Trends in LEED Buildings

AND THEIR EFFECTS ON URBAN PERMEABILITY

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Introduction

Leadership in Energy and Environmental Design (LEED) certification emerged in 1993 as a way by which to recognize projects that made a commitment to increased energy and water efficiency[1]. The US Green Building Council (USGBC) established these guidelines which award a set number of points to a construction project based on the successful implementation of efficient technologies and best practices. Each technology and/or practice implemented contributes some number of points to the project, which in turn determines what LEED classification it receives. Obtaining a higher number of points (or synonymously increasing a building's efficiency by a large margin) yields a higher, more prestigious LEED classification. In descending order, the possible classifications are Platinum, Gold, Silver, and Certified. More information on LEED buildings is detailed in the LEED Info box to the right.

Because of their increased efficiency, these LEED buildings are often heralded as the next wave of green innovation because of their ability to decrease both operating costs and resource consumption. In fact, LEED Buildings decrease their energy expenditure by roughly 25% and decrease operating costs by 19%[2].

However, there is an ongoing debate about the real benefits of implementing these standards. Critics note that a building becomes LEED certified primarily based on an application that details the efficiency decisions that will be implemented in the project, not on the measured performance of the project once it is completed. Because of this, a building could become LEED certified by meeting standards in its application, but the building may not actually function optimally or efficiently once constructed. Critics also point to the fact that there is no follow-up assessment of LEED projects after their original certification. This means that the performance of a project might diminish to sub-LEED standards over time yet still maintain its certification. Thus there is no way to ensure that LEED buildings maintain the high standards

[1] McCluskey, L. (2015, June 12). LEEDing Up to Today – A Short History of LEED. Retrieved November 25, 2016, from https://www.linkedin.com/pulse/leeding-up-today-short-history-leed-linda-mccluskey
[2] Ibid.

LEED Info

Platinum (>80 points)
Gold (60 – 79 points)
Silver (50 – 59 points)
Certified (40 – 49 points)

162
Number of countries and territories with LEED projects

82,000
Number of commercial LEED projects

15.7 Billion
Total number of commercial square feet that are LEED certified

they claim to uphold[3]. Thus the belief that LEED buildings have the potential to be neutral or even beneficial to the cities they are built in might overly optimistic.

One way a building can receive points is the utilization of the land around the building; points are awarded for the implementation of nature-scaping, utilization of drought resistant plants, incorporation of green spaces, and application of sustainable practices like integrated pest management (IPM). While these point scoring options are intended to decrease the impact of the building on its surroundings, they have not been studied to see if these decisions will mitigate runoff or decrease the amount of impervious land cover in the area where a given LEED project is created. This project aims to quantify what effect, if any, LEED buildings have on the permeability of their immediate surroundings.

METHODOLOGY

To accomplish this goal, this projects aims to use National Land Cover Data (NLCD) and Impervious Surface data from USGS to visualize changes in permeability and land cover in select cities which contain various numbers of LEED projects. The exact location each project and the amount of impervious surface around these locations will be compared to determine what relationship exists between the number of LEED certified buildings and the amount (magnitude and relative percentage) of impervious surfaces.

The benefit of using USGS NLCD and Permeability data is there are four datasets that show the change in NLCD and Permeability with time. Having these four different snap shots of land cover data will allow the visualization of how the completion of a LEED project changes the permeability and land cover across time. The years for which this data is available are 1992, 2001, 2006, and 2011. These datasets should lend a perspective on how these factors are changing within the selected regions as more LEED buildings are constructed. The USGS advises on its website to not compare the 1992 to the other datasets and therefore the 1992 dataset was not considered in this project.

Selecting Case Study Cities

In order to get a representative look at LEED buildings and their effects on their surroundings, this study selected two US states to investigate—Texas and California. These states were chosen for the following reasons:

- *Politics*—California and Texas are on opposite sides of the political spectrum, and therefore have different opinions and legislation pertaining to sustainability and the built environment
- *Conservation*—while quite different politically, both states have been struggling against droughts and therefore these states have been forced to rethink how and when they use water
- *Both are LEED Established*—these states lead the pack with respect to volume of LEED certified projects and therefore represent the best chance of understanding how development of LEED buildings impacts the areas in which they are established

[3] USATODAY (2013, June 13). In U.S. Building industry, is it too easy to be green? Retrieved from http://www.usatoday.com/story/news/nation/2012/10/24/green-building-leed-certification/1650517/

Within each state, three cities were selected for this assessment. The Californian cities chosen were Los Angeles, San Diego, and San Francisco. These were obvious choices as all three of these cities were in the USGBC's 2003 top ten LEED certified cities (based on volume of LEED projects undergone.)[4] Texas only had one city listed on this top 10 list—Houston. This led to the other Texas cities to be chosen somewhat arbitrarily. Austin, Texas was selected because of its heavy emphasis on sustainability and conservation (not to mention that this report was written in Austin, Texas.) The final Texas city selected was Dallas because it was at a similar latitude as Los Angeles and San Diego.

DATA SYNTHESIS AND RESULTS

Green Building Information Gateway (GBIG)

The Green Building Information Gateway (GBIG) is an online database/repository for all green projects and certifications one can imagine. It was an invaluable resource as it is updated frequently, it allows users to create collections of LEED projects, and it can export the data from these collections via excel.

GBIG was used to obtain a full list of energy efficient projects located in each of the six cities being studied. The resulting data was downloaded as an excel file that contained each project's name, certifications, location, and Source. Because this list encompassed many different energy certifications, the total number of projects in each city was very large. The specific values for each city are listed in Table 1.

Table 1: Summary of the total number of green projects found using GBIG's databases

City	Energy Efficient Projects
Austin, Texas	9,798
Dallas, Texas	1,859
Houston, Texas	2,141
Los Angeles, California	1,995
San Diego, California	1,447
San Francisco, California	1,833

[4] USGBC. (2012). *Top 10 U.S. Cities and States Ranked By Total Number of LEED Projects*. Retrieved from http://www.usgbc.org/Docs/Archive/General/Docs7744.pdf

Data Extraction

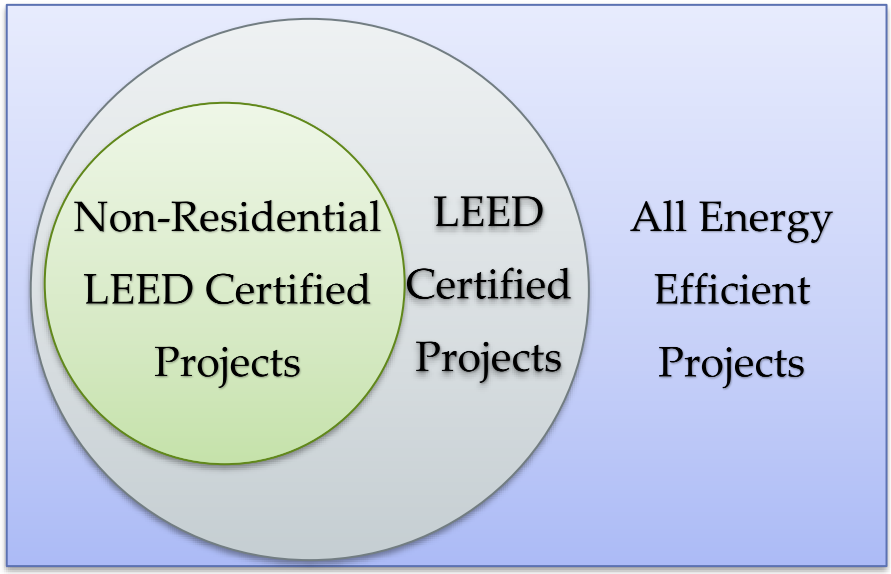

Figure 1: visual demonstration of the data we sought to find and use

Many of the certifications and recognitions contained in the Excel file obtained from GBIG were not LEED specific. Therefore, a new Excel sheet was created by extracting all data points that had LEED certifications. This greatly decreased the number of data points in each city. However, the data needed to be cut further to remove residential LEED buildings because residential LEED projects are excluded from many of the comparative statistics provided by the USGBC website; Including residential buildings in the data would not allow for the use of USGBC statistics later in the project. A new Excel sheet was created and filled with LEED certified building that were non-residential (signified by the green region in Figure 1: visual demonstration of the data we sought to find and use.) This sheet constituted the final list of LEED buildings whose impact on its surroundings would be considered. These excel sheets contained the name of each project, the LEED certification level (certified, Silver, Gold, Platinum), the city in which the project was located, and what LEED rating system was used in evaluation. Table 2 shows The final number of projects obtained through this method for each city.

Table 2: Total number of LEED certified projects in each city. This is a subset of the data in Table 1, page 5

City	Non-Residential LEED Buildings
Austin, Texas	148
Dallas, Texas	187
Houston, Texas	412
Los Angeles, California	350
San Diego, California	305
San Francisco, California	449

Creation of Summary Statistics

Through this process the GBIG data had been whittled down to the non-residential LEED certified projects inside each city being studied. This tailored dataset was then used to create six collections in GBIG containing the LEED projects in each city. These collections could then be used to generate summary statistics about the trends in LEED projects within each city and among cities. The summary statistics generated through GBIG included the total number of certifications within a collection, the cumulative activity count by year, the total number of LEED certified square footage per city, and finally a map showing the geographic placement of the LEED projects. Figure 2 shows these summary Statistics for Austin, Texas. Summary Statistics for all other cities can be found in Appendix A.

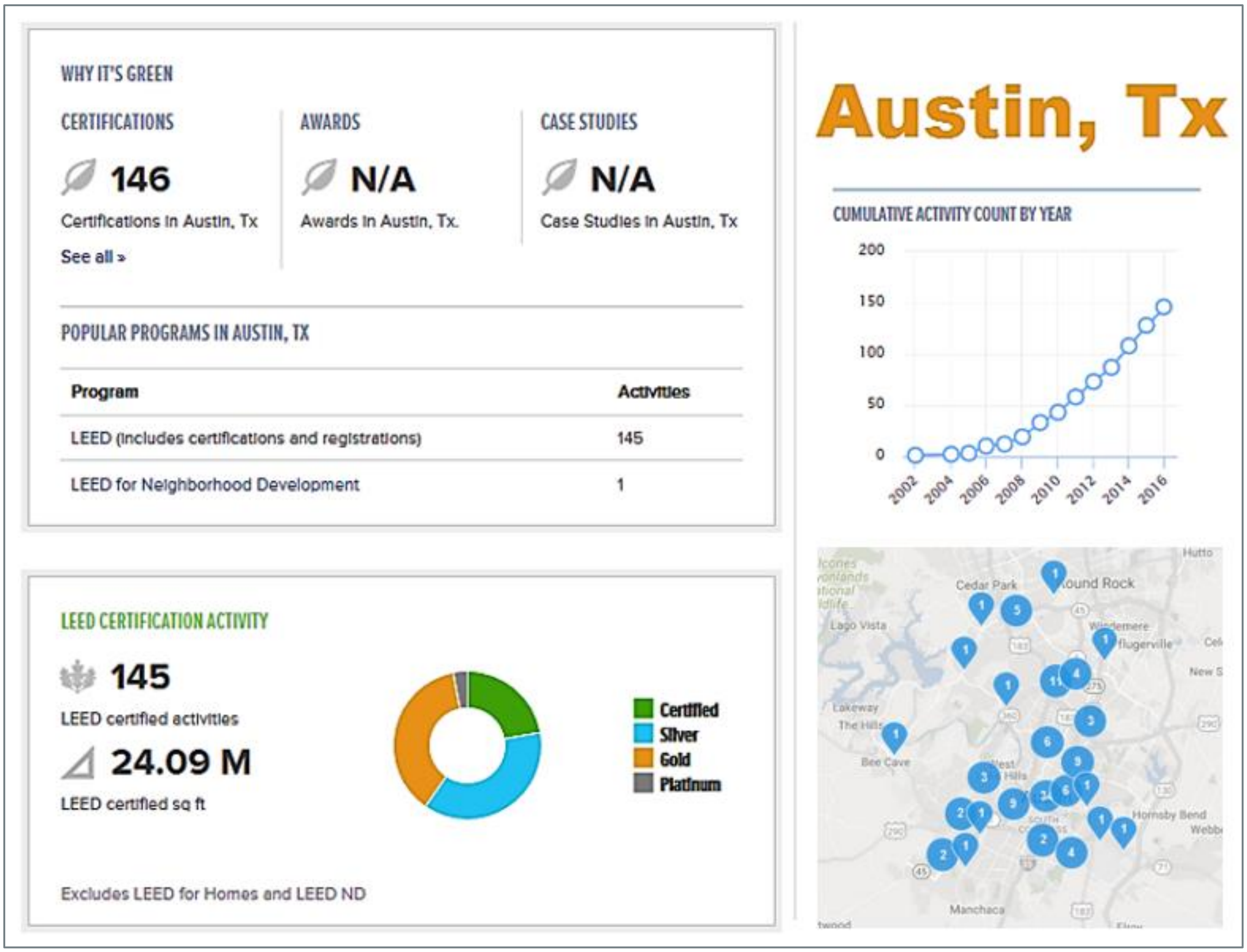

Figure 2 : Summary statistics for the LEED buildings in Austin, Texas

This data demonstrated that in every city studied there was an exponential increase in the number of LEED projects initiated each year. Above we can see that Austin's first LEED certification occurred in 2002. All the other cities have their first LEED Certification in 2004, with the number of cumulative LEED projects being quite large by 2010.

In addition to these statistics, the respective percentage of each type of project activity was determined. This was done to learn more about the trends in LEED construction and the respective amounts of retrofitting verses new construction that was done. The results for Austin, Texas are shown in Figure 3, the results from the other cities can be found in Appendix A.

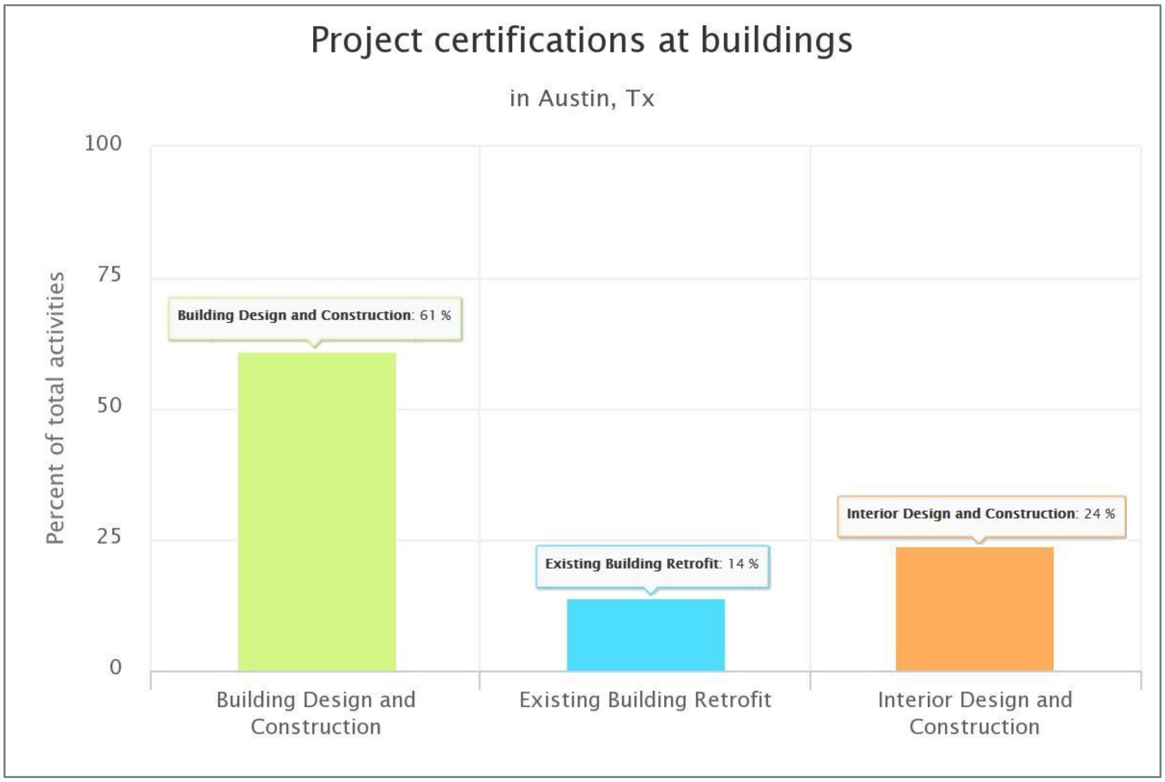

Figure 3: types of LEED certification projects by percentage

From the graph above it is apparent that new construction of LEED buildings dominated over retrofitting in Austin. This is also true of every other city except San Francisco, which has a much higher rate of retrofitting than any of the other cities. A summary of these values is shown in Figure 4.

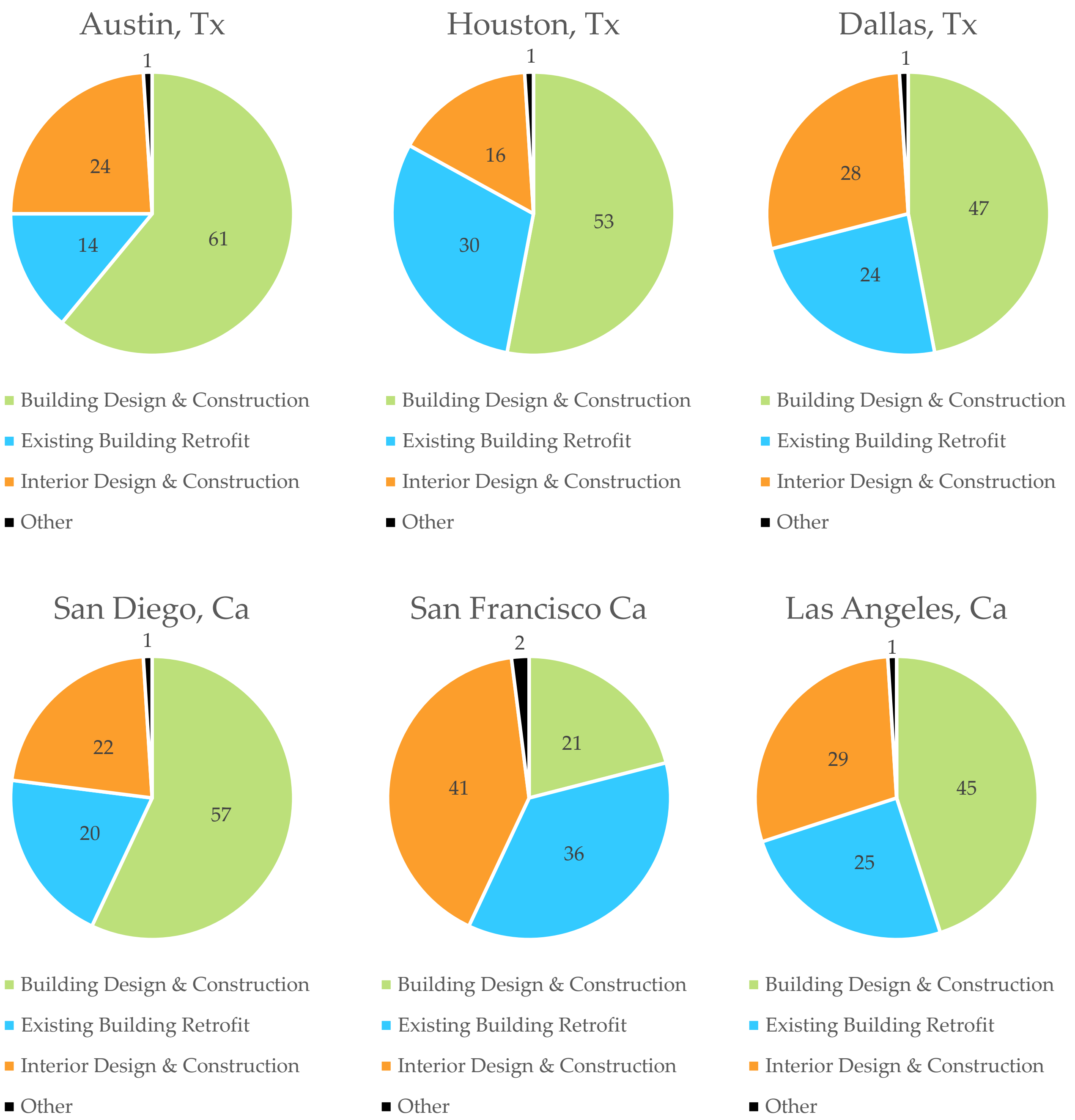

Figure 4: These charts show the split between new construction, retrofitting, and interior design/construction in each city

The final summary statistic that was found was the relative ratios of ownership of the LEED projects (e.g. local government, commercial, higher education, etc.) This data was collected to determine if there exists a trend in LEED building ownership in general and if any of these owner types are on the rise. This data for Austin, Texas is shown in Figure 5.

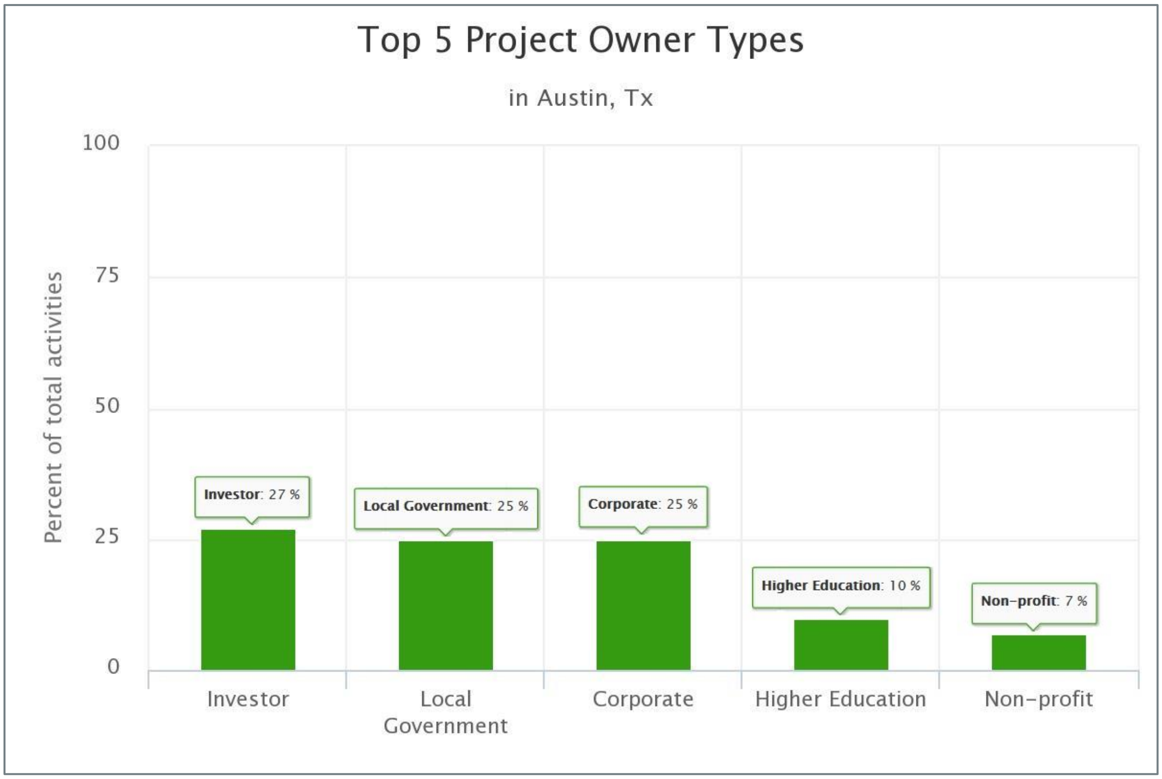

Figure 5: Top five LEED building/projects owner types

The data for all six cities were compiled into a table that is included in Appendix A. This table was used to generate a stacked column chart in order to better visualize each city's relative ratio of the types of LEED project owners. This stacked chart is included as Figure 6. These data seem to suggest that the majority of projects are owned by the local government, investors, and corporations, with small percentages being owned by other groups (e.g. Higher Education, k-12 education, Non-Profits.) However, there does not seem to be enough of a correlation to make any general statements beyond this. Ownership of LEED Projects seems to be individualistic to the city and dependent on the culture of the city (for example, Austin has a relatively high percentage of Higher Education ownership, which can be attributed to The University of Texas and the many LEED buildings they have erected on campus.)

So far, summary statistics have been used to determine the current state, type, and distribution of LEED projects. Additionally, cumulative LEED project completion from ~2002 to ~2010 was discovered to be exponential in nature. These insights can begin to be tied to GIS data to better answer the research inquiry into the relationship between LEED projects and permeability in their immediate proximity.

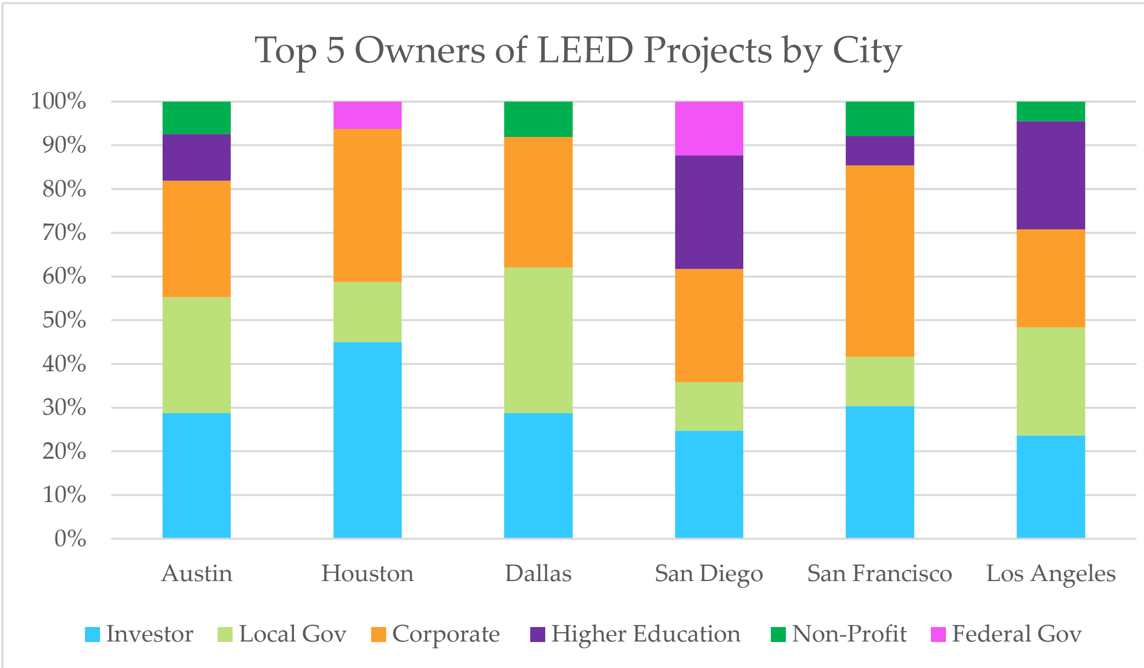

Figure 6: Top 5 owners of LEED Projects by City

GIS Representation of LEED buildings

As mentioned in the Summary Statistics Section, in every city assessed, LEED projects were few and far between before 2004, but they began to gain traction around 2006, until by 2008 – 2010 when the number of LEED projects was quite high. This means that the years for which NLCD and Permeability datasets are available correspond beautifully with the rise of LEED certified projects in the cities in this study. The 2001 dataset provides a snapshot of land cover and permeability right before LEED projects began to garner attention; the 2006 dataset corresponds to the time period in which a handful of LEED projects had been completed, right before there was an exponential rise in the number of LEED projects; and finally the 2011 dataset captures a scenario where both the number of LEED projects that have been completed and number of future LEED projects are high.

GBIG was an excellent tool for compiling the lists of current data on LEED Certified housing, however it has serious limitations in that the Excel files it allows to be exported do not contain a physical address for the buildings in question, and therefore no way to determine its latitude and longitude. Moreover there is no easy way to obtain this from the GBIG collections because addresses must to be copied one at a time. Many hours were spent trying to solve this problem in clever ways (google text readers, excel, etc.) and eventually all of the addresses for the Austin LEED buildings were obtained. All 148 of these addresses needed to be converted to Latitude and longitude. After finding a function that works with Google's API to determine latitude and longitude, Google sheets was able to read in an address as

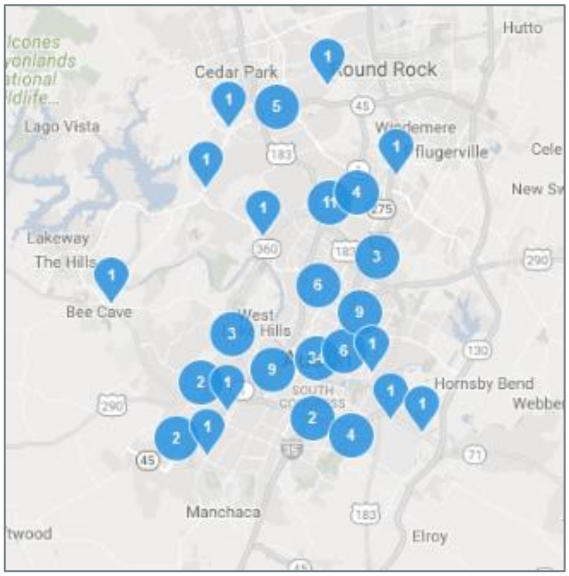

Figure 8: Map generated by GBIG displaying Austin LEED Building locations

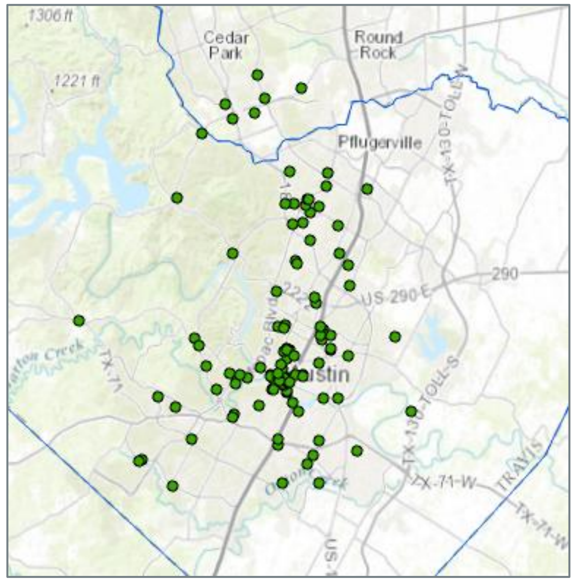

Figure 8: GIS Layer displaying Austin LEED Buildings

a string and then determine that address's coordinates. This is slightly out of bounds of this project but the code is included in Appendix B for posterity. Surprisingly this method did not yield as precise Latitude and Longitude vales as was expected. However, using these values, the latitude and longitude of each LEED project in Austin was listed in a csv file and its coordinates were added to the map. Above is a comparison between the map obtained by the GBIG database (Figure 7), and the GIS image generated from the process just described (Figure 8.) The maps are very similar, which confirms that this method would yield reasonably correct results. However, this method was incredibly tedious and complex, and therefore alternative approaches were sought.

The method arrived upon was to use a CSV file containing National LEED data from 2013 from LEED Projects Feb 2013 obtained through ArcGIS. This data came with much more information than the GBIG data did, including data on location, LEED rating, number of LEED points scored, Building address as well as Latitude and Longitude values, and the dates of application and accreditation. This did is not be as current as data found through GBIG, but the LEED 2013 data began after the 2001 and exceed 2011, and would therefore still provide the insights necessary to draw conclusions on the relationship of LEED building and permeability. The CSV file of 2013 data contained every point in the Continental US, and thus the data for the six cities in this study needed to be extracted. This was done in excel in the same way the GBIG data was managed (described previously). The number of LEED buildings in each city is summarized below (Table 3).

Table 3: LEED Buildings in each city using 2013 LEED Data

City	**Non-Residential LEED Buildings**
Austin, Texas	72
Dallas, Texas	92
Houston, Texas	205
Los Angeles, California	173
San Diego, California	131
San Francisco, California	207

Figure 9 shows the number of LEED buildings in Austin Texas using the 2013 data. This map demonstrates that there is a similar distribution of LEED buildings when comparing the 2013 data (Figure 9) and the GBIG data (Figure 8) despite the 2013 data having far fewer buildings.

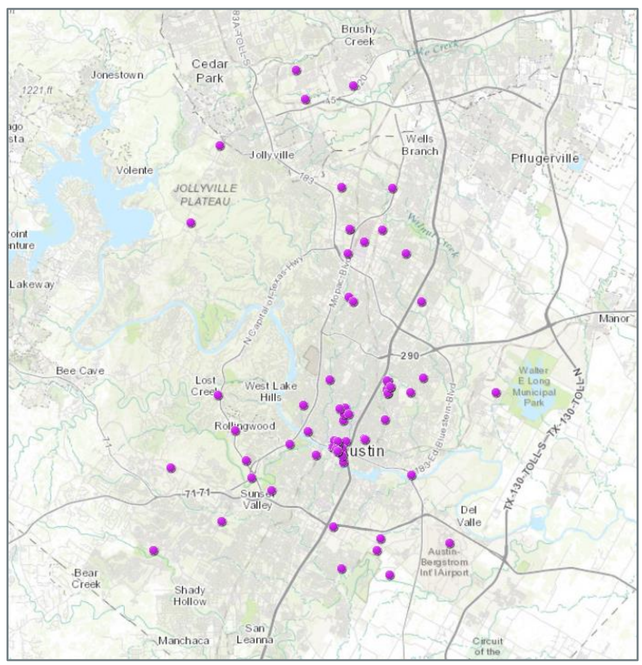

Figure 9: LEED Building locations in Austin, Texas using 2013 Data

A layer was created that contained buffers around all of the LEED locations. This was done to circumscribe an area around the building which would be compared against the changes in permeability between different years of NLCD datasets. Originally, the buffer size for each building was a function of the building's gross square footage provided by the LEED 2013 CSV data file. The function found the radius of the buffer by assuming the gross square footage was a circle, and by taking the square root of the area divided by pi. However, the buffers resulting from this function were unreasonably large because of an inability to account for the number of floors over which this square footage was divided. To get a buffer size that was reasonable, the average square footage of all the LEED buildings was calculated. This resulted in a value of 232,742.65 square feet. Again assuming the buffer circumscribes this area, the resulting radius of the buffer would need to be 272.18 feet. This value was much more reasonable because it was still somewhat representative of the data, while being relatively close to the average area of a city block. Buffers with radii of 272 feet were created and added to the map, and these data were dissolved such that there were no overlapping areas. This was done to ensure that when these areas are compared to the NLCD data no double counting occurs. These buffers, as well as the border and county shapefiles for Texas and California and the LEED building locations, are shown in Figure 10. A close up of the Los Angeles buffers is included as Figure 11 to show how the buffers were dissolved to avoid overlap.

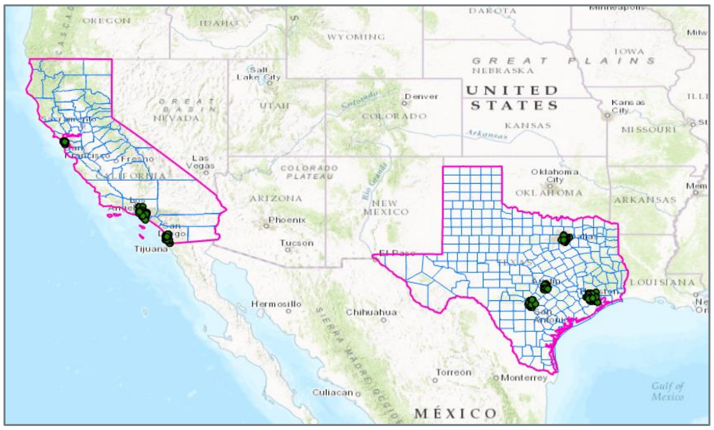

Figure 11: Image of buffer, LEED locations, and shapefiles of California and Texas

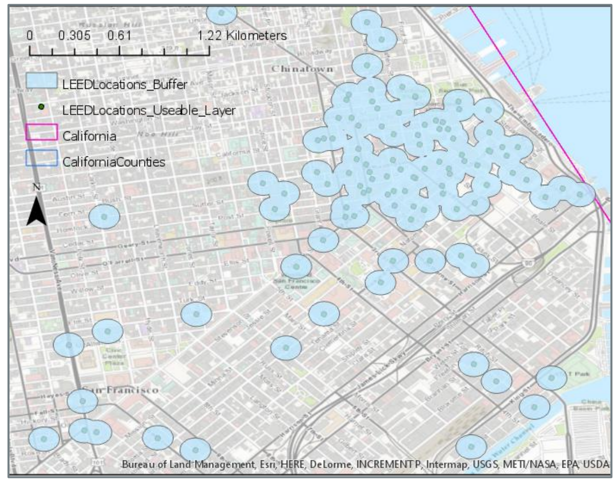

Figure 11: Dissolved buffers in Downtown San Francisco

Obtaining NLCD and Permeability Data

The data was now ready to be compared to NLCD and permeability data for 2001, 2006, and 2011. In exercise 2, a server was used to obtain the National Land Cover Database (NLCD) for 2006. This layer was a raster which contained data that could be queried and used. However, this server did not contain the NLCD data for any other year, and therefore an alternative data source was needed.

The Multi-Resolution Land Characteristics (MRLC) Consortium at mlrc.gov was used to acquire the data. This website hosted land cover, permeability, and change in permeability maps for 2001, 2006, and 2011. These files were downloaded in the aim of adding them as layers and using them to run Summarize Within analysis. However, the data would only display as an image devoid of any useful data. Because of this, still other sources of queriable raster data were sought. The next attempt to obtain this data was to use a server from Raster.NationalMap.gov which contained USGS EROS Land cover data sourced from NLCD. However, the maps resulting from this WMS server connection again resulted in data that could not be queried.

Consulting with the TA confirmed that the correct data had been downloaded but could not be queried. Although many different avenues for obtaining this data were perused during the meeting with the TA, nothing that was tried gave me the data. Use of the UT computers, and personal computers were all tried.

Finally, the TA suggested a visual comparison because of the inability to obtain the necessary data to run a comparison.

As a last attempt, this comparison was attempted in the living atlas layers available through ArcGIS.com. NLCD data was obtained, and the layers constructed in ArcGIS Pro were successfully uploaded. Figure 12 shows a screen shot of the data imported over a living atlas layer of 2011 impervious surface data.

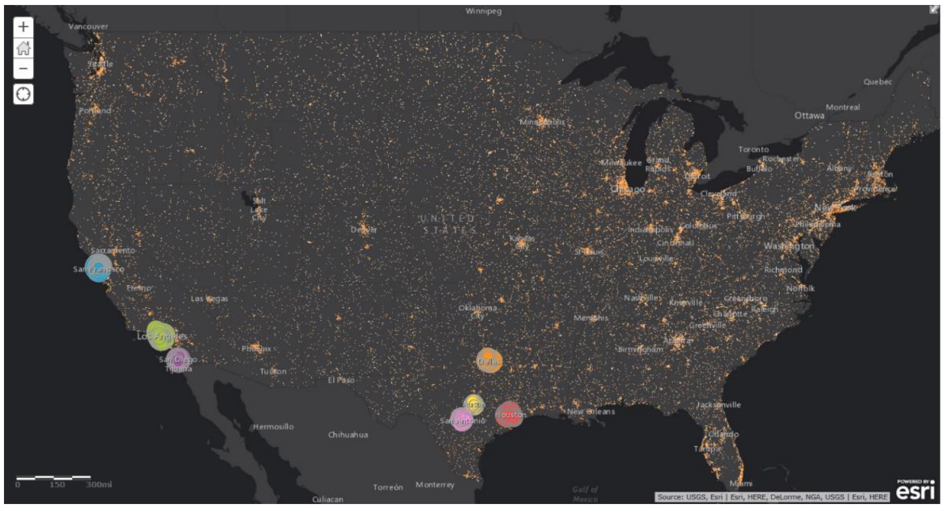

Figure 12: LEED location and buffer data transposed onto impervious surface living layer

The living layer that shows the percent change in impervious cover from 2006 to 2011 was added to the map from ArcGIS.com. This layer allows the user to click any area and be prompted by a text box that displays the percent increase or decrease in impervious cover. Figure 13 shows the change in impervious cover layer, the LEED building buffer layer, the point location of each LEED building, and an example text box resulting from the selection of a grid square.

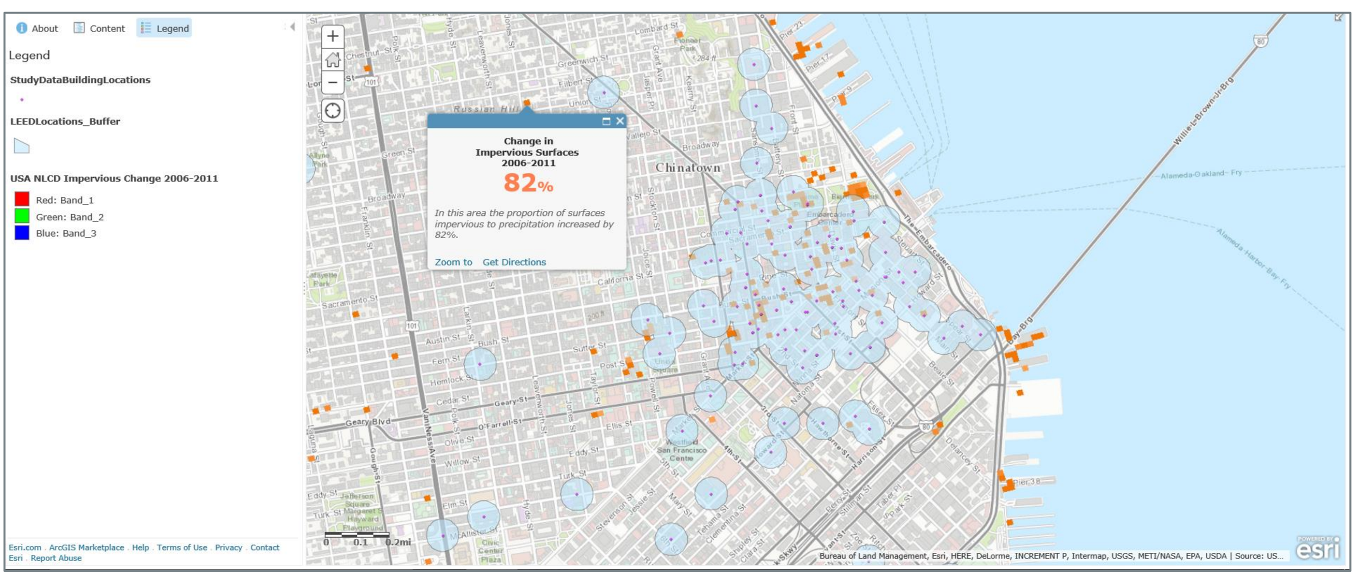

Figure 13: arcGIS.com screenshot displaying LEED data over change in impervious cover living atlas

Different tools were used to try and synthesize the data to complete the comparison but these attempts were unsuccessful. The buffer areas were enriched with the data from the 2006 NLCD, and this found the percentage of each type of land cover within the buffer area. This data is displayed in Table 4. However, this was a single data point and therefore no differences could be calculated and thus no conclusions could be made about how the addition of LEED buildings affected this number.

Land Cover	**Percentage of Buffer Area**
Developed	80.72
Open Water	4.74
Ice, Snow, Barren Land	0.26
Forest	4.38
Shrub/Scrub/Grasslands	7.43
Pasture/Hay/Crops	1.01
Wetlands	1.36

Discussion and Further Work

The data from this analysis is incomplete, and therefore there no conclusions can be made about the effects LEED construction has on permeability. The construction of a building involves the replacement of undeveloped land with an enclosed building made of concrete and steel. Within the footprint of whatever is built place of undeveloped land, there is no way for water to pass into the ground. This changes the way water moves in the region and therefore effects the hydrology of the area.

This project could be improved and expounded upon in many ways. The first improvement would be to use GIS functionality to calculate the total amount of permeability change in the places where LEED buildings were constructed. This was the original goal of the project which was compromised by the inability to find queeriable NLCD and permeability data.

This study determined that the construction of a LEED building did decrease the permeability of the cite, but this result seems intuitive; anywhere a building is constructed there is going to be less permeability compared to the natural state of the land. A more insightful study might be to compare the loss in permeability from the construction of a LEED building and compare this to the loss in permeability from the construction of a conventional building. That way LEED buildings' impact on their immediate surroundings could be compared to the impact of a conventional building. This relative impact of LEED construction would be a more precise and useful metric than the one used here.

It would also be interesting to compare the change in permeability resulting from retrofitting conventional buildings into green buildings to see if there is a statistically significant difference between changes in or absolute amount of permeability resulting from retrofitting and new construction.

SOURCES

Fry, J., Xian, G., Jin, S., Dewitz, J., Homer, C., Yang, L., Barnes, C., Herold, N., and Wickham, J., 2011. Completion of the 2006 National Land Cover Database for the Conterminous United States, *PE&RS*, Vol. 77(9):858-864.

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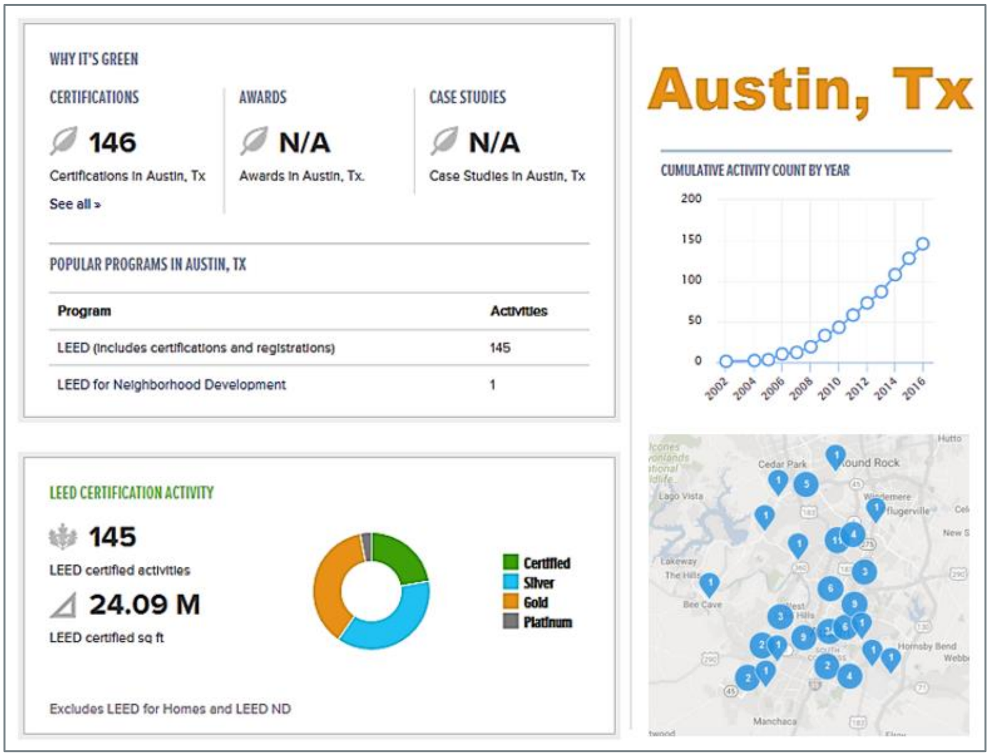
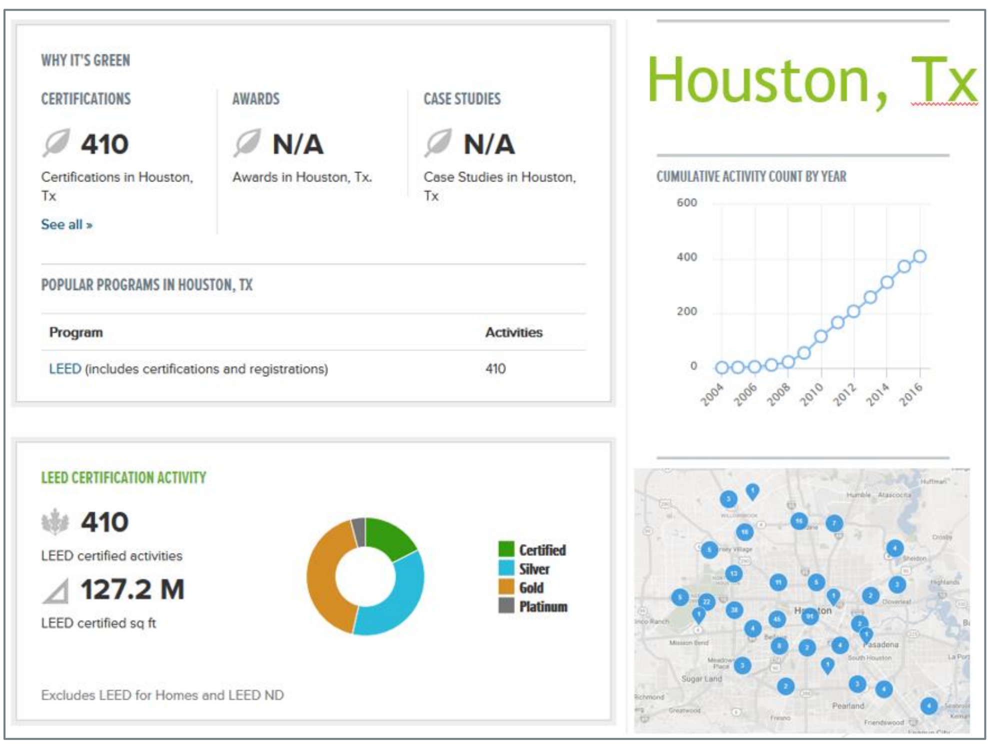
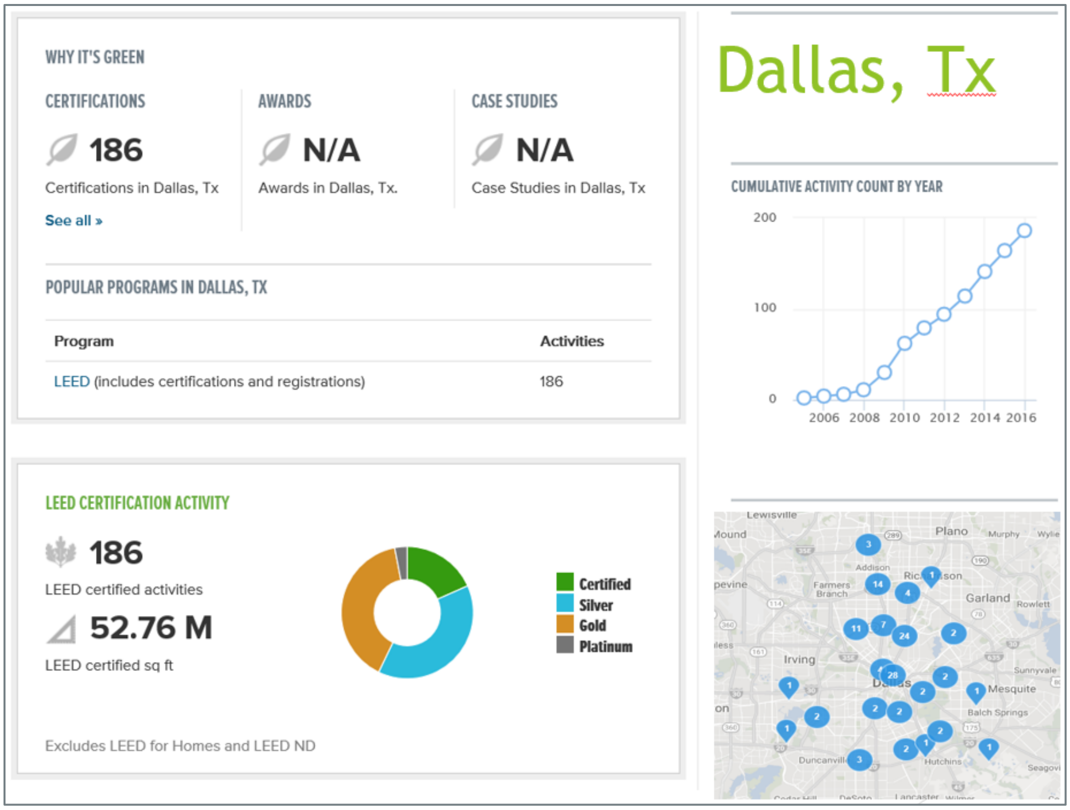
Vogelmann, J.E., S.M. Howard, L. Yang, C. R. Larson, B. K. Wylie, and J. N. Van Driel, 2001. Completion of the 1990's National Land Cover Data Set for the conterminous United States, *Photogrammetric Engineering and Remote Sensing* 67:650-662.

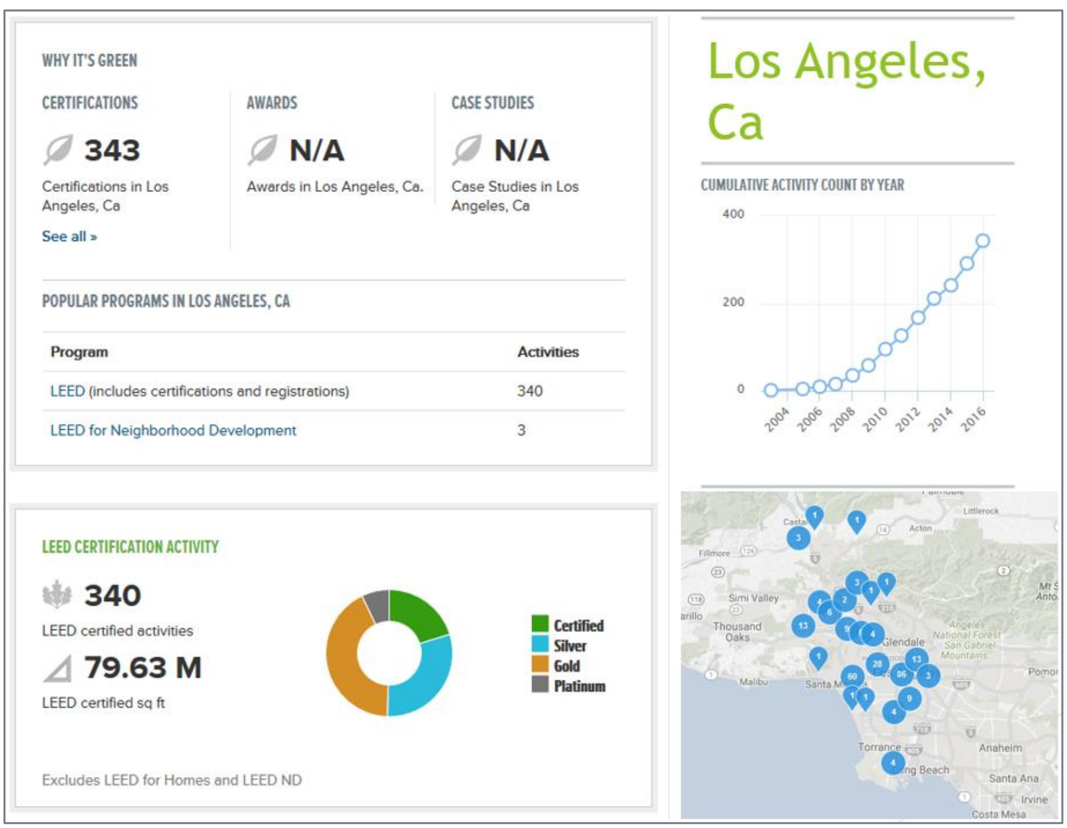
APPENDIX A

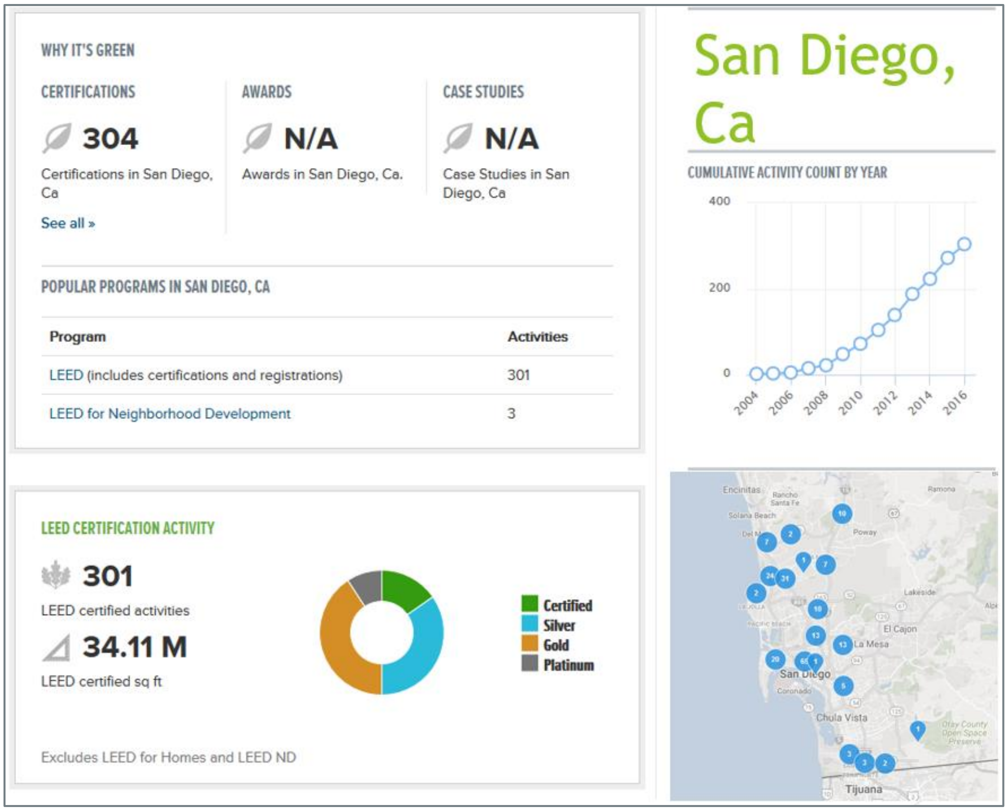
Summary Statistics

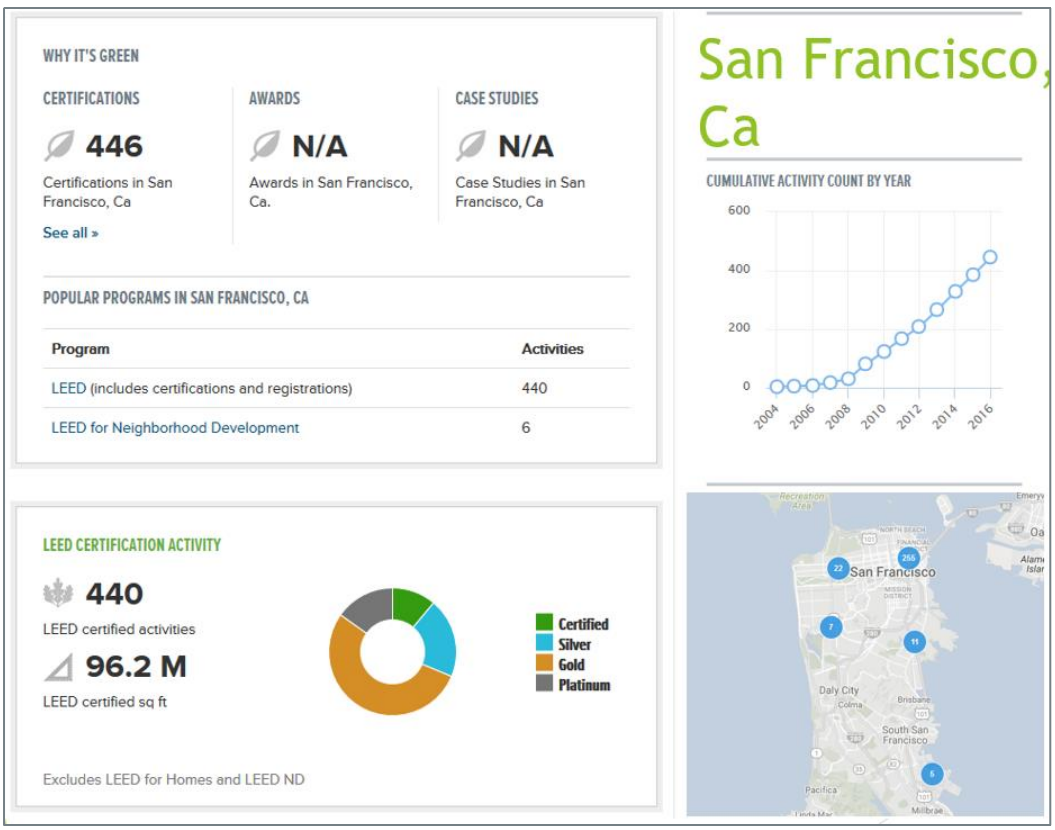





WHY IT'S GREEN
CERTIFICATIONS
186
Certifications in Dallas, Tx
See all »
AWARDS
N/A
Awards in Dallas, Tx.
CASE STUDIES
N/A
Case Studies in Dallas, Tx
POPULAR PROGRAMS IN DALLAS, TX
Program
Activities
LEED (includes certifications and registrations)
186
LEED CERTIFICATION ACTIVITY
186
LEED certified activities
52.76 M
LEED certified sq ft
Certified
Silver
Gold
Platinum
Excludes LEED for Homes and LEED ND
Dallas, Tx
CUMULATIVE ACTIVITY COUNT BY YEAR
200
100
0
2006 2008 2010 2012 2014 2016
Plano
Garland
Irving
Mesquite

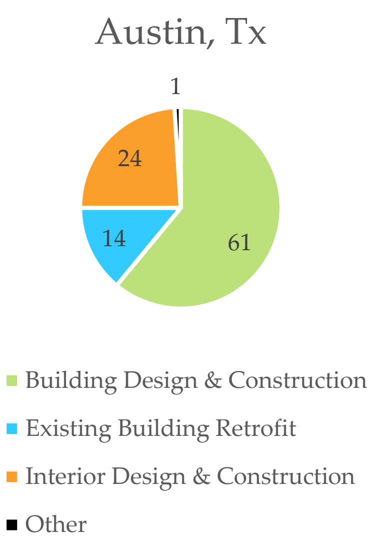

WHY IT'S GREEN
CERTIFICATIONS
343
Certifications in Los Angeles, Ca
See all »
AWARDS
N/A
Awards in Los Angeles, Ca.
CASE STUDIES
N/A
Case Studies in Los Angeles, Ca
POPULAR PROGRAMS IN LOS ANGELES, CA
Program
Activities
LEED (includes certifications and registrations)
340
LEED for Neighborhood Development
3
LEED CERTIFICATION ACTIVITY
340
LEED certified activities
79.63 M
LEED certified sq ft
Certified
Silver
Gold
Platinum
Excludes LEED for Homes and LEED ND
Los Angeles, Ca
CUMULATIVE ACTIVITY COUNT BY YEAR
400
200
0
2004 2006 2008 2010 2012 2014 2016
Simi Valley
Thousand Oaks
Torrance
Anaheim

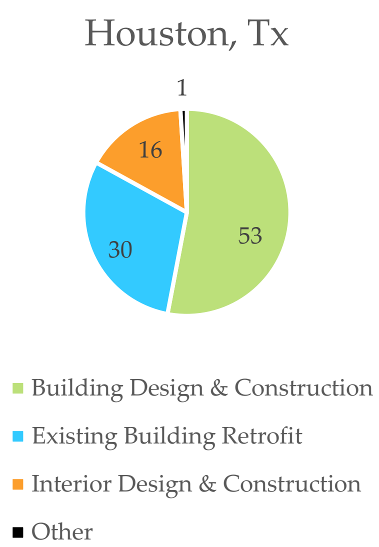

San Diego, Ca
WHY IT'S GREEN
CERTIFICATIONS
304
Certifications in San Diego, Ca
See all »
AWARDS
N/A
Awards in San Diego, Ca.
CASE STUDIES
N/A
Case Studies in San Diego, Ca
POPULAR PROGRAMS IN SAN DIEGO, CA
Program Activities
LEED (includes certifications and registrations) 301
LEED for Neighborhood Development 3
CUMULATIVE ACTIVITY COUNT BY YEAR
400
200
0
2004 2006 2008 2010 2012 2014 2016
LEED CERTIFICATION ACTIVITY
301
LEED certified activities
34.11 M
LEED certified sq ft
Certified
Silver
Gold
Platinum
Excludes LEED for Homes and LEED ND
San Diego
Chula Vista
El Cajon
La Mesa
Tijuana

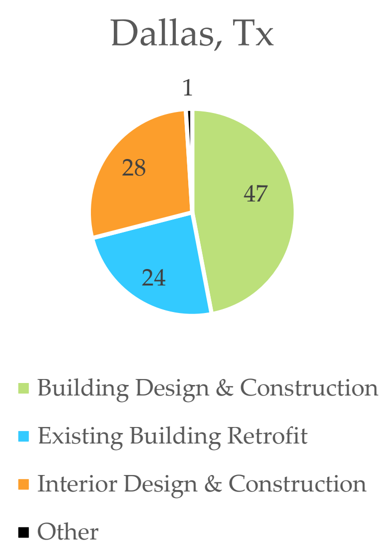

San Francisco, Ca
WHY IT'S GREEN
CERTIFICATIONS
446
Certifications in San Francisco, Ca
See all »
AWARDS
N/A
Awards in San Francisco, Ca.
CASE STUDIES
N/A
Case Studies in San Francisco, Ca
POPULAR PROGRAMS IN SAN FRANCISCO, CA
Program Activities
LEED (includes certifications and registrations) 440
LEED for Neighborhood Development 6
CUMULATIVE ACTIVITY COUNT BY YEAR
600
400
200
0
2004 2006 2008 2010 2012 2014 2016
LEED CERTIFICATION ACTIVITY
440
LEED certified activities
96.2 M
LEED certified sq ft
Certified
Silver
Gold
Platinum
Excludes LEED for Homes and LEED ND
San Francisco
Daly City
South San Francisco
Pacifica

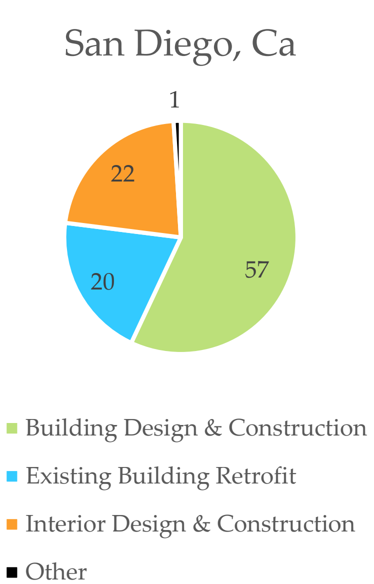
Percentage split of LEED Certification Type

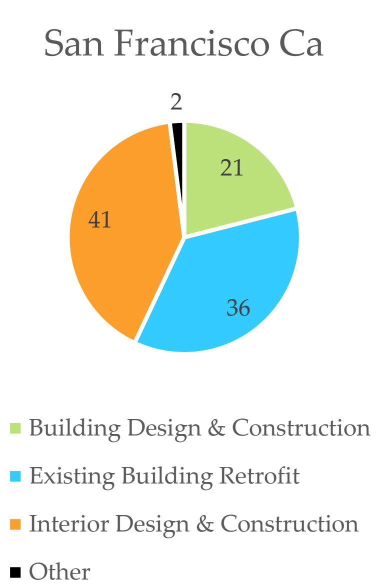
City	Building Design & Construction	Existing Building Retrofit	Interior Design & Construction
Austin	61	14	24
Houston	53	30	16
Dallas	47	24	28
San Diego	57	20	22
San Francisco	21	36	41
Los Angeles	45	25	29

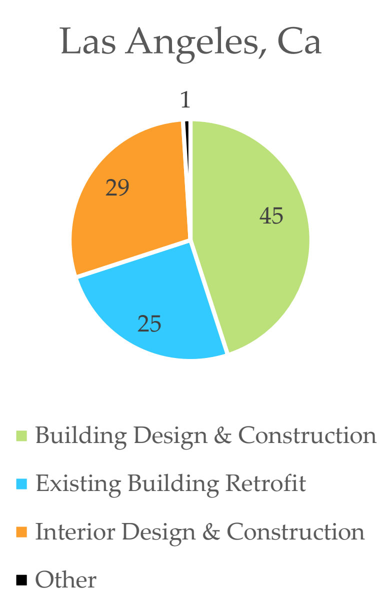






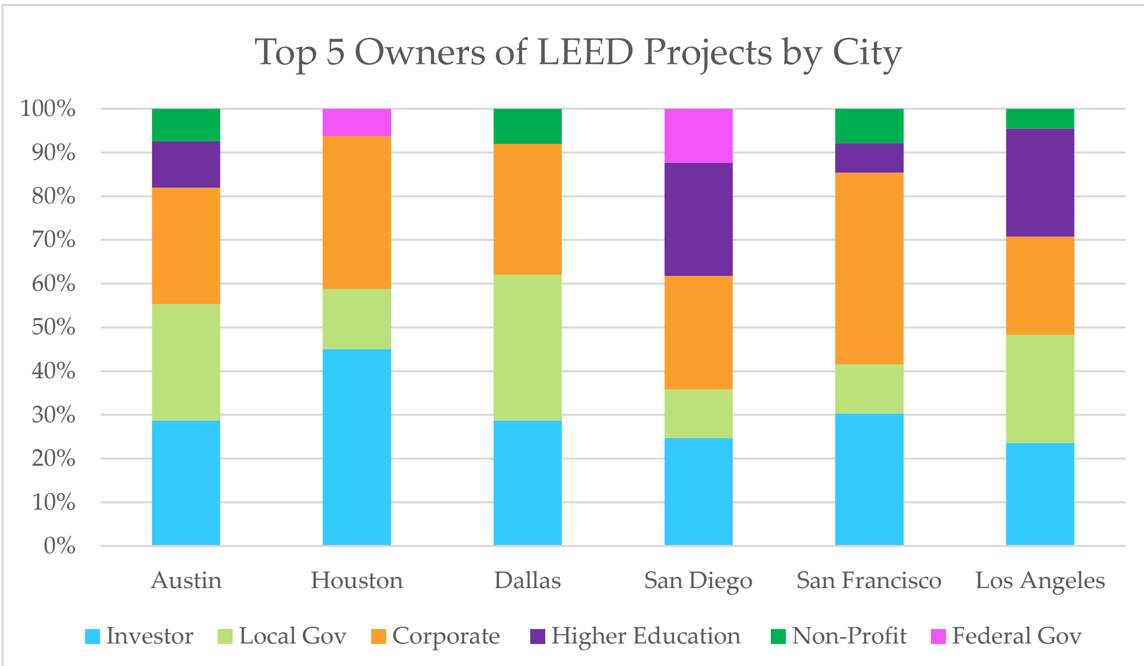






Type of LEED Project Owners by Percentage

City	Investor	Local Gov	Corporate	Higher Education	Non-Profit	Federal Gov
Austin	27	25	25	10	7	-
Houston	36	11	28	8*	-	5
Dallas	25	29	26	5*	7	-
San Diego	20	9	21	21	-	10
San Francisco	27	10	39	6	7	-
Los Angeles	21	22	20	22	4	-



APPENDIX B

Below is a screen shot of the google sheet used to automatically calculate the latitude and longitude of any address entered in the address column. All this code was found online in bits and pieces on various help cites.

Addresses	Lat	Lng			Map URL (google map API)		Map image from URL
string	=getLatLng(A2)	-			=if(isblank(A2); ""; hyperlink("https://maps.googleapis.com/maps/api/staticmap?center="& substitute(A2;" ";"%20")& "&zoom=13&size=400x200"& "&markers=color:red%7Clabel:S%7C"& B2& ","& C2))		=IMAGE(F3)
43 Rainey Street austin,Texas	30,25475262	-97,74079203			https://maps.googleapis.com/maps/api/staticmap?center=43%20Rainey%20Street%20austin,Texas&zoom=13&size=400x200&markers=color:red%7Clabel:S%7C30,2547526197(85,-97,7407920302915		

Below is the code that creates the getLatLng() function which allowed for this automation.

```
function getLatLng(adress) {
  try{
    if(adress=="")return("");
    var geo = Maps.newGeocoder().geocode(adress);
    if(geo.status=="OK"){
      var lng = geo.results[0].geometry.viewport.southwest.lng;
      var lat = geo.results[0].geometry.viewport.southwest.lat;
      Utilities.sleep(50);
      return([[lat,lng]]);
    }
    else{
      return("error");
    }
  }
  catch(err){
    return(err);
  }
}

function handleAdressList(adress){
  var results = [];
  for(var i in adress){
    results.push(getLatLong(adress[i][0]));
  }
  return results;
}
```