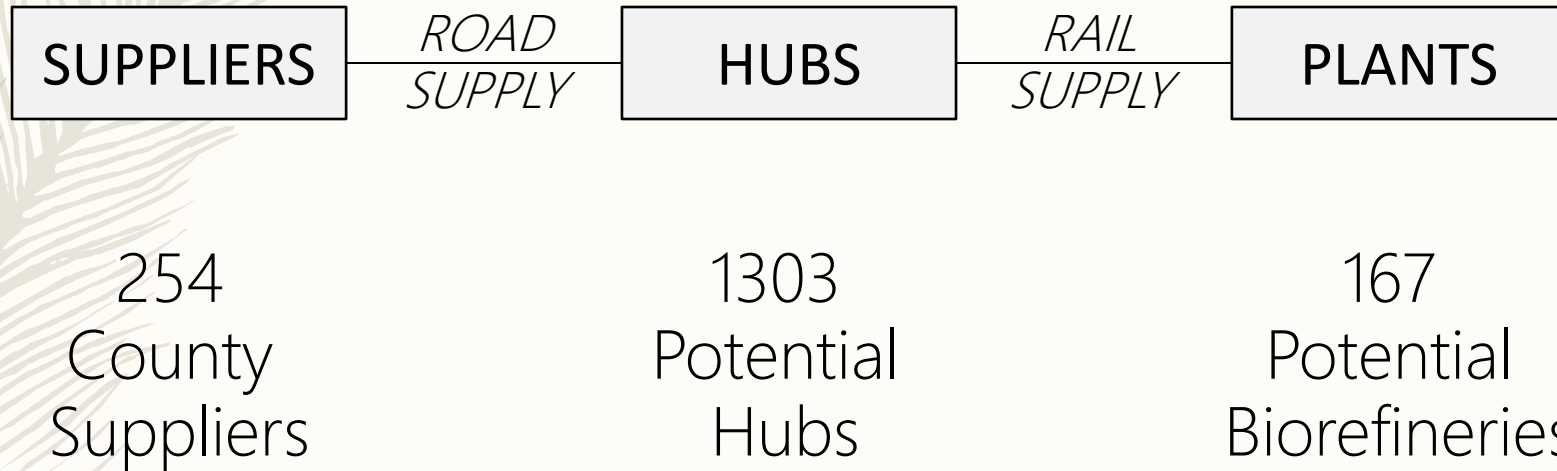


TEXAS BIOFUEL SUPPLY NETWORK OPTIMIZATION


BY

CHIBUEZE ENYINNAYA

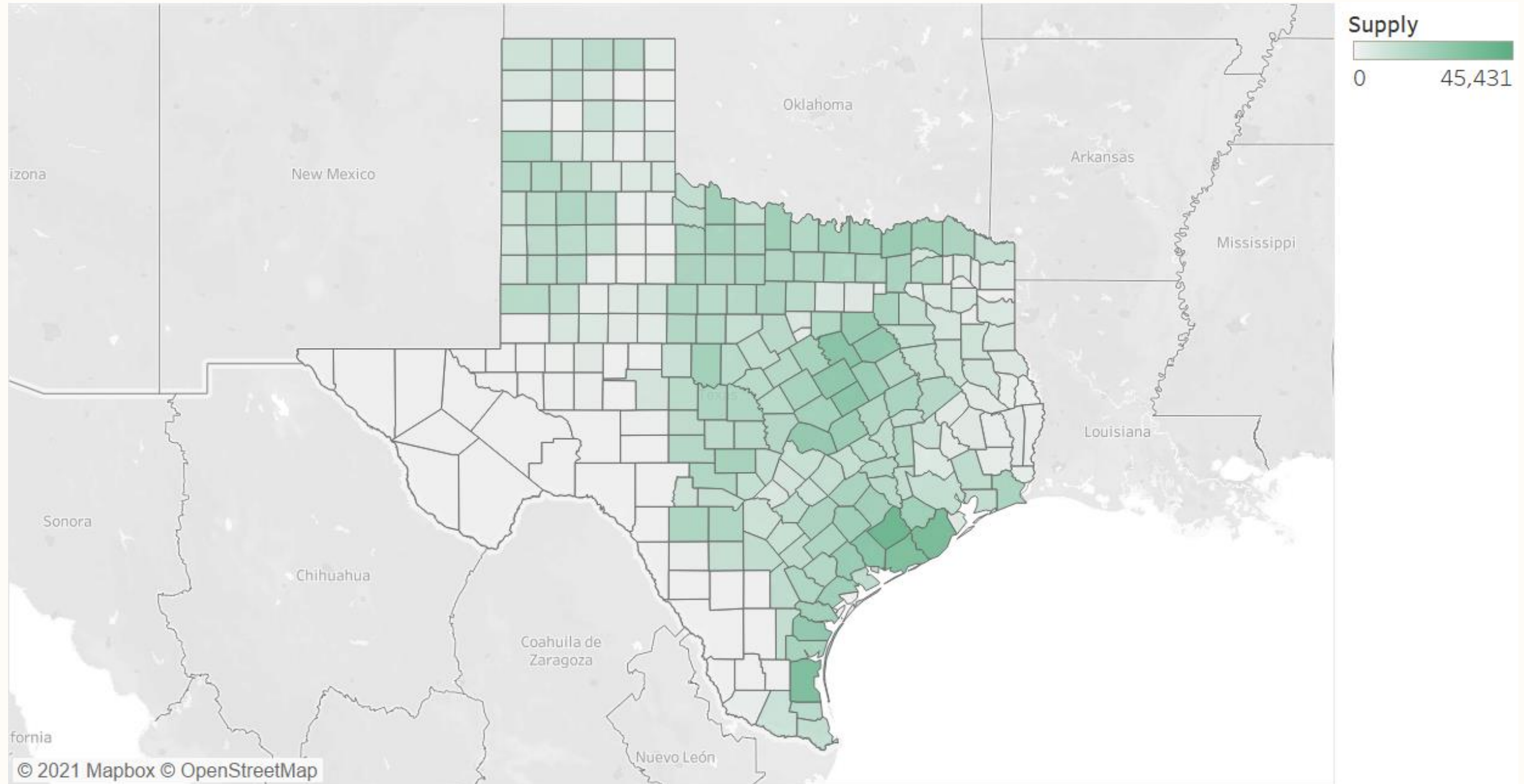
SUPPLY NETWORK



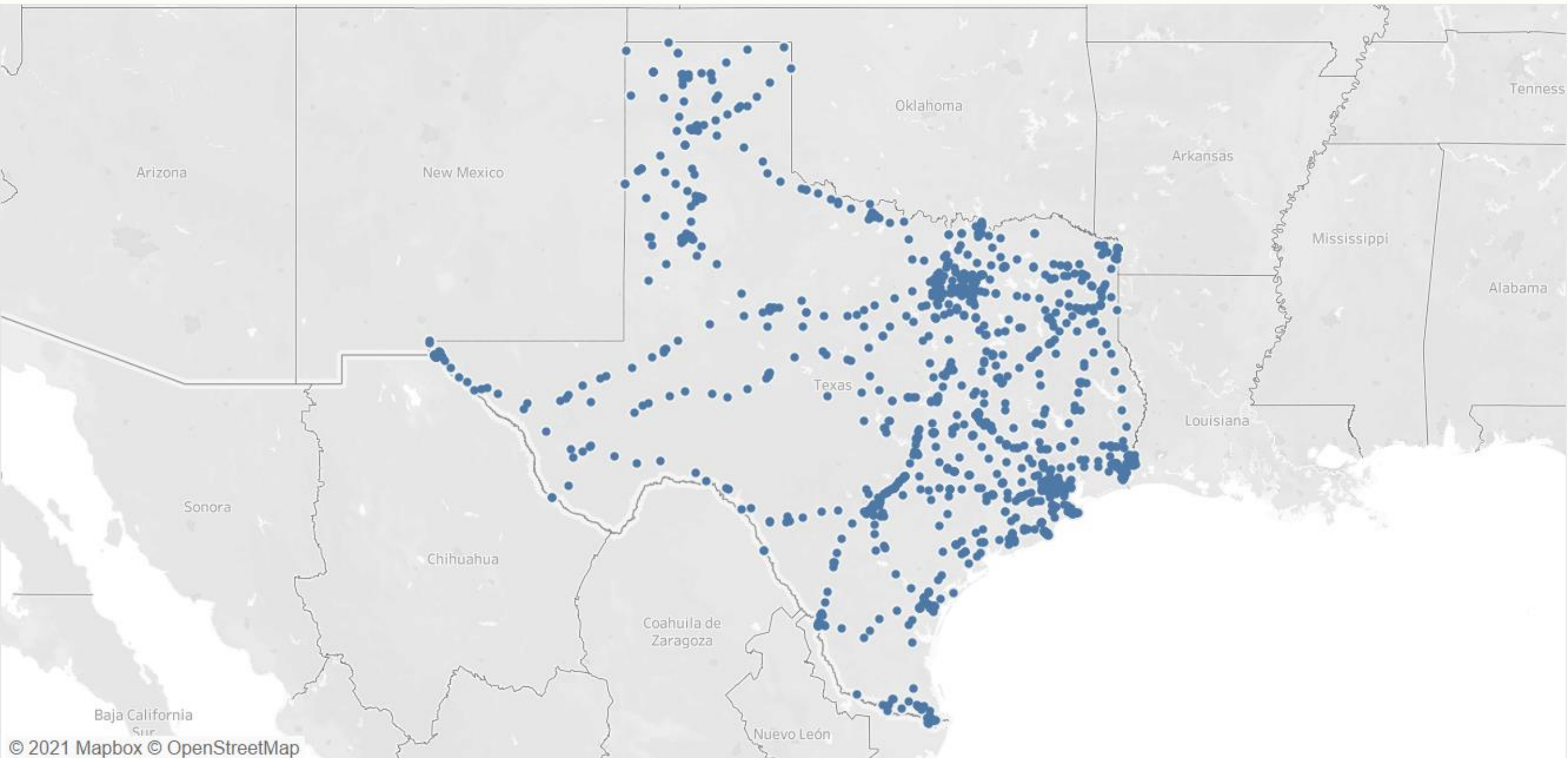
ASSUMPTIONS

- 
- The centroid of the county is considered as the county supplier
 - Road and Rail distances are not accounted for since they correlate with the costs
 - 2nd Law of Thermodynamics is ignored since there is no energy loss from Biomass conversion to liters
 - Cleaned data errors and redundancies are considered as bonuses and policy issues

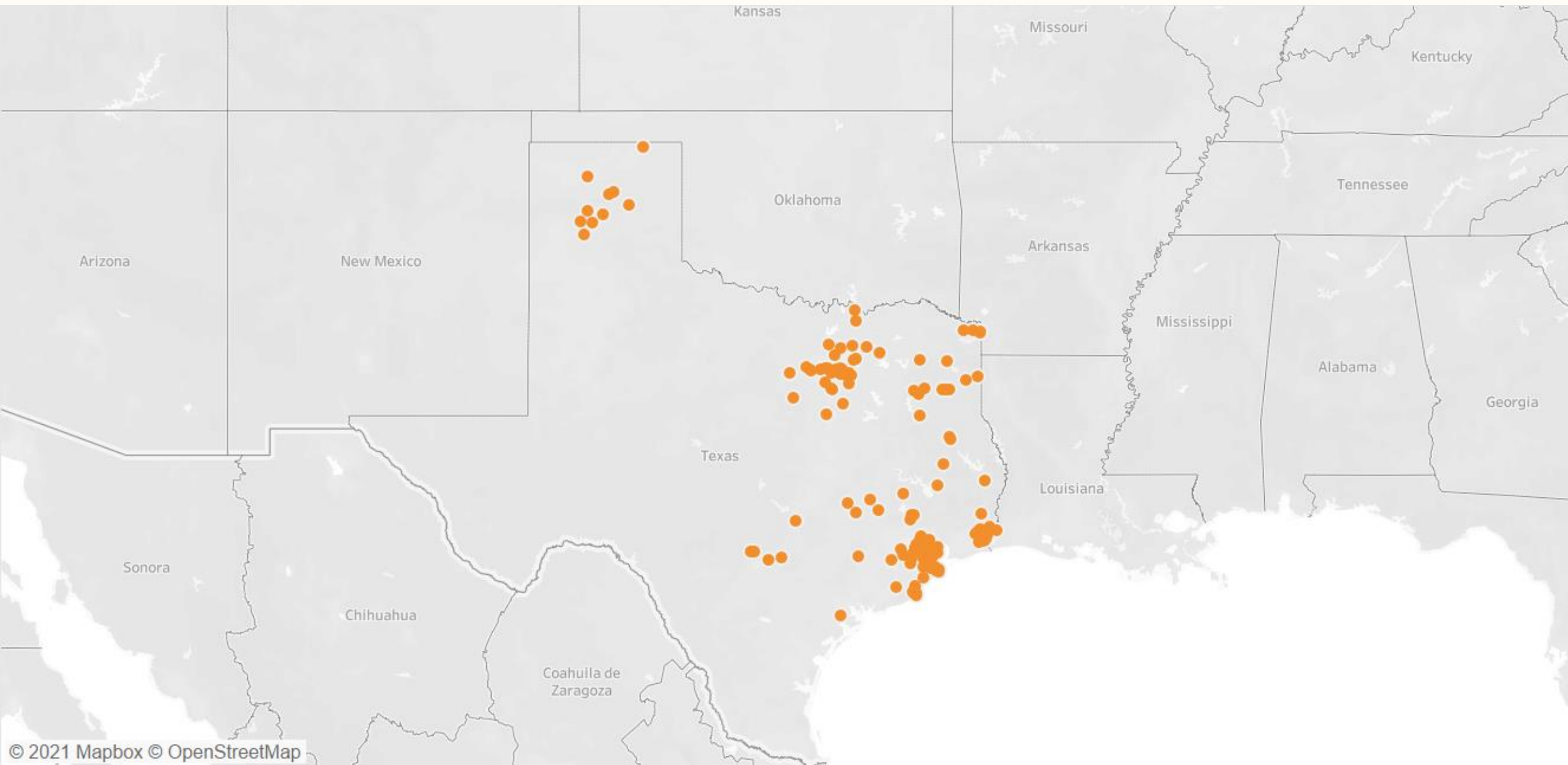
Supply by County



Hub Potential Locations



Plant Potential Locations





PARAMETERS

HUB PARAMETERS

Investment cost	\$ 3,476,219
Preprocessing capacity	300,000 Mg

PLANT PARAMETERS

Investment cost	\$ 130,956,797
Annual conversion capacity	152,063,705 liters
Conversion yield	232 liters/Mg

DEMAND

Network demand	1,476,310,602 liters
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Note: All the parameters are considered for a period of time of one year.



CALCULATIONS

From the datasets and parameters:


Total Supply = 3,053,377.71 Mg

Demand in Mg = Network demand in liters / Conversion yield
= 1,476,310,602 liters / 232 liters/Mg
= 6,363,407.77 Mg

Since the demand supersedes the total supply, a third-party supplier is to be introduced:

3rd party Supply = Demand – Total Supply = 3,310,030.06 Mg

CALCULATIONS

- 
-
- The Average Road Cost is used as the estimated 3rd party cost per unit
 $= \$ 30,488,893.10 / 330,962 = \$92.122 \approx \$92$
 - Number of plants to meet demand
 $= \text{Demand} / \text{Annual Conversion Capacity} = 9.7085 \approx 10 \text{ plants}$
 - Total Plant Investment Cost = $10 \times \$ 130,956,797 = \$ 1,309,567,970$
 - Number of hubs to meet plant requirement
 $= \text{Demand} / \text{Hub Capacity} = 21.21 \approx 22 \text{ hubs}$
 - Total Hub Investment Cost = $22 \times \$ 3,476,219 = \$ 76,476,818$

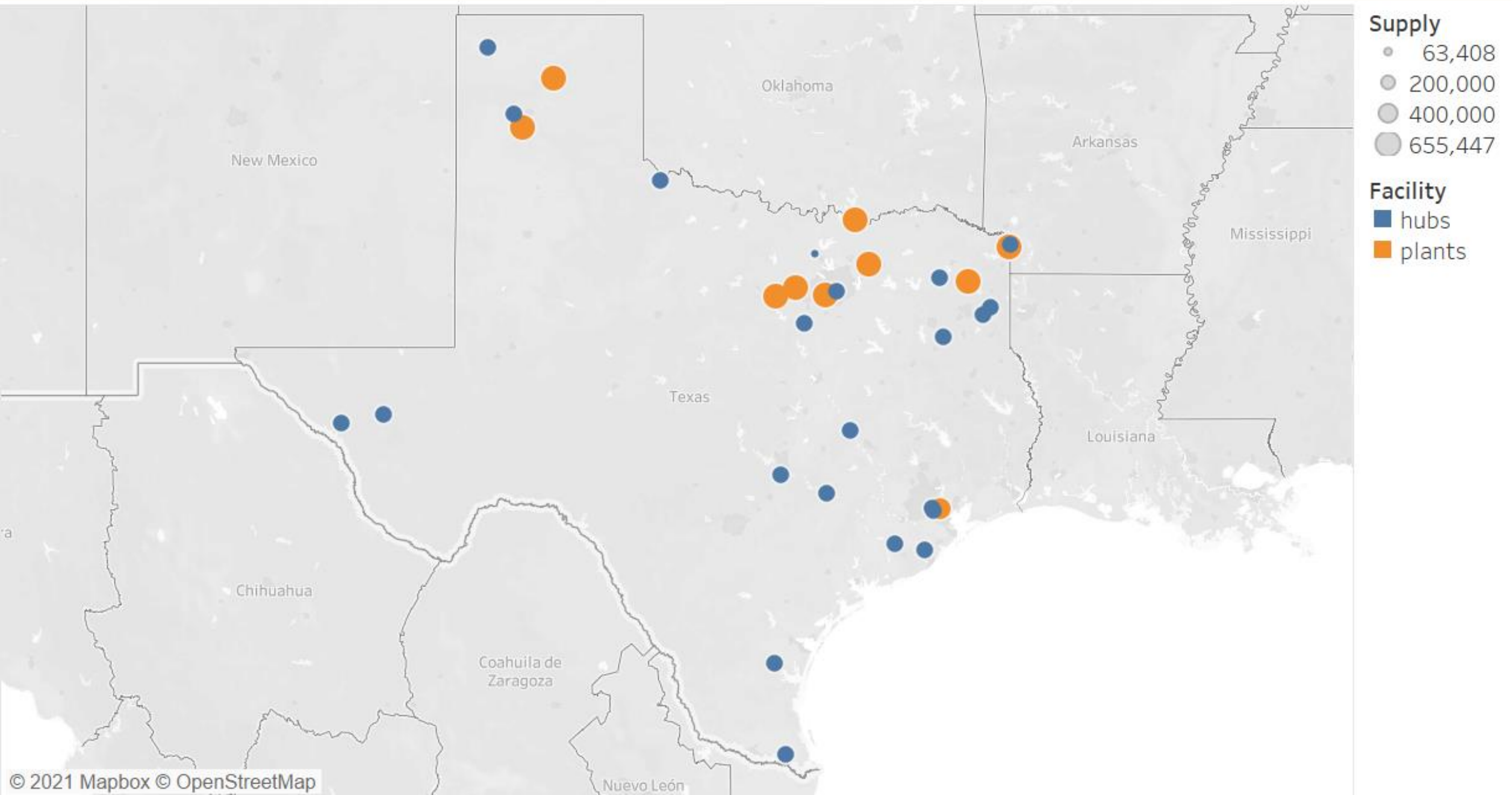
RESULTS

	hub_status	road_supply
hubs		
512	1.0	300000.000
17246	1.0	300000.000
17318	1.0	300000.000
17387	1.0	300000.000
17399	1.0	300000.000
17482	1.0	300000.000
17517	1.0	300000.000
17623	1.0	300000.000
17695	1.0	63407.767
17850	1.0	300000.000
17886	1.0	300000.000
17909	1.0	300000.000
17969	1.0	300000.000
18006	1.0	300000.000
18012	1.0	300000.000
18097	1.0	300000.000
18103	1.0	300000.000
18119	1.0	300000.000
18255	1.0	300000.000
18264	1.0	300000.000
18307	1.0	300000.000
18483	1.0	300000.000

	plt_status	rail_supply
plants		
543	1.0	655447.00
9088	1.0	655447.00
9091	1.0	655447.00
9104	1.0	655447.00
9142	1.0	655447.00
9167	1.0	464384.73
9188	1.0	655447.00
9203	1.0	655447.00
10060	1.0	655447.00
10061	1.0	655447.00



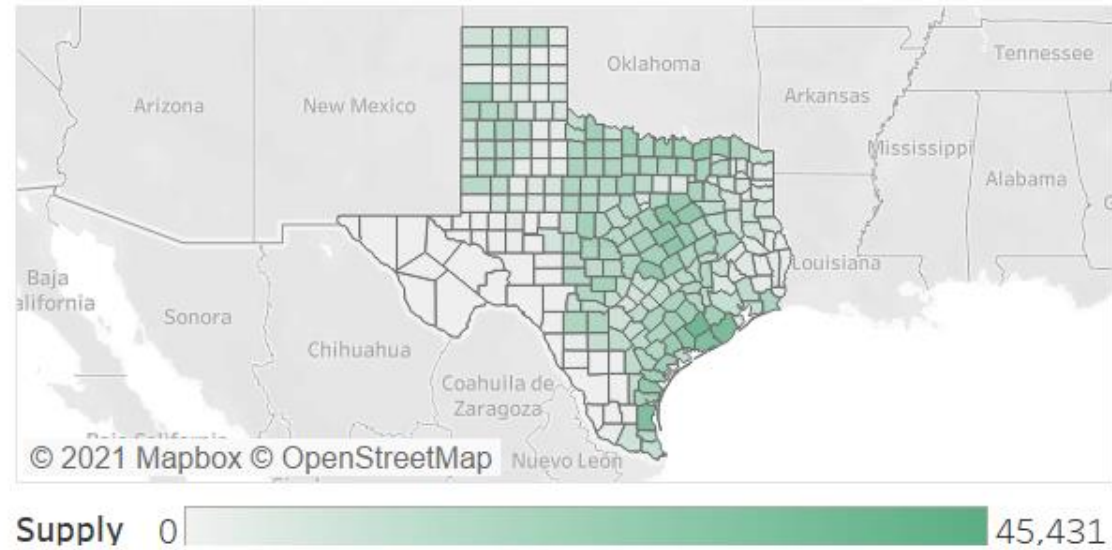
Optimal Hub and Plant Locations



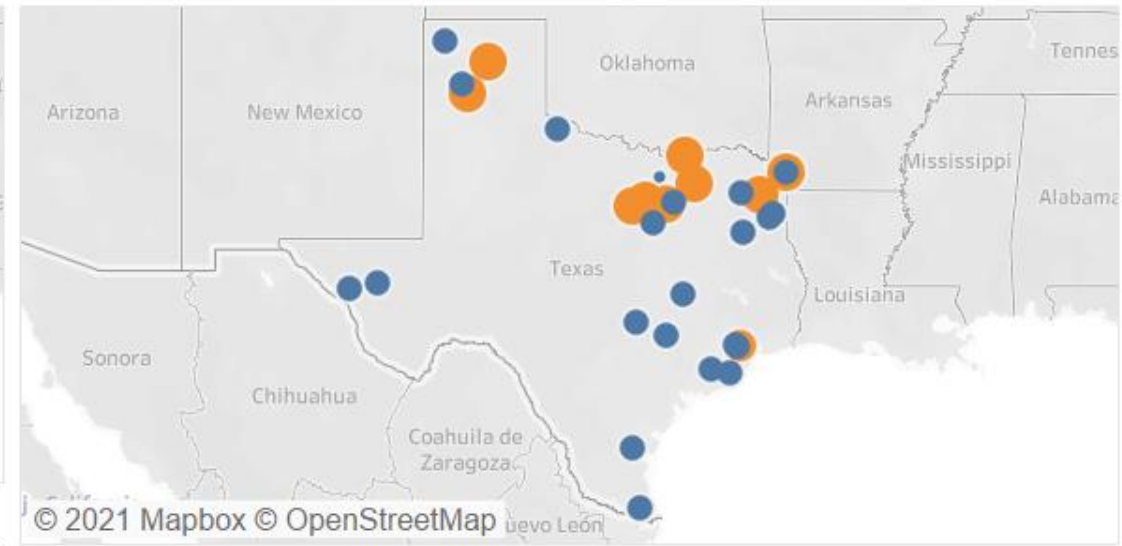
TEXAS BIOFUEL SUPPORT NETWORK

Facility
■ hubs
■ plants

Supply by County



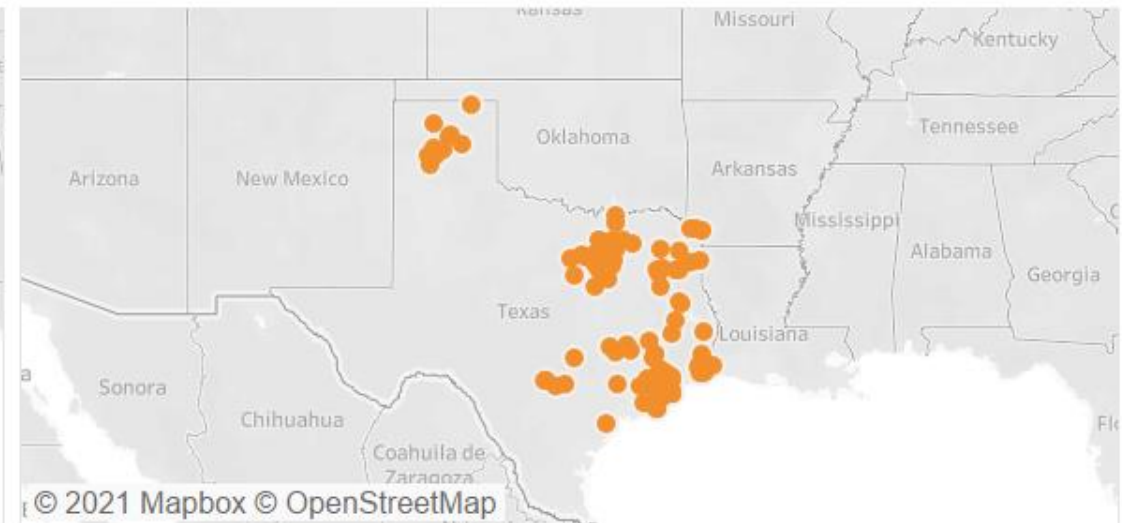
Optimal Hubs and Plants



Potential Hubs



Potential Plants





CONCLUSION & RECOMMENDATIONS

- The optimal number of **22 hubs** and **10 plants** were obtained for an overall network (investment and transportation) cost of **\$1,725,868,653,500**
- With **0.025%** and **0.215%** error rate from the TX_roads and TX_railroad datasets these results were retrieved, but with more accurate data better results would have been reached.