State Surplus Land Assessment

Fall 2020

Deliverable 2

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Strategic Questions Answered

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1. What land owned by municipal housing authorities is most attractive for the development of affordable housing based on proximity to public transport, existing availability of affordable housing units (% of all housing and per 100 low income families)?

2. What land owned by municipal housing authorities is most attractive for sale based on the value of the surrounding land?

3. What state land owned by the Mass Department of Housing and the Mass Department of Transportation (DOT and related agencies e.g. MBTA) is most attractive for the development of affordable housing based on proximity to public transport, existing availability of affordable housing units (% of all housing and per 100 low income families)? Which of these lands have existing buildings, i.e. are likely to have existing utility (water/electricity) services?

4. What state land owned by the Mass Department of Housing and the Mass Department of Transportation (DOT and related agencies e.g. MBTA) is most attractive for sale based on the value of the surrounding land?

5. Which legislative districts have the most opportunity to benefit from this legislation (develop or sell lands) based on which districts have the greatest need and the greatest $ to be made based on land value or the largest number of parcels + land size to be developed for affordable housing?

Strategic Questions Unanswered

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6. What is the "opportunity cost" of not selling the most valuable land, i.e. how much is the land costing to maintain? How much revenue is the state potentially sacrificing based on the market value of nearby land?

Strategic Question 1

What land owned by municipal housing authorities is most attractive for the development of affordable housing based on proximity to public transport, existing availability of affordable housing units (% of all housing and per 100 low income families)?


Analysis actions performed:

- Referring to analysis.py, we first filtered land parcels owned by municipal housing authorities.
- In the dataset, there is a field that reflects how many transit stops a parcel has. Set a threshold and choose those with more than 10 transit stops as transit_friendly parcels.
- Group parcels by city and town and town and also by district. Calculate for each town and city and also for each district the land area, total number of transit stops and total number of transit_friendly parcels.
- Add a field of the percentage of SHI units to each dataset. Those with lower percentages of SHI units have greater opportunity to develop affordable housing.
- In final_data.csv, there is a field that reflects the median income of a land parcel. When grouping the data, we calculated max income, min income and median income of each city and town and of each district and add them to the datasets.
- By doing the above, we formed several datasets.
    - ct_housing.csv
    - ct_housing_vacant.csv
    - ct_housing_non_vacant.csv
    - district_housing.csv
    - district_housing_vacant.csv
    - district_housing_non_vacant.csv
- As stated above, those which have the most transit stops, the lowest percentage of shi units and the lowest median income are in great need of affordable housing. Regarding this, there are lists of several city and town and districts that are the most attractive for the development of affordable housing.

Table 1. Cities with high selectability for additional affordable housing

| City	Number of Parcels	Available Land (ft^2)	Transit Score	Median Income $(\$)$	SHI $(\%)$
Quincy	36	2314376	40.1	47044.47	9.61
Peabody	15	1798335	37.9	63767.2	9.27
Fitchburg	27	1412004	31.3	50919.28	8.71
Gloucester	21	1192040	37.2	55602.17	7.37
Weymouth	9	1187105	37.9	66230.44	7.59
Westfield	23	1048415	37.9	49917.13	7.24
Revere	95	1033640	53.0	49216.14	8.1
Haverhill	14	903734.8	33.1	51113.57	10
Clinton	6	851356	37.9	66955	8.58
Webster	7	784392.1	37.9	40388	9.27
Middleborough	5	771817.4	37.9	62963	6.6
Ludlow	16	769100.6	37.9	64442.13	3.51
Oxford	3	760807.2	37.9	60689	7.32

Parcel analysis for vacant land

Vacant Housing and Transit Friendly
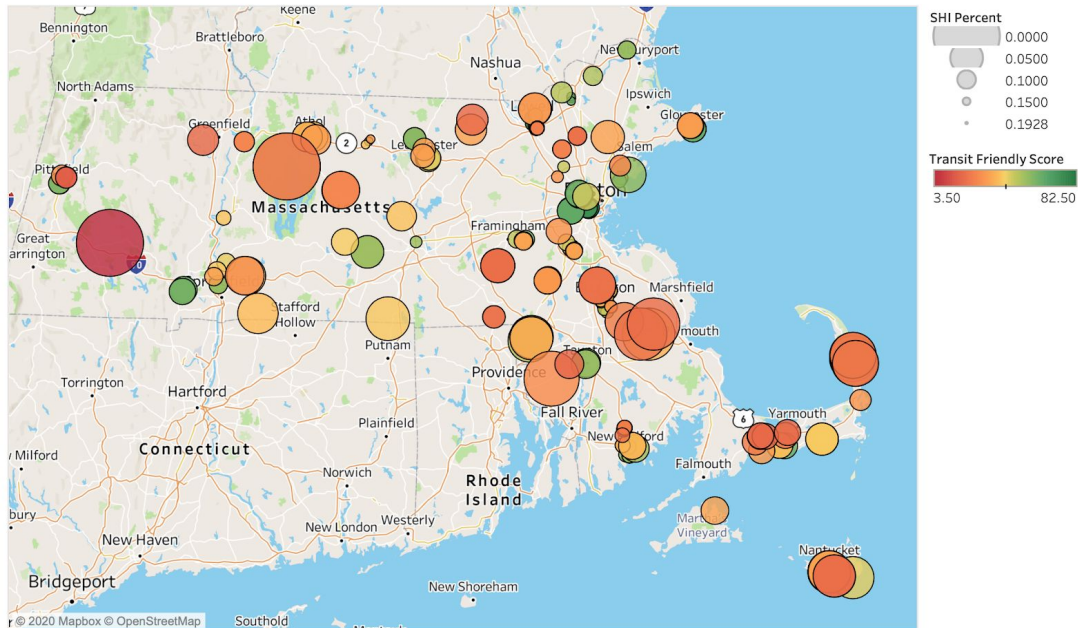
Map of vacant parcels owned by municipal housing authorities within the state of Massachusetts. Calculated transit score is shown as variable color and the city's SHI percentage is shown as size.

Parcel analysis for non-vacant land

Non-Vacant Housing and Transit
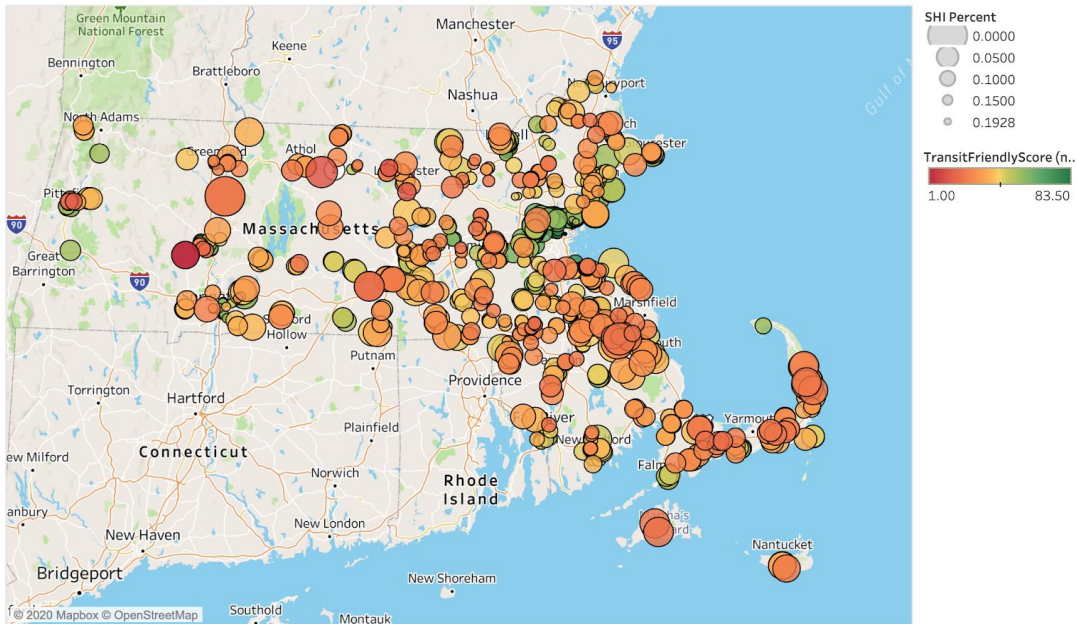
Map of non-vacant parcels owned by municipal housing authorities for the state of Massachusetts. Only parcels are shown that have at least 8,000sq. ft. available. Calculated transit score is shown as variable color and the city's SHI % is shown as size.

These figures show the dispersion of parcels within the state. It can be seen that there are available parcels in cities with a low SHI percentage, but that these available lands have poor transit friendliness. There are many non-vacant parcels in cities with relatively high transit friendly scores which could have possible opportunities for further development.
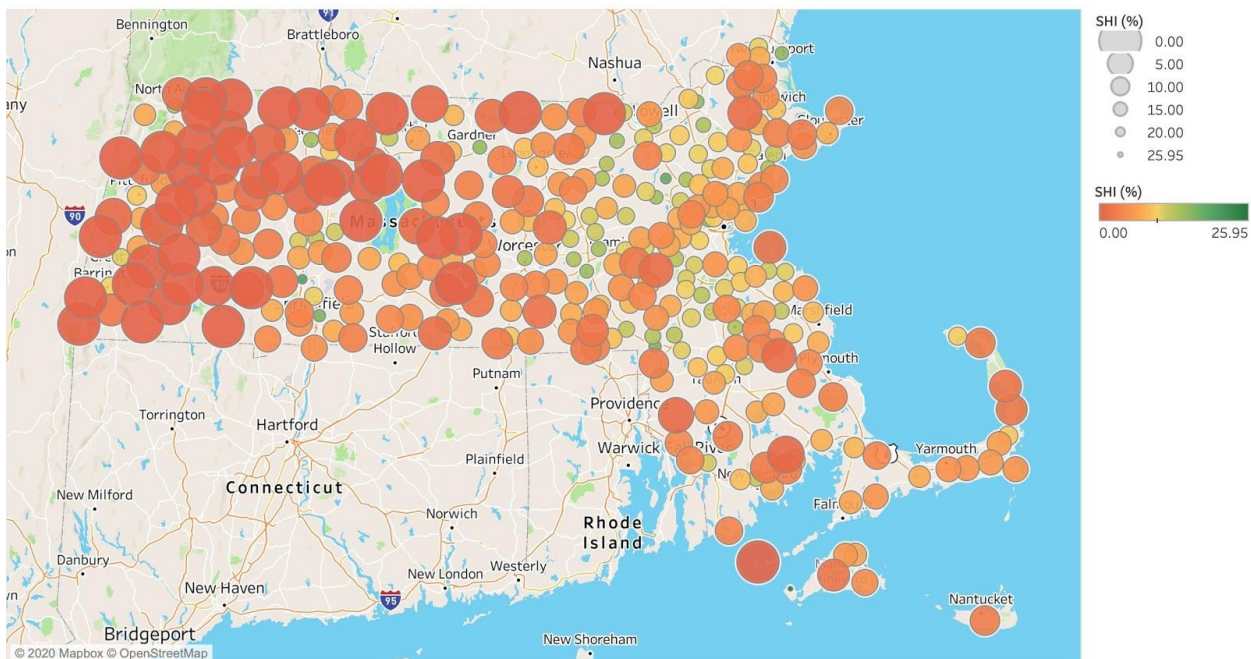
These figures were prepared with transitAnalysis.twbx using the data contained in:

vacantTransitFriendlyFullHousing_Final.csv
nonvacantTransitFriendlyFullHousing_Final.csv

City SHI Percentage Analysis

SHI Percentage for Massachusetts

Map showing the Subsidized Housing Inventory percentage for each city in the state of Massachusetts.
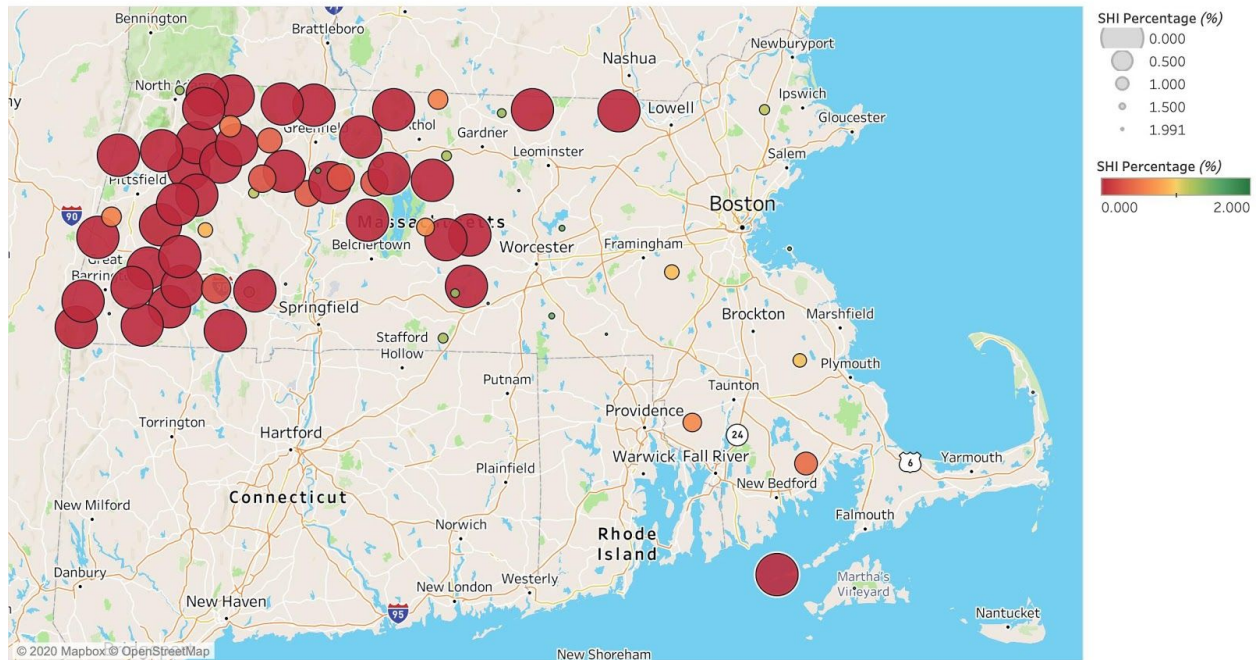
Map showing the Subsidized Housing Inventory percentage for each city in the state of Massachusetts.

This figure shows a breakdown of the SHI percentages within the state. It can be seen that the cities in the northwest part of the state have the lowest SHI percentage.

A complete sorted list of each city's SHI percentage from lowest to highest can be found in Appendix A.

Cities with less than SHI of 2%

Map showing the cities with less than 2% Subsidized Housing Inventory.

This figure shows the cities with the lowest SHI percentage (less than 2%) within the state. These are the cities that may benefit the most from having increased funding for affordable housing.

The specific names of the cities can be found in Appendix A, referenced earlier. Both of these figures were generated using cityAnalytics.twbx.

City Case Examples:

Two specific cases that show how the data can be used to analyze a city for potential increased affordable housing. Both the vacant and non-vacant parcels owned by municipal housing authorities were used.

Leominster and Fitchburg
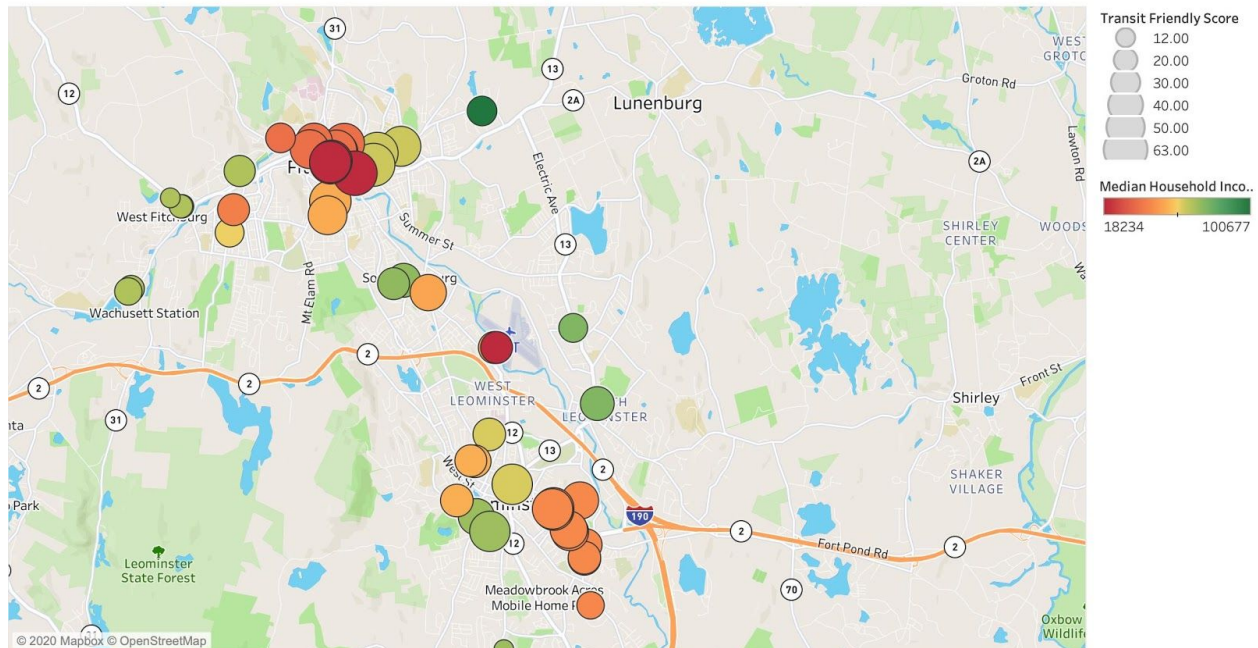
Parcels owned by municipal housing authorities for municipalities (% SHI) of Fitchburg (8.7%), Lunenburg (4.8%), and Leominster (8.2%).

It can be seen that for Lunenburg, which has the lowest SHI percentage, there are no parcels currently available. Increasing the cities SHI percentage will require purchasing additional land or repurposing other land. Both Firchburg and Leominster have a slightly higher SHI percentage and have much more housing opportunities. The parcels that have the highest transit score are also in the areas with the lowest median income.

Springfield and surrounding towns
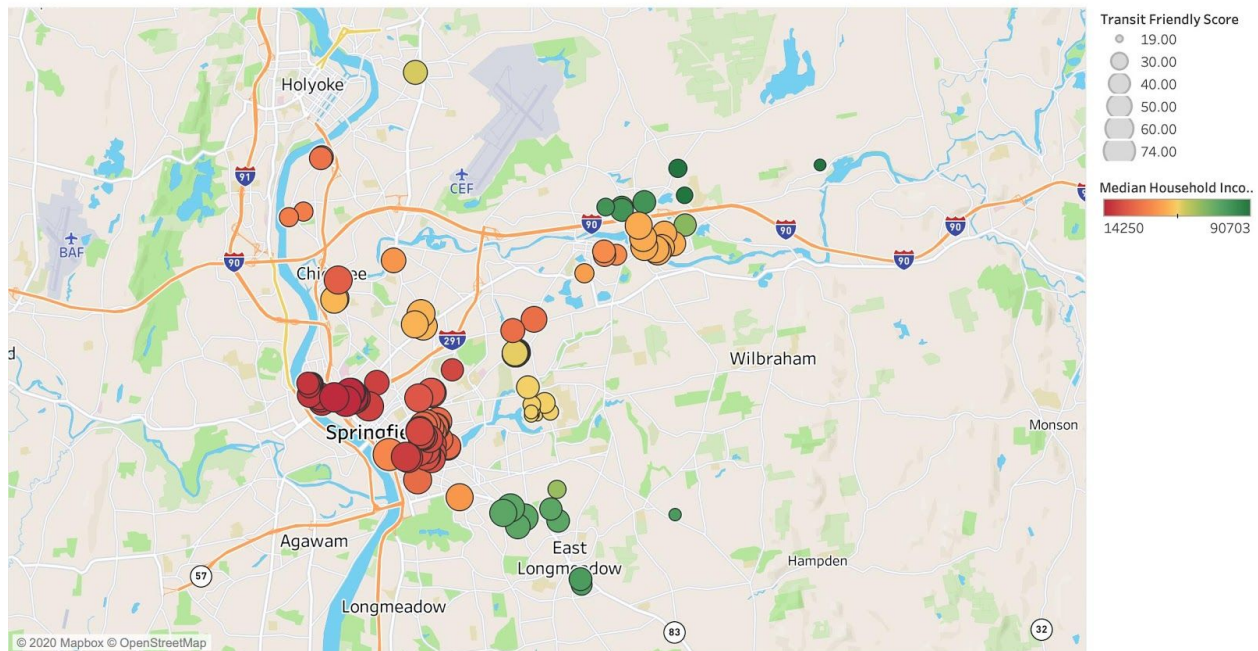
Parcels owned by municipal housing authorities for municipalities (% SHI) of Springfield (16.6%), Ludlow (3.5%), East Longmeadow (7.3%), and Chicopee (10.7%).

These cities show a wider range of transit friendly scores. The majority of parcels that have a high transit score are also in areas with lower median household incomes. Some of the parcels that are further outside the city centers and have a lower transit score are also once with a moderate median household income. These parcels may be good candidates to sell to increase funds for building of more affordable housing in lower income neighborhoods.

Figures generated using caseExamples.twbx

Property Type Breakdown:

Please refer to this CSV file with a complete breakdown by city of the property types:

Housing Rental Analysis

Four types of properties were found in the analysis:
1. Ownership
2. Rented
3. Mixed
4. Other

Appendix B and Appendix C show the number of rental parcels and units, respectively, for each city. These appendices were also generated using the cityAnalytics.twbx.

Existing services analysis:

Each parcel has three values associated with them: land value, building value, and other value. For the means of determining which parcels could have potential utilities, such as water and electricity, the data was filtered by parcels that have some building or other value. If a parcel only has land value, it is assumed that it has not been improved upon.

Please refer to Appendix D for a list of each city's number of parcels with improvements versus no assumed improvements.

For the parcels owned by municipal housing authorities, in total:
- 1,147 parcels had some improvement value
- 300 parcels only had land value

Top five cities with most improved parcels (number of parcels):
1. New Bedford (268)
2. Revere (92)
3. Springfield (79)
4. Needham (75)
5. Lowell (71)

Top five cities with most not improved parcels (number of parcels):
1. Lowell (86)
2. New Bedford (29)
3. Brockton (25)
4. Barnstable (20)
5. Springfield (18)

This data can be found in housing_improvedLots.csv and housing_nonImprovedLots.csv. The appendix and further analysis can be found in transitAnalysis.twbx.

Strategic Question 2

What land owned by municipal housing authorities is most attractive for sale based on the value of the surrounding land?

Analysis performed:
- From **final_data.csv**, we filtered out parcels that are owned by the municipal housing authorities and saved this new dataset as **housing.csv**
- In the housing.csv dataset, there is an address associated with each parcel. Using ParcelLookup API, a free public research tool with access to millions of parcel records in the United States, we were able to obtain the most current assessed value for the parcels owned by municipal housing authorities.
- Here is a summary table of lands owned by municipal housing authorities that are most attractive for sale based on its assessed value.
- The entire summary is stored as **housing_assessed_value_summary.csv**

Table 2. Cities with high value of parcels owned by housing authorities

| Municipality	Total Parcels	Total Land Value	Total Vacant Parcels	Total Vacant Land Value	Total Non-vacant Parcels	Total Non-vacant Land Value
Nantucket	13	$16,084,000	8	$8,082,600	5	$8,001,400
Lowell	157	$122,307,000	96	$7,888,100	62	$114,670,800
East Bridgewater	2	$8,224,300	1	$5,426,400	2	$8,224,300
Gardner	9	$15,711,000	3	$4,943,000	8	$15,661,300
New Bedford	297	$133,715,900	31	$4,295,100	264	$130,592,400
Swampscott	2	$4,746,100	1	$2,868,500	2	$4,746,100
Brockton	92	$140,738,140	30	$2,646,090	67	$139,384,710
Somerville	24	$142,357,000	7	$2,534,400	16	$128,460,100
Barnstable	84	$51,263,600	20	$2,034,900	64	$49,228,700
Dedham	53	$27,147,400	13	$1,053,300	40	$26,094,100
Wellfleet	7	$2,858,100	5	$1,003,600	2	$1,854,500
Taunton	8	$14,343,000	3	$774,200	5	$13,568,800
Natick	22	$28,586,500	5	$738,600	17	$27,847,900
Wilmington	19	$8,360,900	5	$638,800	14	$7,722,100

***Note: The table grouped the parcels by municipality and sorted the vacant lands by its highest assessed value.

Analysis Findings:
- From the summary table above, we found that the ten municipalities that have the most attractive vacant lands for sale (based on its assessed value) in order to fund the development of affordable housing are:
    1. Nantucket
    2. Lowell
    3. East Bridgewater
    4. Gardner
    5. New Bedford
    6. Swampscott
    7. Rockton
    8. Somerville
    9. Barnstable
    10. Dedham

- The cities with over $1,000,000 vacant land value are shown below. There is one additional city, Wellfleet, from outside the list of top 10.

Housing Authority Vacant Land
All cities with municipal housing authority land cumulative value over $1,000,000
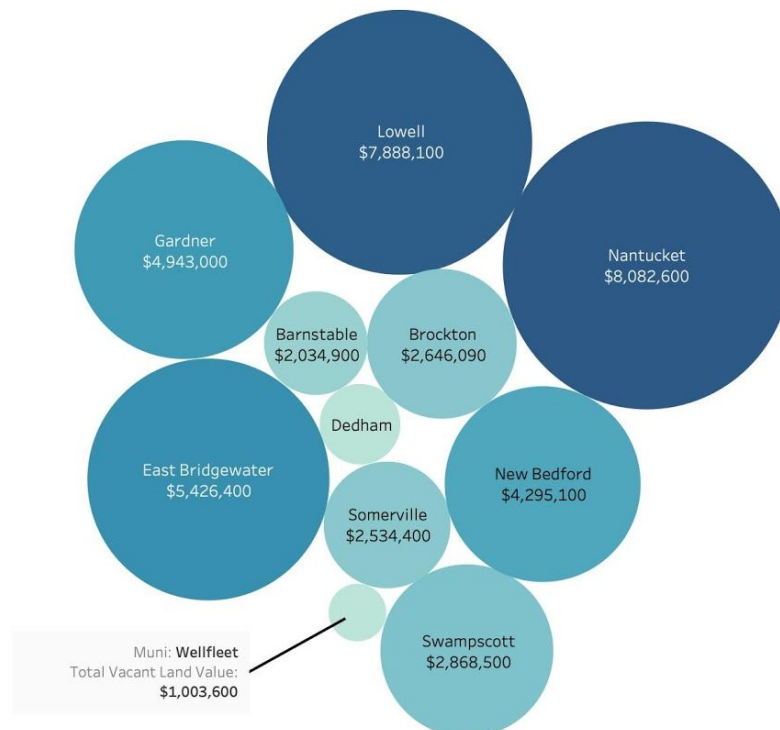
Cities with vacant land owned by municipal housing authorities. The size of circles is not representative of total value, but rather the ranking of total value. The color shows the scaled overall value.

Figure generated using vacantLandValue.twbx

Strategic Question 3

What state land owned by the Mass Department of Housing and the Mass Department of Transportation (DOT and related agencies e.g. MBTA) is most attractive for the development of affordable housing based on proximity to public transport, existing availability of affordable housing units (% of all housing and per 100 low income families)? Which of these lands have existing buildings, i.e. are likely to have existing utility (water/electricity) services?

Analysis actions performed:

- Looking at final_data.csv, we filtered land parcels owned by the department of transportation and related departments such as MBTA.
- Do the same with those land parcels as question 1.
- We formed several datasets:
  - ct_transportation.csv
  - ct_transportation_vacant.csv
  - ct_transportation_non_vacant.csv
  - district_transportation.csv
  - district_transportation_vacant.csv
  - district_transportation_non_vacant.csv
- As is the same with question 1, we listed several cities and towns and districts that are most attractive for the development of affordable housing.

Table 3. Cities with high selectability for additional affordable housing based on Mass DOH and Mass DOT

| City	Number of Parcels	Available Land *(ft²)*	Transit Score	Median Income *($)*	SHI *(%)*
Quincy	75	1236455	59.6	67836.14	9.61
Everett	4	607315.5	54.8	55244.75	6.36
Taunton	1	78378.68	40.3	31162	6.41
Fairhaven	1	108789.9	40.3	60714	6.94
Edgartown	1	160232.5	40.3	64810	4.54
Gloucester	6	307589.6	36.0	66280.83	7.37
Haverhill	30	3227103	31.8	65830.04	10
Pittsfield	2	251888.8	31.0	41914.5	9.21

Parcel analysis for vacant land

Vacant Transportation and Transit Friendly
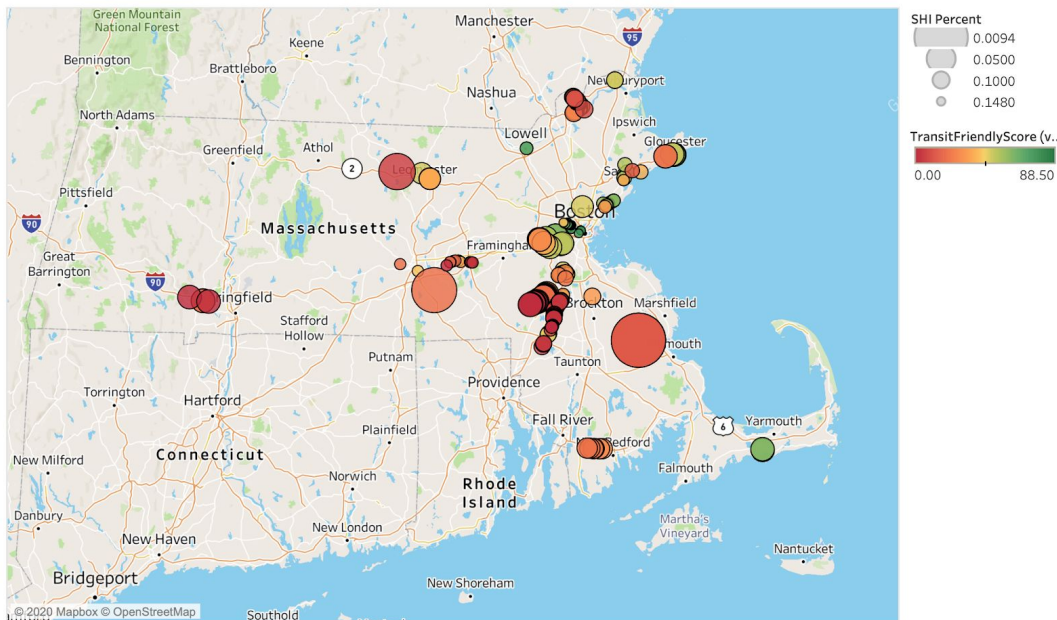
Map of vacant parcels owned by Mass DOH and Mass DOT. Calculated transit score is shown as variable color and the city's SHI percentage is shown as size.

Parcel analysis for non-vacant land

Non-Vacant Transportation and Transit Friendly Score
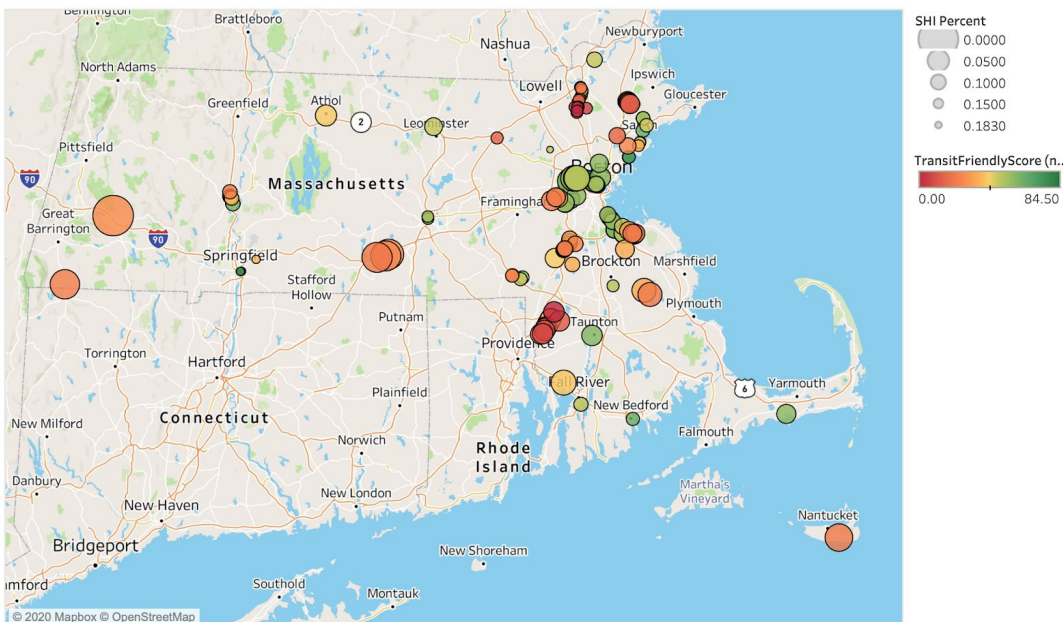
Map of non-vacant parcels owned by Mass. DOH and Mass. DOT. Only parcels are shown that have at least 8,000sq. ft. available. Calculated transit score is shown as variable color and the city's SHI % is shown as size.

Much like the figures from the housing analysis, these show the dispersion of parcels within the state. There are less parcels owned by Mass DOT and Mass DOH than owned by the municipal housing authorities. The majority of parcels are in areas that have a relatively high SHI percentage which indicates that these parcels may be better for selling to raise funds than development.

These figures were prepared with transitAnalysis.twbx using data contained in:

nonvacantTransitFriendlyFullTransportation_Final.csv
vacantTransitFriendlyFullTransportation_Final.csv

Existing Service Analysis

Each parcel has three values associated with them: land value, building value, and other value. For the means of determining which parcels could have potential utilities, such as water and electricity, the data was filtered by parcels that have some building or other value. If a parcel only has land value, it is assumed that it has not been improved upon.

Please refer to Appendix E for a list of each city's number of parcels with improvements versus no assumed improvements

For the parcels owned by Mass. DOH and DOT, in total:
- 171 parcels had some improvement value
- 393 parcels only had land value

Five cities with the most improved parcels (number of parcels):
1. Quincy (40)
2. Springfield (14)
3. Somerville (9)
4. Newton (9)
5. Worcester (5)

Five cities with the most not improved parcels (number of parcels):
1. Quincy (35)
2. Cambridge (34)
3. Sharon (31)
4. Lynn (31)
5. Walpole (27)

This data can be found in trans_improvedLots.csv and trans_nonImprovedLots.csv. The appendix and further analysis can be found in transitAnalysis.twbx.

Strategic Question 4

What state land owned by the Mass Department of Housing and the Mass Department of Transportation (DOT and related agencies e.g. MBTA) is the most attractive for sale based on the value of the surrounding land?

Analysis performed:
- From **final_data.csv**, we filtered out parcels that are owned by the Mass Department of Housing and the Mass Department of Transportation and saved this new dataset as **transportation.csv**
- In the transportation.csv dataset, there is an address associated with each parcel. Using ParcelLookup API, a free public research tool with access to millions of parcel records in the United States, we were able to obtain the most current assessed value for parcels owned by the Mass Department of Housing and the Mass Department of Transportation.
- Here is a summary table of lands owned by the Mass Department of Housing and the Mass Department of Transportation that are most attractive for sale based on their assessed value.
- The entire summary is stored as **transportation_assessed_value_summary.csv**

Table 4. Cities with high value of parcels owned by Mass. DOT or DOH

Municipality	Total Parcels	Total Land Value	Total Vacant Parcels	Total Vacant Land Value	Total Non-vacant Parcels	Total Non-vacant Land Value
Worcester	14	$158,988,700	4	$132,295,900	5	$153,442,400
Cambridge	39	$78,125,000	34	$30,560,100	5	$47,564,900
Haverhill	30	$6,953,200	28	$4,447,100	2	$2,527,700
Newton	36	$86,169,300	19	$4,091,200	4	$80,807,300
Lynn	39	$14,916,600	34	$2,926,700	3	$11,275,400
Dedham	12	$28,386,300	11	$2,885,200	1	$25,501,100
Walpole	29	$2,084,000	28	$1,404,900	1	$679,100
Westminster	1	$815,100	1	$815,100	0	$0
Halifax	3	$623,400	3	$623,400	0	$0
Sharon	32	$978,900	31	$550,200	1	$428,700
Gloucester	6	$3,937,900	5	$523,800	1	$3,414,100
Westborough	14	$432,100	14	$432,100	0	$0

| Barnstable	6	$4,659,000	2	$427,400	4	$4,231,600
Holbrook	1	$350,100	1	$350,100	0	$0
Amesbury	3	$1,591,400	2	$307,400	1	$1,284,000

***Note: The table grouped the parcels by municipality and sorted the vacant lands by its highest assessed value.

Analysis Findings:

- *From the summary table above, we found that the ten municipalities that have the most attractive vacant lands for sale (based on their assessed value) in order to fund the development of affordable housing are:*
  1. Worcester
  2. Cambridge
  3. Haverhill
  4. Newton
  5. Lynn
  6. Dedham
  7. Walpole
  8. Westminster
  9. Halifax
  10. Sharon

- *The cities with over $500,000 in total vacant land value are shown below.* Figure generated using vacantLandValue.twbx

DOT Vacant Land
All cities with DOT land cumulative value over $500,000
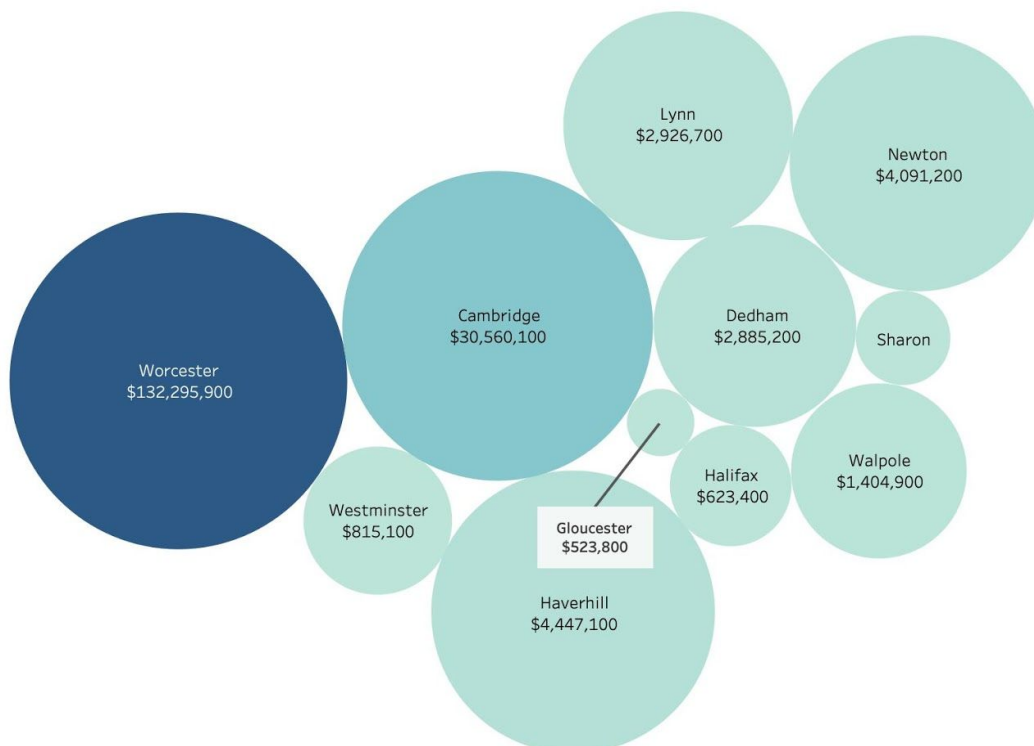
Strategic Question 5

Which cities have the most opportunity to benefit from this legislation (develop or sell lands) based on which cities have the greatest need and the greatest $ to be made based on land value or largest number of parcels and land size to be developed for affordable housing?


To determine which cities have the most opportunities, the data was filtered in several ways. First, for both the municipal housing authority land and Mass. DOT and DOH, the cities were filtered by those with less than 10% SHI. Next, the 80th percentile value was determined for the vacant land. The cities that match both of these criteria, below 10% SHI and in the 80th percentile, are shown below.
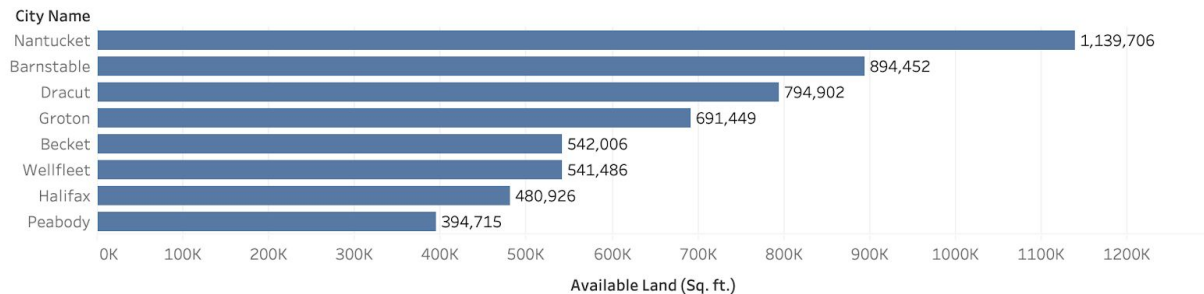
Housing Land Value, 80th Percentile = $738,600
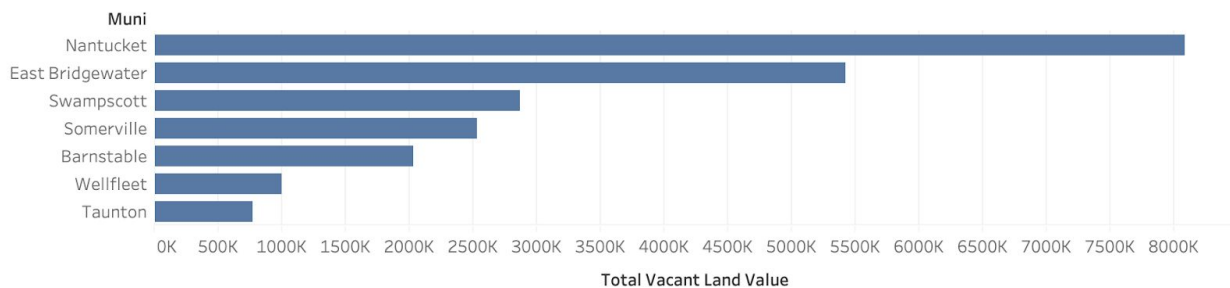
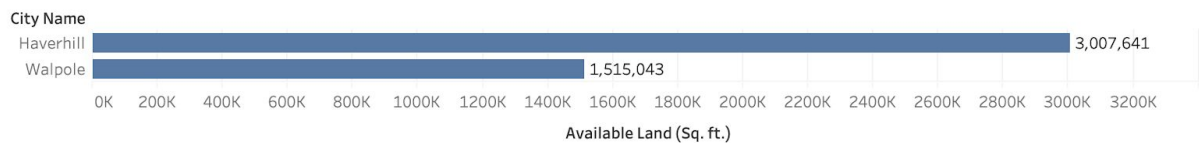State Land Value, 80th Percentile = $350,100
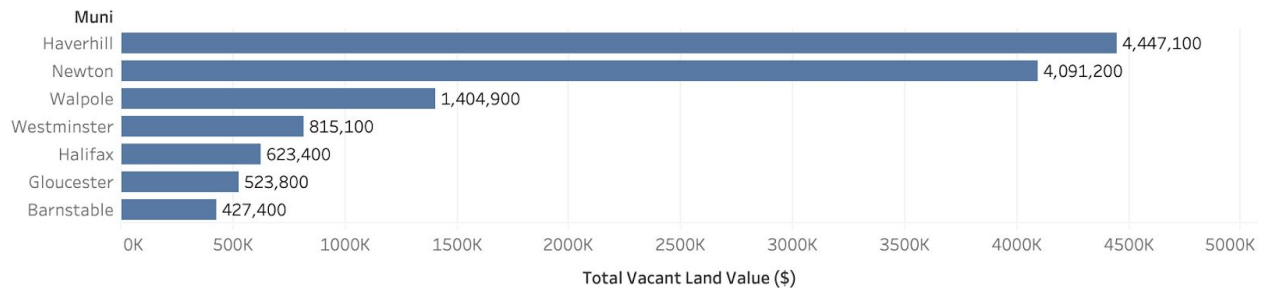
Similar filtering was conducted for the amount of available land per city. The cities were filtered to those below 10% SHI and then the cities with an amount of available square feet in the 80th percentile were selected.

Housing Land Sq. Ft., 80th Percentile = 394,715sq. ft.

City Name	Available Land (Sq. ft.)
Nantucket	1,139,706
Barnstable	894,452
Dracut	794,902
Groton	691,449
Becket	542,006
Wellfleet	541,486
Halifax	480,926
Peabody	394,715

State Land Sq. Ft., 80th Percentile = 1,461,793sq. ft.

City Name	Available Land (Sq. ft.)
Haverhill	3,007,641
Walpole	1,515,043

There are a few cities that show up in multiple filtered sets, which show these as being strong candidates to benefit from the legislation. The cities that show up on several sets include:
- Nantucket *(Available land amount and value for housing parcels)*
- Haverhill *(Available land amount and value for state land)*
- Walpole *(Available land amount and value for state land)*
- Barnstable *(Available land amount and value for housing parcels and value for state land)*

This analysis was conducted with cityOpportunity.twbx using previously mentioned files.

Recommendations for Strategic Question 6

What is the "opportunity cost" of not selling the most valuable land, i.e. how much is the land costing to maintain? How much revenue is the state potentially sacrificing based on the market value of nearby land?

- To answer this question, financial information needs to be provided on how much the land costs to maintain. Useful information would include tax information, maintenance cost, and any other costs associated with the land.
- Additionally, further research is necessary to gather data on surrounding market values; the APIs available only provide assessed values, which are not always equivalent.

Recommendations for further Analysis

- Find accurate addresses and zip codes for all properties to assist in future API pulls
- Ensure that every parcel has a correct house number (including parcels that have 0 to represent a missing house number/property without a house number)
- Work needs to be done to further break down the information on the size of the parcels. Currently, it is not evident which cities have parcels with land big enough to actually develop houses on.
  - To this end, a cut-off needs to be established as a minimum square footage required to build affordable housing, before then applying that cut-off to both the vacant parcels, and the empty land in the non-vacant parcels.
- Further analysis of the Property Type Classification codes will prove useful, as we have determined there exists other land owned by cities, towns, districts or the state that does not fall under the established codes we had determined, but were impossible to distinguish from privately owned parcels with the filters we have currently developed.