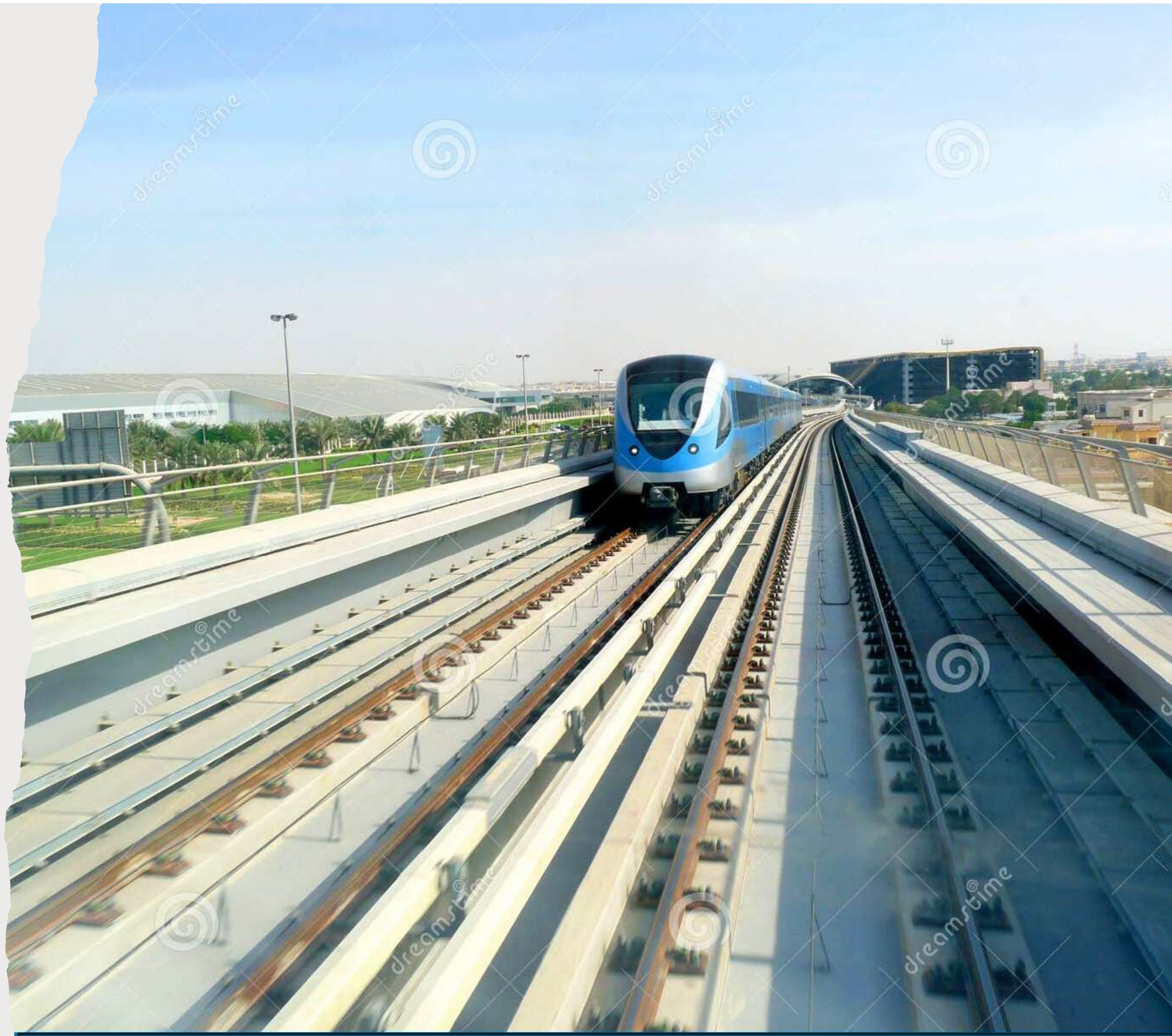
Challenges

1. **Limited Public Transit**:
    1. Texas historically prioritized car-centric infrastructure.
    2. Low-income and marginalized communities lack equitable transportation options.
2. **Infrastructure Gaps**:
    1. Public transit has not kept pace with population and economic growth.
    2. Inadequate access to jobs, education, healthcare, and essential services.
3. **Complex Data Needs**:
    1. Large datasets require preprocessing and integration.
    2. Real-time updates and diverse data types pose challenges for analysis.

APPROACH

1. **Data Collection**:
    1. Assess factors like population density, employment trends, land use, and transportation infrastructure.
    2. Consider environmental and community-specific needs.
2. **Data Preparation**:
    1. Preprocess and clean data for regression analysis.
    2. Address challenges with large datasets and real-time updates.
3. **Analysis**:

    Develop a regression model focusing on:
    1. Proximity to major roads and highways.
    2. Intersection patterns and access to key institutions.
    3. Density and diversity of amenities.
4. **Validation**:
    1. Validate results with feasibility studies and community feedback.
    2. Include infrastructure cost analysis.
5. **Recommendations**:
    1. Provide ITRD with prioritized station locations.
    2. Develop a scalable methodology for use in other regions.



DEVELOPED SOLUTION

SUMMARY OF PHASE 1

In Phase 1 of the proposed solution, key feeder streets north of US Business 83 and US 83 were identified, along with their corresponding traffic station IDs, annual average daily traffic (AADT) counts, and geographic positions (latitude-longitude). The analysis highlighted the following key road categories:

Major Farm-to-Market (FM) Roads

- FM 681 (Moore Field Road
- FM 88 (North Texas Boulevard)
- FM 1425 (Mile 2 East Road)

Strategic Mile Roads System

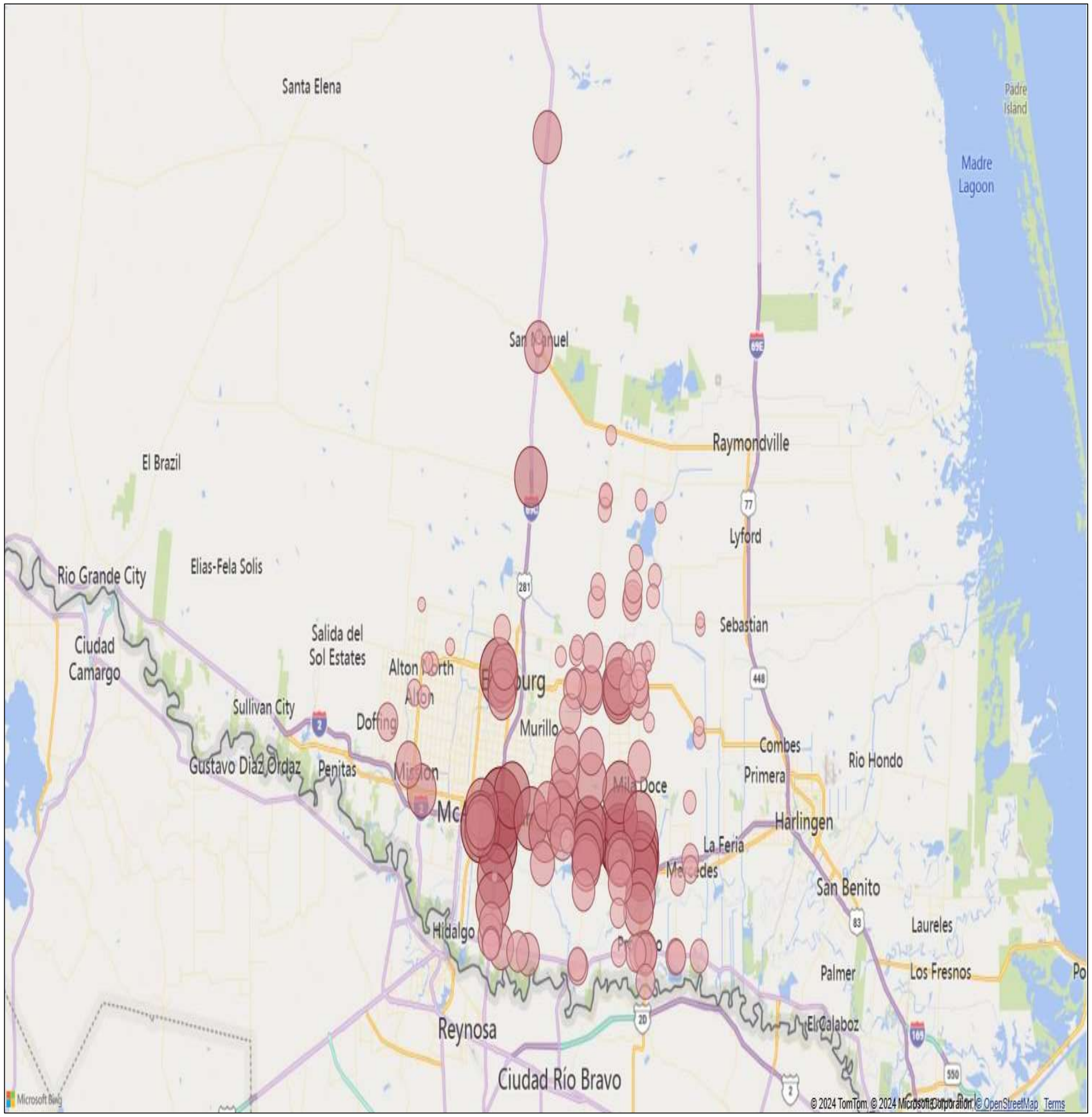
- Mile 6 West Road
- Mile 4 West Road
- Mile 3 West Road

Notable Urban Connectors

- North Expressway 281 (Major arterial)
- Cesar Chavez Road
- Tower Road

Observations on the Network Layout

- Regular spacing between major intersections
- Multiple parallel north-south corridors
- Strong connectivity to agricultural and rural areas
- Direct access to commercial districts
- This layout underlines the region's balanced integration of urban, commercial, and agricultural connectivity.



Average Traffic Counts at Traffic Stations

TRAFFIC STATION ID	AVERAGE TRAFFIC COUNT AT WEST MONTE CHRISTO FOR 5 YEARS	TRAFFIC STATION ID	AVERAGE TRAFFIC COUNT AT SH0107 FOR 5 YEARS	TRAFFIC STATION ID	AVERAGE TRAFFIC COUNT FOR US 83 FOR 5	TRAFFIC STATION ID	AVERAGE TRAFFIC COUNT AT US BUSINESS 83	OMMENT
109UR110A	7220	109H232	8821	NA	NA	NA	NA	
NA	NA	NA	NA	109HP5231	13068	109U228	20222	
109UR111	981	NA	NA	109HP14	3339	109HP5052	4439	
109HP165	263	NA	NA	109UR747	2672	109HP5051	7884	
109H189	6036	109H188	13010	109H371	17784	109H148B	19487	
NA	NA	109HP201	1233	109UR799	2598	109HP17A	6282	
NA	NA	109HP127	1686	109H149	20119	109HP101	16392	
NA	NA	NA	NA	109HP76	5396	109U344	10233	
NA	NA	NA	NA	109UR881	3721	109UR883	5810	
NA	NA	109H191	6263	109H358	41249	109H152	31324	
NA	NA	NA	NA	109HP5353	7118	109UR887E	7269	
NA	NA	NA	NA	109HP5384	7621	109UR930	11390	
109H362	6785	109H195	13633	109H363	40710	109H156	36840	McAllen Convention Center, Shopping Centre, Cultural Centre
109UR223	1078	109HP5453	911	109UR933	8281	109HP5038	14435	
109UR226	1317	109H196	9116	109H240	18000	109H159	17616	
109UR228	1014	NA	NA	109UR1016	13106	109UR1063	15601	
NA	NA	109H198	15699	109D47A	21794	109H161	17735	After it crosses SH0107, the traffic count increases to 30000 because it is located in

TxDOT Annual Average Daily Traffic Counts

TRFC_STATN_ID	AADT_RPT_HIST_19_Q	ON_ROAD	COUNT_CYCLE	LATITUD	LONGITUD	OBJECTI
109A0203		IH0002	1	26.156766	-97.949581	4917
109A0203EBSR		IH0002	1	26.156461	-97.949764	4917
109A0203WBSR		IH0002	1	26.157038	-97.949392	4917
109A0218		IH0002	1	26.193455	-98.25448	4917
109A0218EBSR		IH0002	1	26.193132	-98.254582	4917
109A0218WBSR		IH0002	1	26.193757	-98.254376	4917
109AT27	14100	BU0083S	1	26.191276	-98.164203	4917
109CE113		MILE 6 NORTH	1	26.142261	-97.897904	4917
109CE14A		MILE 3 RD	1	26.272769	-98.420592	4917
109CE15		TEXAN RD	1	26.272352	-98.410422	4917
109CR45		IOWA RD	1	26.426332	-98.392481	4917
109D10		FM0088	1	26.439585	-97.956902	4918
109D100		SS0029	1	26.091363	-98.184685	4918
109D11		FM1015	1	26.42986	-97.925828	4918
109D16		FM1015	1	26.364783	-97.937675	4918
109D164ANBSR		SS0115	1	26.152357	-98.2527603	4918
109D17		FM0493	1	26.360214	-98.028356	4918
109D171NBSR		SS0115	1	26.148553	-98.2533448	4918
109D18		FM0490	1	26.447736	-98.047175	4918
109D2		IH0069C	1	26.387759	-98.141934	4918
109D20		FM0681	1	26.420975	-98.345985	4918
109D221EBSR		US0083	1	26.239132	-98.416509	4918
109D23		FM0490	1	26.490505	-98.438196	4918
109D25		FM1925	1	26.318493	-98.027158	4918
109D26		FM0491	1	26.254083	-97.911886	4918
109D2NBSR		IH0069C	1	26.387664	-98.141604	4918

TxDOT 5-Year Statewide Traffic Counts

DIST_N	CNTY_N	TRFC_S	LATEST_	AADT_F	AADT_F	AADT_F
Pharr	Hidalgo	109CE101	2019			
Pharr	Hidalgo	109CE102	2019			
Pharr	Hidalgo	109CE104	2022		5470	
Pharr	Hidalgo	109CE110	2019			
Pharr	Hidalgo	109CE112	2019			
Pharr	Hidalgo	109CE16A	2019			
Pharr	Hidalgo	109CE18	2019			
Pharr	Hidalgo	109CE4A	2019			
Pharr	Hidalgo	109CE4B	2022		4914	
Pharr	Hidalgo	109CE5B	2019			
Pharr	Hidalgo	109CR101	2019			
Pharr	Hidalgo	109CR102	2019			
Pharr	Hidalgo	109CR103	2019			
Pharr	Hidalgo	109CR105	2019			
Pharr	Hidalgo	109CR106	2019			
Pharr	Hidalgo	109CR108	2019			
Pharr	Hidalgo	109CR110	2019			
Pharr	Hidalgo	109CR111	2019			
Pharr	Hidalgo	109CR112	2019			
Pharr	Hidalgo	109CR113	2022		603	
Pharr	Hidalgo	109CR114	2022		67	
Pharr	Hidalgo	109CR115	2019			
Pharr	Hidalgo	109CR1A	2022		357	
Pharr	Hidalgo	109CR1B	2022		272	
Pharr	Hidalgo	109CR1E	2019			
Pharr	Hidalgo	109CR1G	2019			

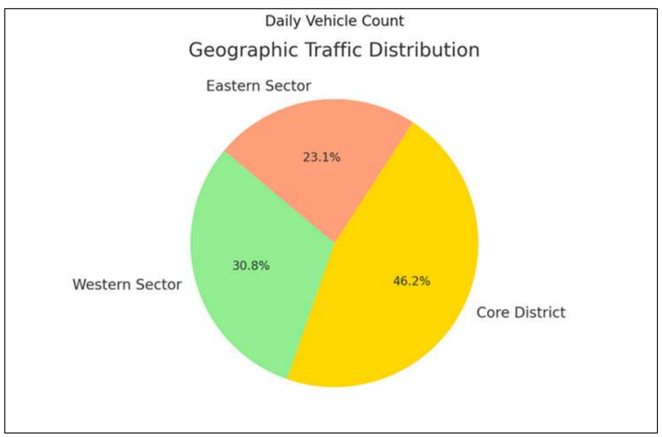
SUMMARY OF PHASE 2

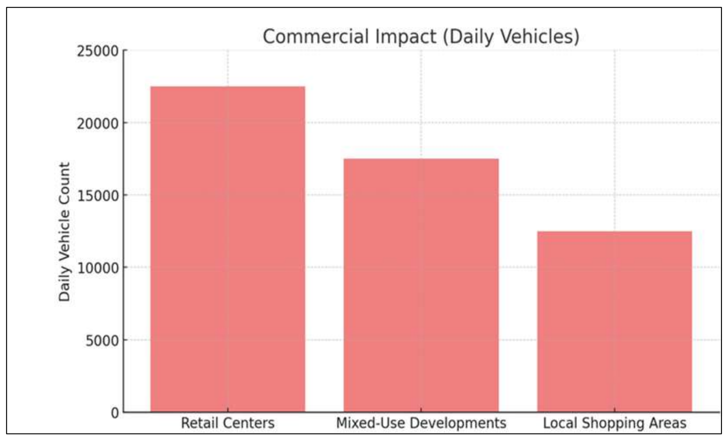
Based on the analysis of collected traffic data across monitoring stations, integrating station identifiers, traffic counts, and geographical coordinates, we have identified the following traffic flow patterns as a part of Phase 2:

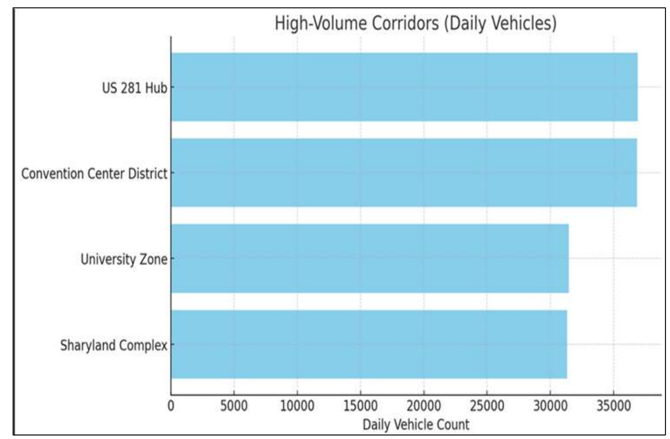
Key Findings

- **High-Volume Corridors**:
  1. **US 281 Hub**: 36,901 vehicles daily.
  2. **Convention Center District**: 36,840 vehicles daily.
  3. **University Zone**: 31,451 vehicles daily.
  4. **Sharyland Complex**: 31,324 vehicles daily.
- **Geographic Traffic Distribution**:
  1. **Western Sector (98.35°W - 98.30°W)**:
     1. Moderate flow: 4,000-20,000 daily vehicles.
     2. Predominantly residential areas.
  2. **Core District (98.29°W - 98.18°W)**:
     1. Peak flow: Exceeds 30,000 daily vehicles.
     2. Mixed commercial and institutional areas.
  3. **Eastern Sector (98.17°W - 97.87°W)**:
     1. Gradual reduction in volume.
     2. Suburban characteristics.
- **Commercial Impact**:
  1. **Retail Centers**: 20,000-25,000 daily vehicles.
  2. **Mixed-Use Developments**: 15,000-20,000 daily vehicles.
  3. **Local Shopping Areas**: 10,000-15,000 daily vehicles.
- **Insights for Urban Planning:** Traffic is concentrated around:
  1. **Educational facilities**: Indicates high commuter activity.
  2. **Major intersections**: Crucial for flow optimization.
  3. **Commercial centers**: Key hubs for economic activity.

Key Traffic Flow Pattern Metrics







WHY REGRESSION ANALYSIS?

Based on the data accumulated through phases 1 and 2, we have concluded that using multiple linear regression analysis would be particularly valuable to determine optimal station locations. The reasons being:

1) **Multiple Predictor Variables**

- The dataset contains multiple independent variables that likely influence traffic patterns
- These variables are measured on consistent numerical scales (0-10)
- The relationships between variables appear to be potentially linear

2) **Complex Interactions**

- Traffic patterns are influenced by multiple factors simultaneously
- MLR can help understand the relative importance of each factor
- Can identify which combinations of factors lead to higher traffic counts

3) **Predictive Capabilities**

- Can predict traffic counts for potential new station locations
- Helps optimize resource allocation for new stations
- Allows for scenario testing with different variable combinations

Slide 16

DS1 need to use this slide as a justification for selecting regression analysis

Degala, Shanmukha Abishek, 2024-12-04T18:36:44.923

Benefits of MLR Analysis Model

Variable Impact Assessment

This tells us "what matters most" in driving traffic. By analyzing the data, we can:

- Determine which factors (like highway proximity or amenity density) have the strongest influence on traffic counts
- Identify which combination of factors creates the highest traffic volumes
- Understand how different factors work together (for example, how highway proximity might be more important when combined with high amenity density)

Location Optimization

This helps answer "where should we put new stations?" We can:

- Use the model to predict traffic volumes for potential new locations
- Focus on areas that have the right combination of factors for high traffic
- Ensure stations are placed where they'll be most useful based on data-driven predictions

Resource Allocation

This addresses "how should we invest our resources?" The analysis helps:

- Make evidence-based decisions about where to invest in new infrastructure
- Justify station placement decisions with quantitative data
- Compare costs of different locations against their predicted effectiveness
- The ultimate goal is to make smarter, data-driven decisions about traffic station placement that maximize their utility while making the best use of available resources.

Slide 17

DS1 this slide too. this slide talks about the benefits of using regression analysis for futute planning
Degala, Shanmukha Abishek, 2024-12-04T18:41:45.217

DS1 0 slide 28,29 to be shown before summary of phase 3
Degala, Shanmukha Abishek, 2024-12-04T18:43:17.409

CV1 1 okay no changes right i will just copy paste it as it is??
Chougule, Vineet, 2024-12-04T18:44:07.546

DS1 2 yeah yeah....content is set
Degala, Shanmukha Abishek, 2024-12-04T18:44:59.616

CV1 3 okay okay I'll edit it
Chougule, Vineet, 2024-12-04T18:45:35.798

CV1 4 what should be the title for slide 15??
Chougule, Vineet, 2024-12-04T18:51:26.216

DS1 5 Benefits of Multiple linear regression analysis model.
Degala, Shanmukha Abishek, 2024-12-04T19:17:53.277

SUMMARY OF PHASE 3

Inputs Identified

- Average Traffic Count
- Location Type (Categorical: Commercial, Educational, Transportation, Residential, Mixed-Use)
- Proximity Factor Score (0-10 scale)
- Traffic Station ID

Location Type

Categorized based on traffic patterns into:

- Commercial Areas
- Educational Institutions
- Transportation Hubs
- Residential Areas
- Mixed Use

Proximity Factor Scoring Criteria

1. Highway/Major Road Proximity:

0: None | 2-4: Local roads | 5-7: Business routes | 8-10: Highway intersection

2. Amenity Density:

0: None | 1-3: 1-2 amenities | 4-6: 3-4 amenities | 7-10: 5+ major amenities

3. Institutional Presence:

0: None | 1-3: Small institution | 4-6: Large school | 7-10: Major/multiple institutions

4. Intersection Complexity:

0: Single-road | 1-3: Two-road | 4-6: Local intersection | 7-10: Highway merge/multi-junction

Summary Output from Multiple Regression Analysis

Regression Statistics	
Multiple R	0.890788828
R Square	0.793504737
Adjusted R Square	0.779263684
Standard Error	4246.693397
Observations	32

ANOVA

	df	SS	MS	F	Significance F
Regression	2	2009737062	1004868531	55.71952842	1.1647E-10
Residual	29	522997739.3	18034404.8		
Total	31	2532734802			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-4226.435677	2127.518554	-1.986556436	0.056493458	-8577.69969	124.8283336	-8577.69969	124.828334
Proximity Score	4604.959304	601.6907389	7.653365768	1.94074E-08	3374.36357	5835.555039	3374.36357	5835.55504
Location Type (Numeric)	-171.2347933	600.7460445	-0.285036905	0.777641657	-1399.89841	1057.428824	-1399.89841	1057.42882

Summary Output from Regression Analysis using Dummy Variables

Regression Statistics	
Multiple R	0.941114632
R Square	0.88569675
Adjusted R Square	0.810691635
Standard Error	3473.109915
Observations	32

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	8	2243234982	280404372.7	26.56682611	7.39842E-10
Residual	24	289499819.6	12062492.48		
Total	32	2532734802			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-4895.583929	2058.978359	-2.37767624	0.025735084	-9145.1064	-646.061456	-9145.106402	-646.0614563
Proximity Score	5195.566905	681.0715016	7.628519022	7.24557E-08	3789.904413	6601.229397	3789.904413	6601.229397
Residential	0	0	65535	#NUM!	0	0	0	0
Commercial	-6193.60887	2589.243744	-2.39205323	#NUM!	-11537.5453	-849.672432	-11537.54531	-849.6724316
Mixed Use	-2983.987062	2412.495451	-1.23688816	0.228095587	-7963.13295	1995.15883	-7963.132953	1995.15883
Eduational	-2389.590739	2865.389078	-0.83394983	0.412533	-8303.46314	3524.281658	-8303.463136	3524.281658
Transportation Hu	-2556.209227	3298.319068	-0.77500362	0.44590669	-9363.60521	4251.186754	-9363.605208	4251.186754
Major Highway In	1530.940415	5117.408163	0.299163242	0.767390811	-9030.87093	12092.75176	-9030.870931	12092.75176
Downtown Area	-15037.27613	4885.547498	-3.07791013	0.005153284	-25120.5506	-4954.00168	-25120.55059	-4954.001678

KEY TAKEWAYS FROM REGRESSION ANALYSIS

1. Proximity Score is the Most Significant Predictor

- Proximity Score has the largest impact on traffic counts.
- A **1-point increase** in Proximity Score results in an **increase of ~4,605 vehicles**.
- **Actionable Insight**: Focus on locations with high Proximity Scores for station selection to maximize efficiency and usage.

2. Impact of Location Type

- Changing **Location Type** (e.g., Residential to Commercial) decreases traffic counts by **~171 vehicles**.
- Certain categories (e.g., Residential) generate more traffic.
- **Actionable Insight**: Align station selection with traffic patterns specific to each location type.

3. Strong Model Performance

- **R-Square: 79.35%** – Model explains most variability in traffic counts.
- **Adjusted R-Square: 77.93%** – Accounts for the number of predictors, ensuring robustness.
- **Actionable Insight**: Trust the model for data-driven predictions and decision-making.

4. Statistical Significance Ensures Reliability

- **F-statistic: 55.72, p-value < 0.001** – Confirms a strong, reliable relationship between variables and traffic count.
- **Actionable Insight**: Decisions based on this model are credible and statistically supported.

5. Practical Application

- Model enables accurate predictions for station optimization.
- Focusing on **high Proximity Scores** and **appropriate Location Types** ensures maximum impact.
- **Actionable Insight**: Use the model to finalize 14 station locations and continuously monitor their performance.

Proposed Optimal Solution

The multiple linear regression analysis has validated significant correlations between traffic counts and the measured independent variables, providing several key insights:

- Clear numerical relationships exist between average daily traffic counts and multiple independent variables, with all metrics consistently scaled for comparison.
- Proximity scores effectively function as composite indicators, synthesizing multiple underlying variables. The regression analysis validates these relationships and offers potential refinement opportunities.
- The substantial variation in traffic counts (ranging from 2,552 to 36,840) can be systematically explained through the combined influence of multiple variables.

For the selection of high-priority station locations, the methodology employs a dual-threshold approach:

- Calculate the mean proximity score across all 34 potential locations
- Determine the average annual daily traffic count across all locations
- Select locations that exceed both threshold values simultaneously which have been narrowed down to 14 of them.

This methodology offers two key advantages:

- It ensures selected locations optimize both accessibility and utilization
- The model maintains its relevance with real-time data updates, as the selection criteria dynamically adjust to changing conditions

This data-driven approach provides a robust framework for identifying optimal station locations while remaining adaptable to future data inputs and changing conditions. The model's flexibility ensures sustainable decision-making for long-term infrastructure planning.

Slide 22

DS1 proposed best solution done

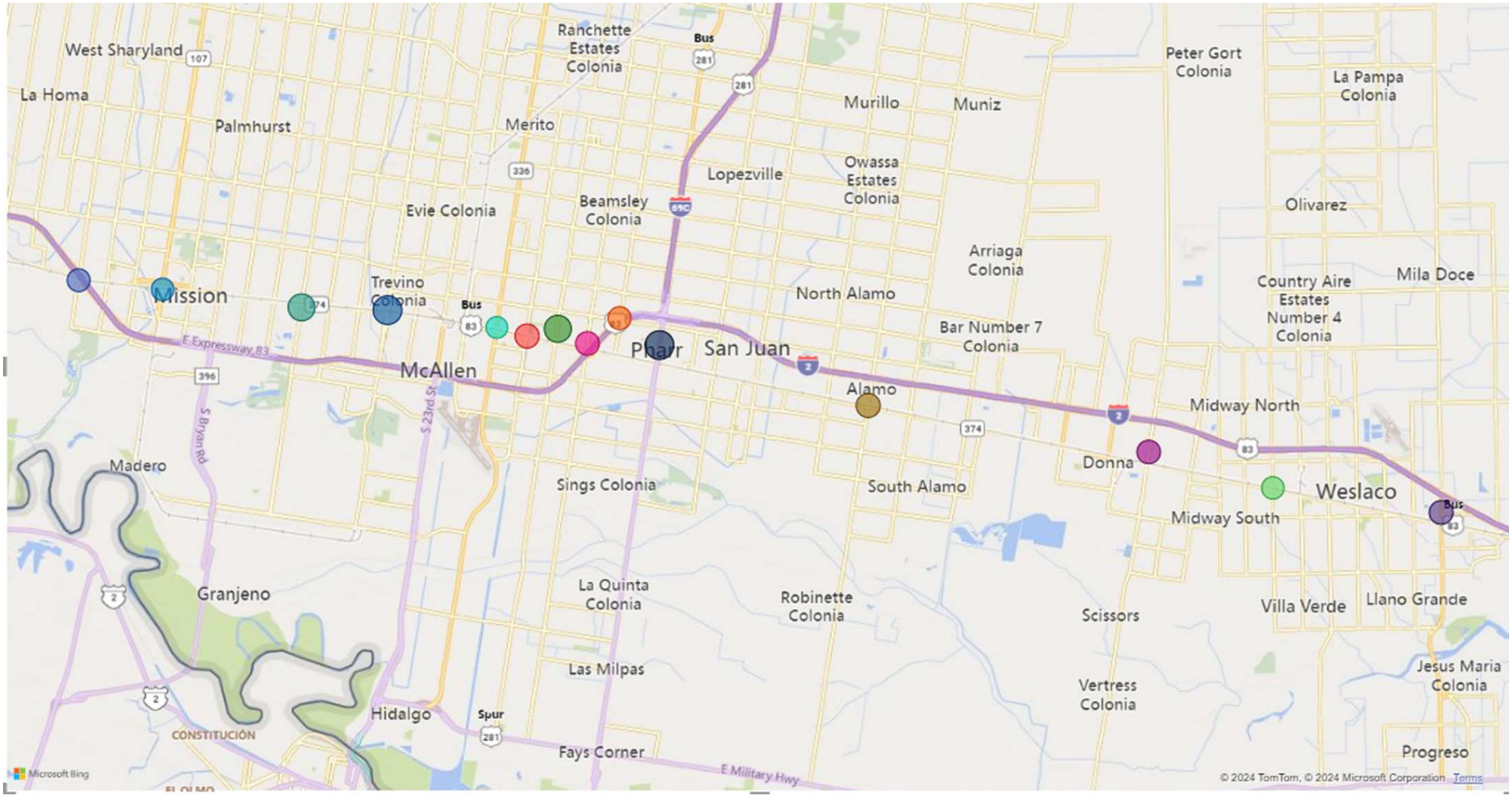
Degala, Shanmukha Abishek, 2024-12-04T19:16:49.368

Final 14 Potential Station Location

Traffic Station ID	Average Traffic Count	Proximity Score	Optimal Station Locations	Latitude	Longitude
109U228	20222	4.75	109U228 - 20222 - 4.75	26.21647	-98.35015
109H148B	19487	5.5	109H148B - 19487 - 5.5	26.21411	-98.32601
109H152	31324	6.75	109H152 - 31324 - 6.75	26.20948	-98.28605
109H156	36840	8	109H156 - 36840 - 8	26.20876	-98.26135
109H161	17735	7.25	109H161 - 17735 - 7.25	26.20428	-98.2299
109HP5213	23338	5.75	109HP5213 - 23338 - 5.75	26.20208	-98.22122
109H143	31451	7	109H143 - 31451 - 7	26.20395	-98.21238
109H142A	22453	7	109H142A - 22453 - 7	26.20015	-98.20385
109UR1379	20567	5.25	109UR1379 - 20567 - 5.25	26.20669	-98.19461
109H133A	36901	7.75	109H133A - 36901 - 7.75	26.19974	-98.18314
109H65	23251	5.5	109H65 - 23251 - 5.5	26.18416	-98.12313
109H79	22087	5.5	109H79 - 22087 - 5.5	26.17216	-98.04247
109UR1579	19291	5.5	109UR1579 - 19291 - 5.5	26.16288	-98.00677
109H87	22643	5.5	109H87 - 22643 - 5.5	26.15654	-97.95839

CV1

FINAL 14 STATION LOCATIONS



Slide 24

CV1 can you insert the pic here please bro?
Chougule, Vineet, 2024-12-04T19:31:00.579

CV1 0 [@Degala, Shanmukha Abishek]
Chougule, Vineet, 2024-12-04T19:38:58.881

Future Transportation Corridor Evaluation Criteria

1. Population and Employment Projections

Analyse current and forecasted population growth

Assess workforce distribution and commuter patterns

Identify areas with emerging economic development

Predict long-term transportation demand based on demographic trends

2. Connectivity and Multimodal Integration

Evaluate existing transportation networks

Assess potential linkages with:

- Public transit systems
- Bike and pedestrian infrastructure
- Regional and intercity transportation routes

Analyse potential for seamless modal transfers

3. Environmental and Community Impact

Conduct comprehensive environmental assessment

Evaluate potential effects on:

- Local ecosystems
- Air and noise pollution
- Community social dynamics
- Land use and urban development patterns

Consider sustainability and green infrastructure opportunities

4. Infrastructure Development Feasibility

Perform detailed cost-benefit analysis

Assess:

- Capital investment requirements
- Long-term maintenance costs
- Potential funding sources
- Technical and engineering challenges
- Phased implementation strategies

Transportation Metrics and Sustainability Goals

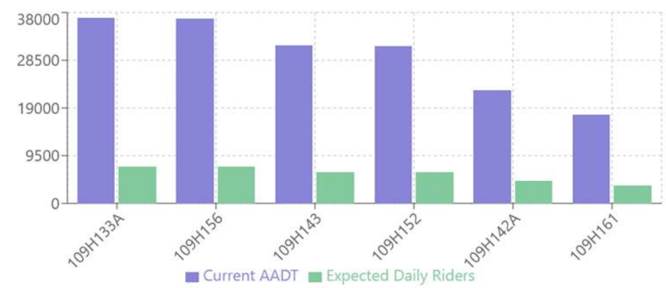
Sustainability Impact Metrics

Carbon Reduction
25,000-30,000
Tons CO2/Year

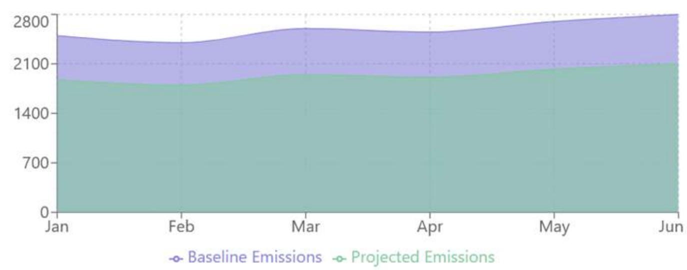
Air Quality Improvement
20%
Emission Reduction

Energy Efficiency
50%
vs Private Vehicles

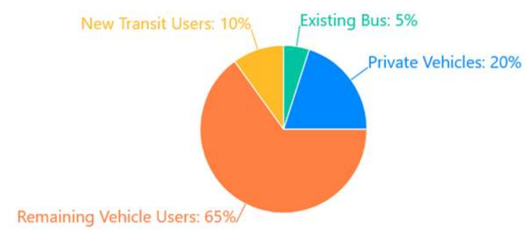
Expected Daily Ridership by Station



Projected CO2 Emissions Reduction



Modal Shift Distribution



ACKNOWLEDGEMENTS

FOR TRAFFIC STATION ID'S, TRAFFIC COUNT AND GEOGRAPHICAL POSITIONS
TXDOT.GOV

FOR HIDALGO COUNTY DATA

HTTPS://WWW.CENSUS.GOV/

SURVEYS: **AMERICAN COMMUNITY SURVEY (ACS)**

TOOLS USED FOR DATA ANALYSIS:
DATA VISUALIZATION: **POWERBI**

DATA PREP AND REGRESSION ANALYSIS: **MS EXCEL**

TRAFFIC FLOW PATTERN ANALYSIS: **PYTHON, REACT**

THANK YOU

Q&A