Hacettepe Üniversitesi

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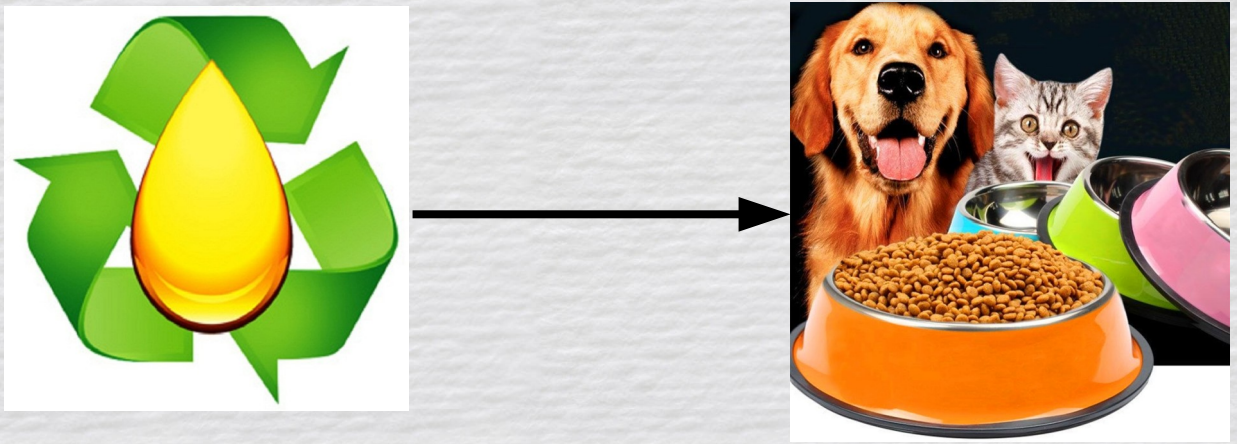
Purpose of Our Project

Finding the most appropriate places for the Yempati boxes,which disposes animal food for stray animals when given waste oil.



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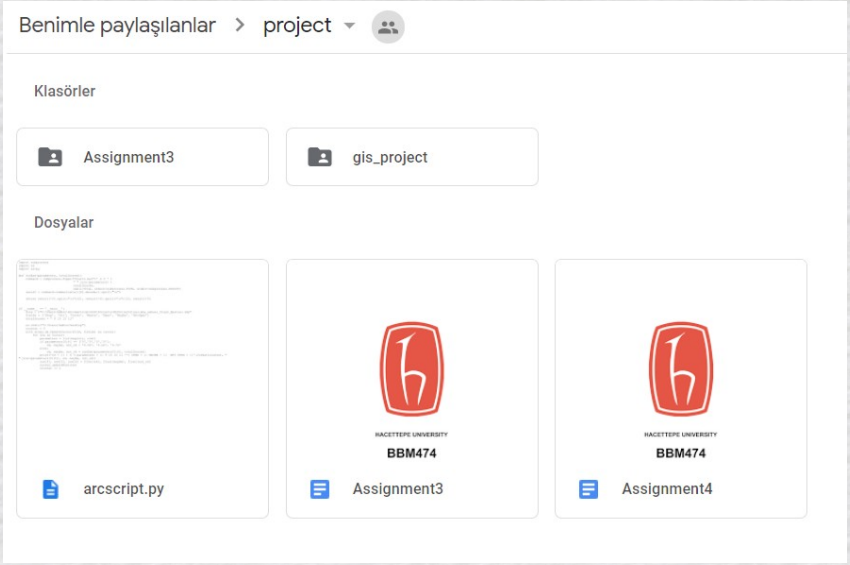
PROJECT MANAGEMENT

We used to Google Drive and Google Documents for sharing our documentation and creating report.



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EXTENT OF STUDY AREA

- Our field of study was Çankaya district.
- We thought about the places where stray animals and fat waste could be the most.
- The places where street animals are most common are usually parks and universities.
- Shopping centers are the places where waste oils can be most present

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DATA SOURCES

SPATIAL OBJECT/DATA	DATA SOURCE	DATA MODEL
Parks	• Ankara Metropolitan Municipality website • Google Earth Pro	Vecotr Data Model - Point
Universities	• Google Earth Pro	Vector Data Model - Point
Shopping Malls	• Google Earth Pro	Vector Data Model - Point
Waste Collection Centers	• Google Earth Pro • Ankara Metropolitan Municipality website	Vector Data Model - Point

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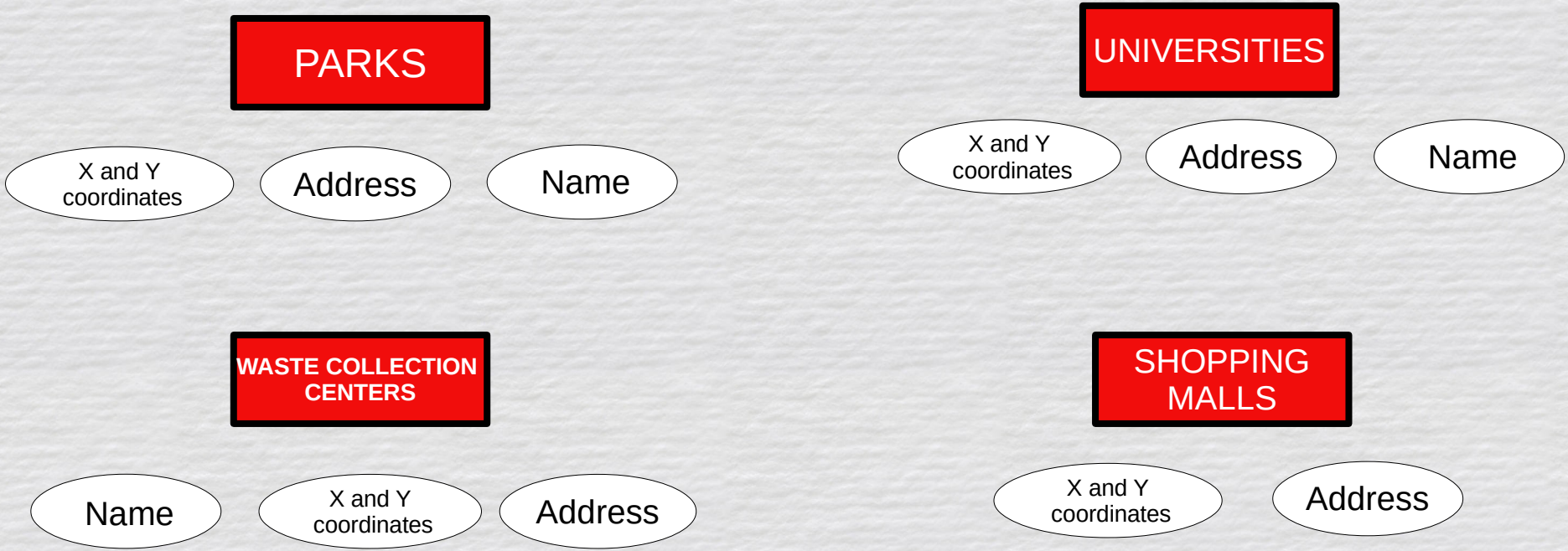
DESIGN OF DATABASE



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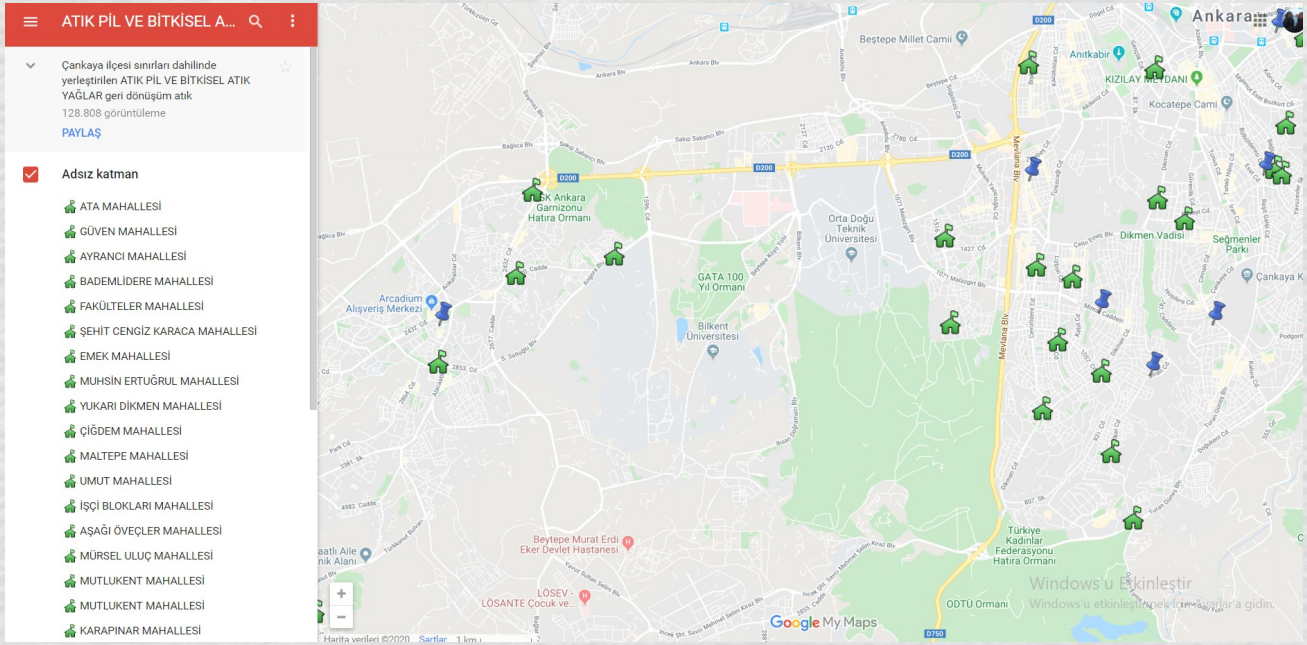
SPATIAL DATA

We used Ankara Metropolitan Municipality website for waste collection centers's coordinates.



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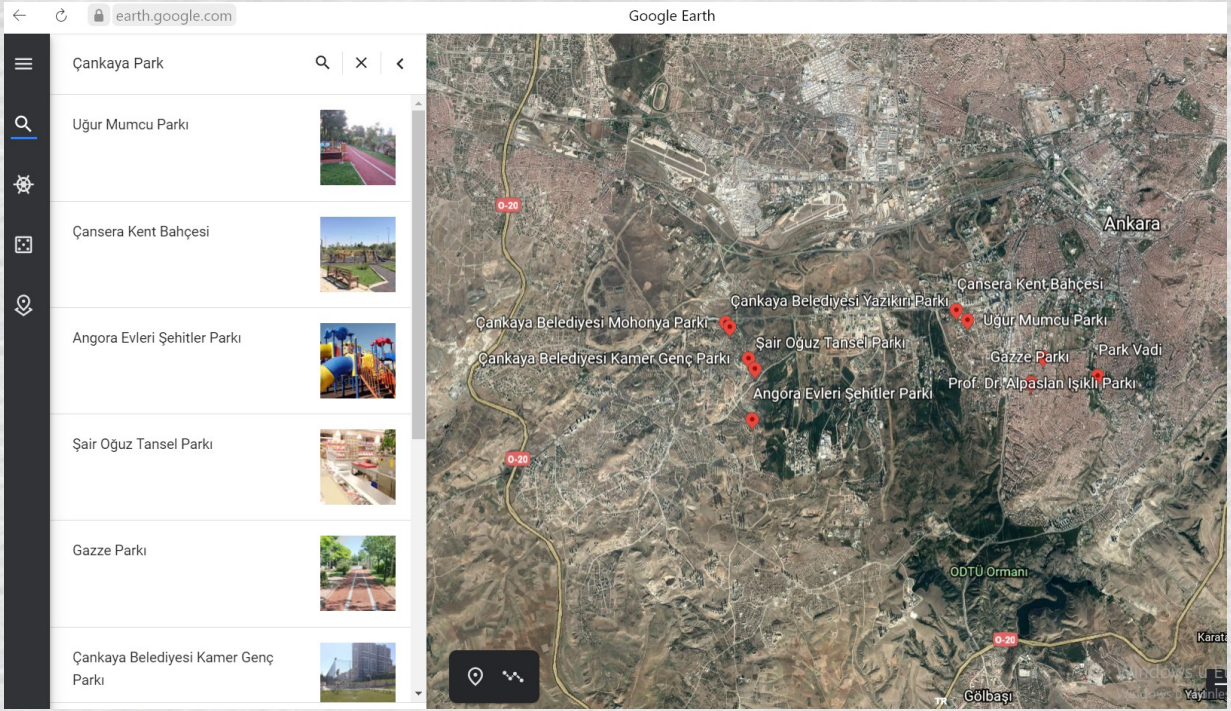
SPATIAL DATABASE

We used Google Earth Pro for parks's,shopping malls's and universities's coordinates.



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We used python code to edit the data we received from Google Earth Pro.

main.py

```python
import csv

if __name__ == '__main__':
    parklar = open("çankayaPARK.txt","r")
    parks, parkName, addresses, latitude, longitude = [], [], [], [], []

    for i in parklar:
        if "<name>" in i and "çankaya" not in i:
            parkName.append(i.split("<name>")[1].split("\n")[0])
        elif "address>" in i:
            addresses.append(i.split("<address>")[1].split("\n")[0])
        elif "coordinates" in i:
            coordinates = i.split("<coordinates>")[1].split(",")
            latitude.append(coordinates[1])
            longitude.append(coordinates[0])

    parks = []
    for i in range(len(parkName)):
        parks.append([parkName[i], latitude[i], longitude[i], addresses[i]])

    with open("parks.csv", "w+", newline="") as my_csv:
        csvWriter = csv.writer(my_csv,delimiter=',')
        csvWriter.writerows(parks)
```

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We had to change the coordinate system with UTM/WGS 84.

Geographic coordinates (Latitude, Longitude)				UTM Coordinates
Hemisphere	**DMS**	**DMM**	**DDD**	
	ddd°mm'ss.ss"	**ddd°mm.mmm'**	**ddd.ddddd°**	Northing:
Latitude: ○ N ○ S	° ' "	° '	°	Easting:
Longitude: ○ W ○ E	° ' "	° '	°	Zone/Sector:
*Datum:	WGS84/NAD83 ▾	WGS84/NAD83 ▾	WGS84/NAD83 ▾	WGS84/NAD83 ▾
Magnitude of total shift (WGS84 vs. NAD27): N/A				

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SPATIAL DATA

We transferred spatial data names,adresses and longitude-latitude values to the excel table as shown.

Latitude	Longitude	ShoppingCenterName	Address			
398.910.598	32.810.391	Taurus	Aktaş Mahallesi	Mevlana Blv. 190/B	06520 Çankaya/Ankara	
398.881.821	329.305.674	Anatolium Avm	Akşemsettin	215/B	Doğukent Cd.	06480 Mamak/Ankara
3.988.391	327.561.866	Bilkent Center	Üniversiteler	1597. Cd. NO. 3	06800 Çankaya/Ankara	
398.829.251	326.834.453	Arcadium	Koru	2432. Cd. No:192	06810 Çankaya/Ankara	
399.097.532	327.737.616	Kentpark	Mustafa Kemal	Dumlupınar Blv. 7.km D:No:164	06800 Çankaya/Ankara	
39.921.566	328.512.085	Kızılay	Kızılay, Atatürk Blv. No:96, 06420 Shawnee Mission/Körfez/Ankara			
399.112.973	328.101.079	Nextlevel	Kızılırmak	Dumlupınar Blv. No:3	06520 Çankaya/Ankara	
399.004.181	328.612.343	Karum	Gaziosmanpaşa	İran Cd. No:21	06680 Çankaya/Ankara	
398.893.551	32.847.112	Ansera	Ayrancı	Portakal Çiçeği Sok. No:17	06690 Çankaya/Ankara	
399.011.259	326.887.442	Gordion	Koru	06810 Çankaya/Ankara		
398.484.246	328.310.641	Panora	Oran	Mahallesi Bulvarı	Turan Güneş Blv. No:182	06550 Çankaya/Ankara

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Latitude	Longitude
39.878.621	32.823.565
39.899.202	32.851.524
39.902.625	32.845.559
39.903.498	32.884.258
39.873.422	32.833.183
39.925.597	32.817.144
39.907.708	32.871.011
39.848.555	32.840.195
39.881.511	32.799.801
39.906.887	32.872.869
39.896.177	32.798.704
39.889.268	32.826.872
39.859.863	32.835.297
39.891.275	32.818.694
398.749.984	326.871.371

	Park Name;Latitude;Longitude;Addresses		
2	Uğur Mumcu Parkı;39.9013852;32	06510 Çankaya/Ankara	
3	Metin Oktay park	Cengizhan Cd. N	06490 Çankaya/Ankara
4	Frederic Chopin I	Bosna Hersek Ca	06490 Çankaya/Ankara
5	Bahçe Sokak Çoı	Bahçe Sk.	06490 Çankaya/Ankara
6	50. Yıl Parkı;39.9	104. Sk. No:1	06590 Çankaya/Ankara
7	Adnan Ötüken Pa	Aşkaabat Cd. No	06490 Çankaya/Ankara
8	Yunus Emre Park	Bişkek Cd.	06500 Çankaya/Ankara
9	Çankaya Belediy	Dögol Cd. No:65	06490 Çankaya/Ankara
10	Aydın Sönmez Pa	06500 Çankaya/Ankara	
11	Çankaya Belediy	Kırım Cd. 78 A	06490 Çankaya/Ankara
12	Çansera Kent Ba	06510 Çankaya/Ankara	
13	Beştepe Çocuk P	Merhale Sk. No:6	06560 Yenimahalle/Ankara
14	Seğmenler Parkı	06680 Çankaya/Ankara	
15	Lozan Parkı;39.8	06550 Çankaya/Ankara	
16	Özdemir Özok Pa	Park İçi Yol	06520 Çankaya/Ankara
17	Kemal Sunal Par	Dikmen Cd. No:3	06450 Çankaya/Ankara
18	Abdi İpekçi Parkı	06420 Çankaya/Ankara	
19	Cahit Sıtkı Taran	Sokullu Mehmet	06450 Çankaya/Ankara
20	Belpa Parkı;39.9	78. Sk.	06490 Çankaya/Ankara
21	Kuğulu Park;39.9	Kuğulu Park	06690 Çankaya/Ankara
22	Yılmaz Güney Pa	70. Sk. No:16	06490 Çankaya/Ankara

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Then we added these tables to ArcGIS Pro program using "add data" feature.

avmler.csv | sonn.csv

Field: Add Delete Calculate | Selection: Zoom To Switch

Park Name	Latitude	Longitude	Addresses
Uğur Mumcu Parkı	39.901385	32.79755	Çukurambar,, 06510...
Metin Oktay parkı	39.92619	32.824581	Bahçelievler, Cengizh...
Frederic Chopin Parkı	39.917625	32.822282	Emek Mah., Bosna H...
Bahçe Sokak Çocuk...	39.928172	32.821888	Emek, Bahçe Sk., 064...
50. Yıl Parkı	39.923827	32.876334	50. Yıl, 104. Sk. No:1,...
Adnan Ötüken Parkı	39.917108	32.829032	Yukarı Bahçelievler,...
Yunus Emre Parkı	39.927951	32.818716	Emek, Bişkek Cd., 06...
Çankaya Belediyesi B...	39.932364	32.826873	Bahçelievler, Dögol C...
Aydın Sönmez Parkı	39.916995	32.815943	Emek, 06500 Çankay...
Çankaya Belediyesi B...	39.924391	32.816023	Emek, Kırım Cd. 78 A...
Çansera Kent Bahçesi	39.904262	32.793385	Çukurambar, 06510...
Beştepe Çocuk Parkı	39.923316	32.811888	Beştepe, Merhale Sk....
Seğmenler Parkı (Ça...	39.894835	32.862982	Çankaya, 06680 Çank...
Lozan Parkı	39.875292	32.866189	Birlik, 06550 Çankaya...
Özdemir Özok Parkı	39.907166	32.818226	Balgat, Park İçi Yol, 0...
Kemal Sunal Parkı	39.87344	32.833276	Şht. Cengiz Karaca, D...
Abdi İpekçi Parkı	39.92814	32.856396	Sağlık Mh., 06420 Ça...
Cahit Sıtkı Tarancı Pa...	39.884524	32.837229	Çankaya, Sokullu Me...
Belpa Parkı	39.917355	32.828522	Yukarı Bahçelievler, 7...

0 of 189 selected

Latitude	Longitude
39.878621	32.823565
39.899202	32.851524
39.902625	32.845559
39.903498	32.884258
39.873422	32.833183
39.925597	32.817144
39.907708	32.871011
39.848555	32.840195
39.881511	32.799801
39.906887	32.872869
39.896177	32.798704
39.889268	32.826872
39.859863	32.835297
39.891275	32.818694
39.874998	32.687137

avmler.csv

Field: Add Delete Calculate | Selection: Zoom To Switch Clear Delete Copy

Latitude	Longitude	ShoppingCenterNam	Address	Field5	Field6	Field7
39.89106	32.810391	Taurus	Aktaş Mahallesi	Mevlana Blv. 190/B	06520 Çankaya/Ank...	<Null>
39.888182	32.930567	Anatolium Avm	Akşemsettin	215/B	Doğukent Cd.	06480 Mamak/Ankara
39.88391	32.756187	Bilkent Center	Üniversiteler	1597. Cd. NO. 3	06800 Çankaya/Ank...	<Null>
39.882925	32.683445	Arcadium	Koru	2432. Cd. No:192	06810 Çankaya/Ank...	<Null>
39.909753	32.773762	Kentpark	Mustafa Kemal	Dumlupınar Blv. 7.k...	06800 Çankaya/Ank...	<Null>
39.921566	32.851208	Kızılay	Kızılay, Atatürk Blv. N...	<Null>	<Null>	<Null>
39.911297	32.810108	Nextlevel	Kızılırmak	Dumlupınar Blv. No:3	06520 Çankaya/Ank...	<Null>
39.900418	32.861234	Karum	Gaziosmanpaşa	İran Cd. No:21	06680 Çankaya/Ank...	<Null>
39.889355	32.847112	Ansera	Ayrancı	Portakal Çiçeği Sok....	06690 Çankaya/Ank...	<Null>
39.901126	32.688744	Gordion	Koru	06810 Çankaya/Ank...	<Null>	<Null>
39.848425	32.831064	Panora	Oran	Mahallesi Bulvarı	Turan Güneş Blv. No...	06550 Çankaya/Ank...

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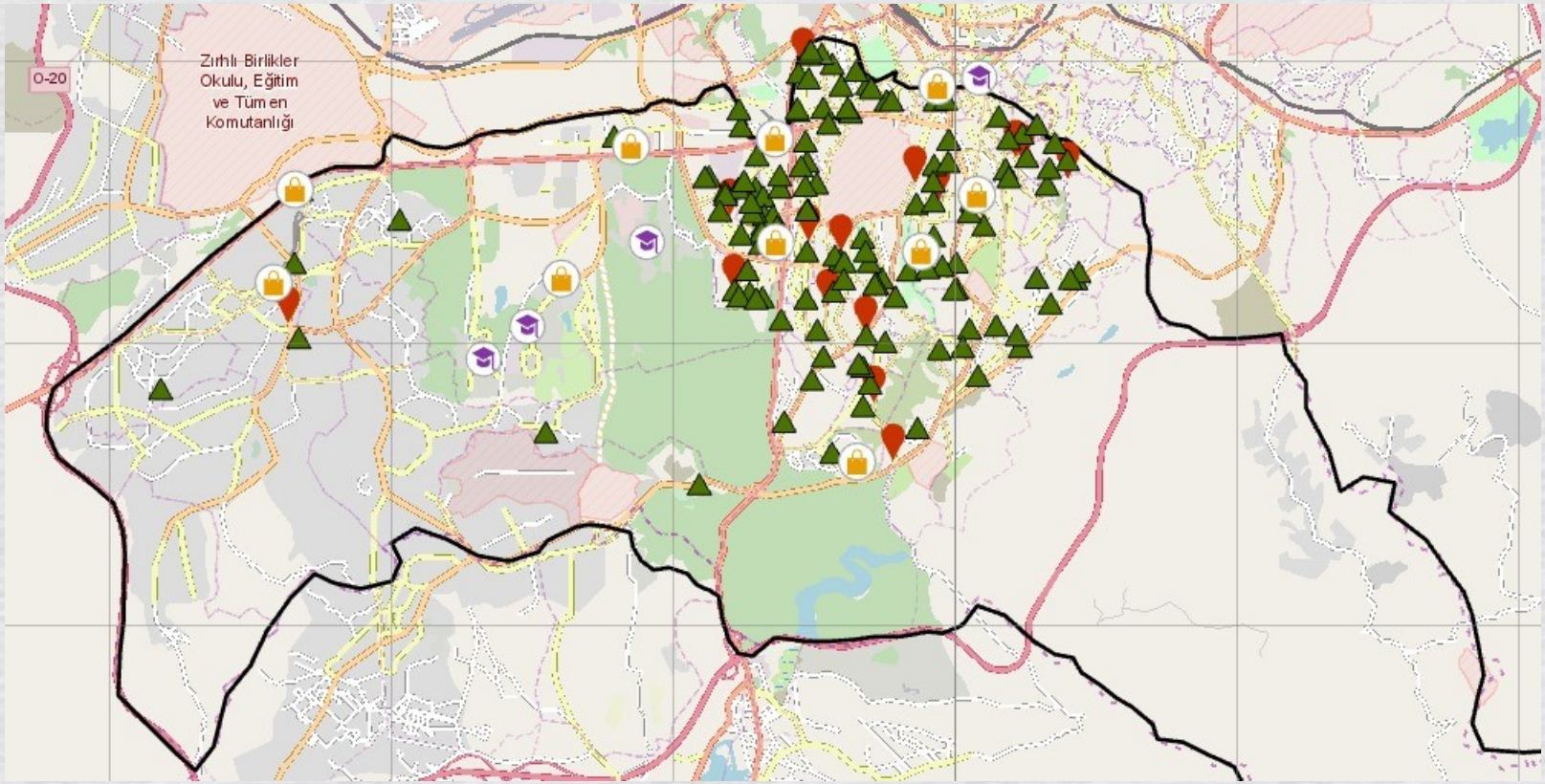

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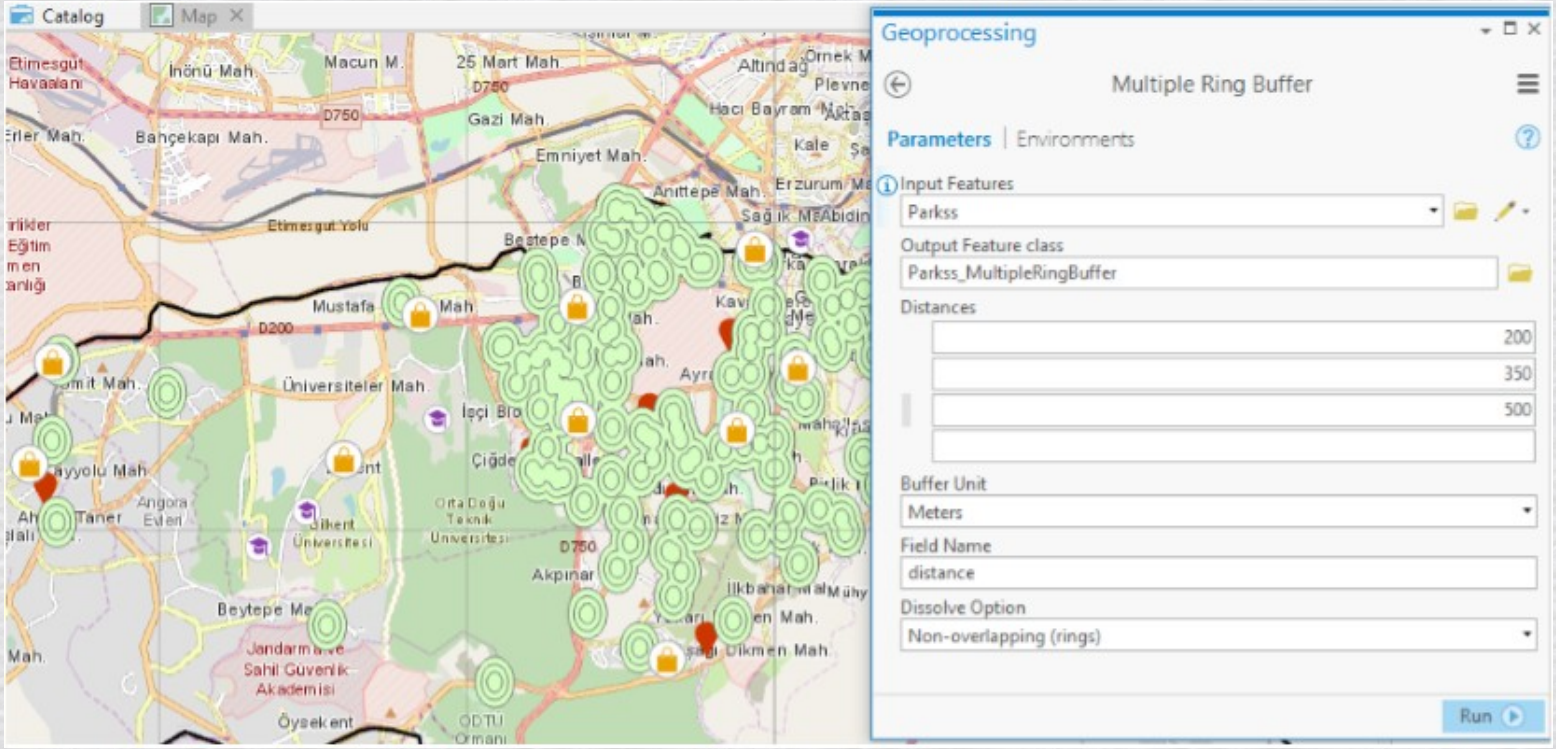
->After applying Parks Ring Buffer:



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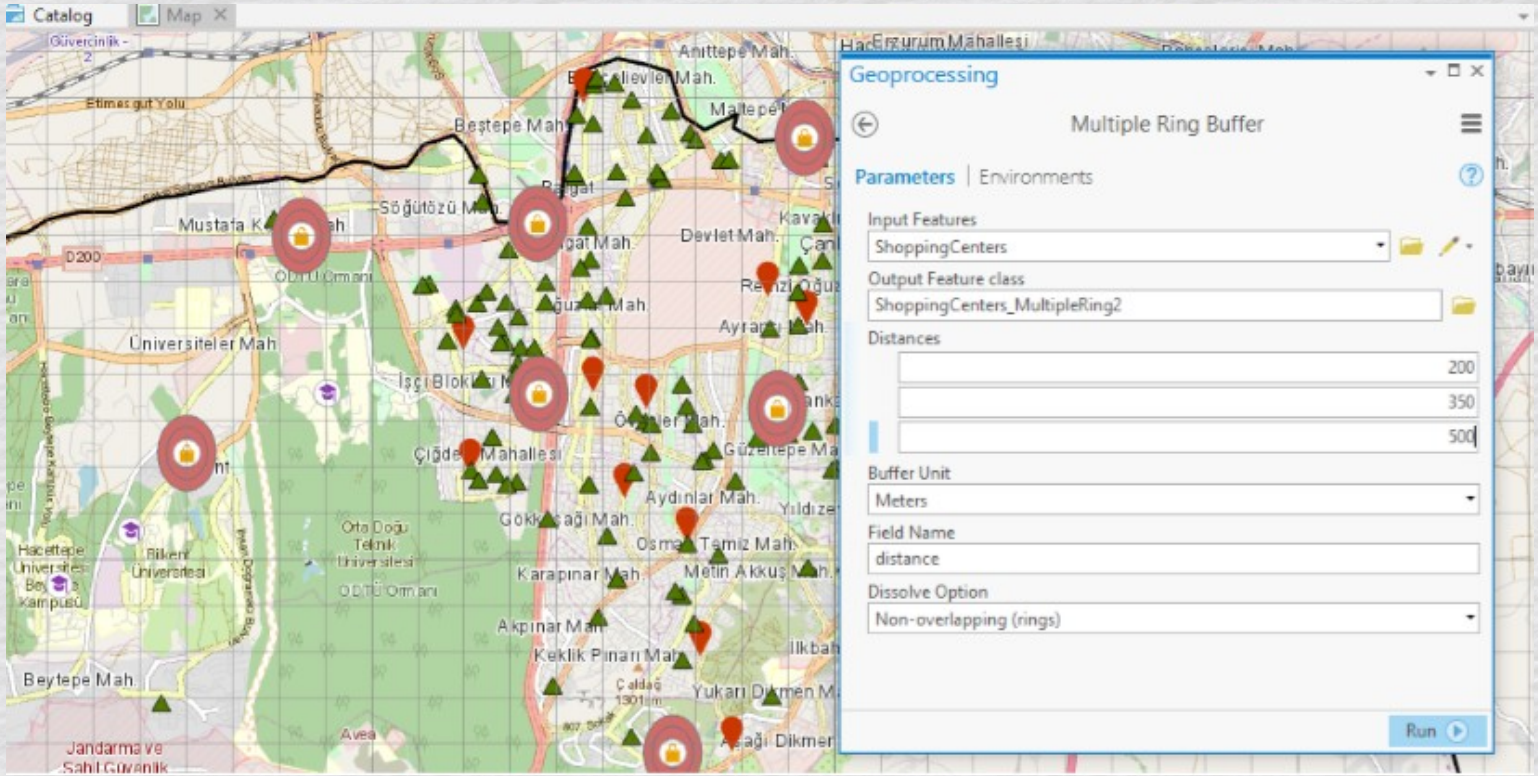
->After applying Shopping Centers Ring Buffer:



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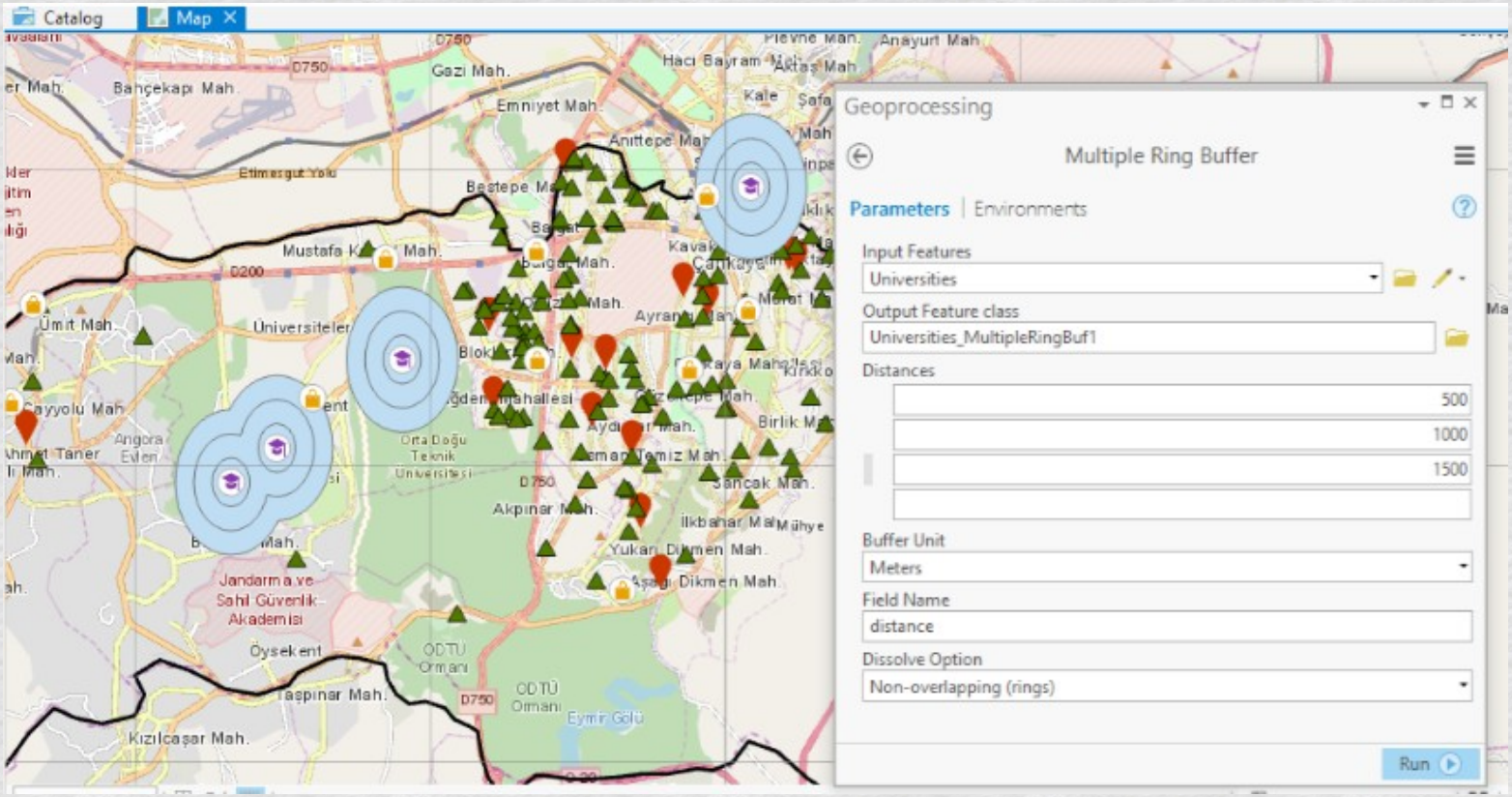
-> After applying Universities Ring Buffer:



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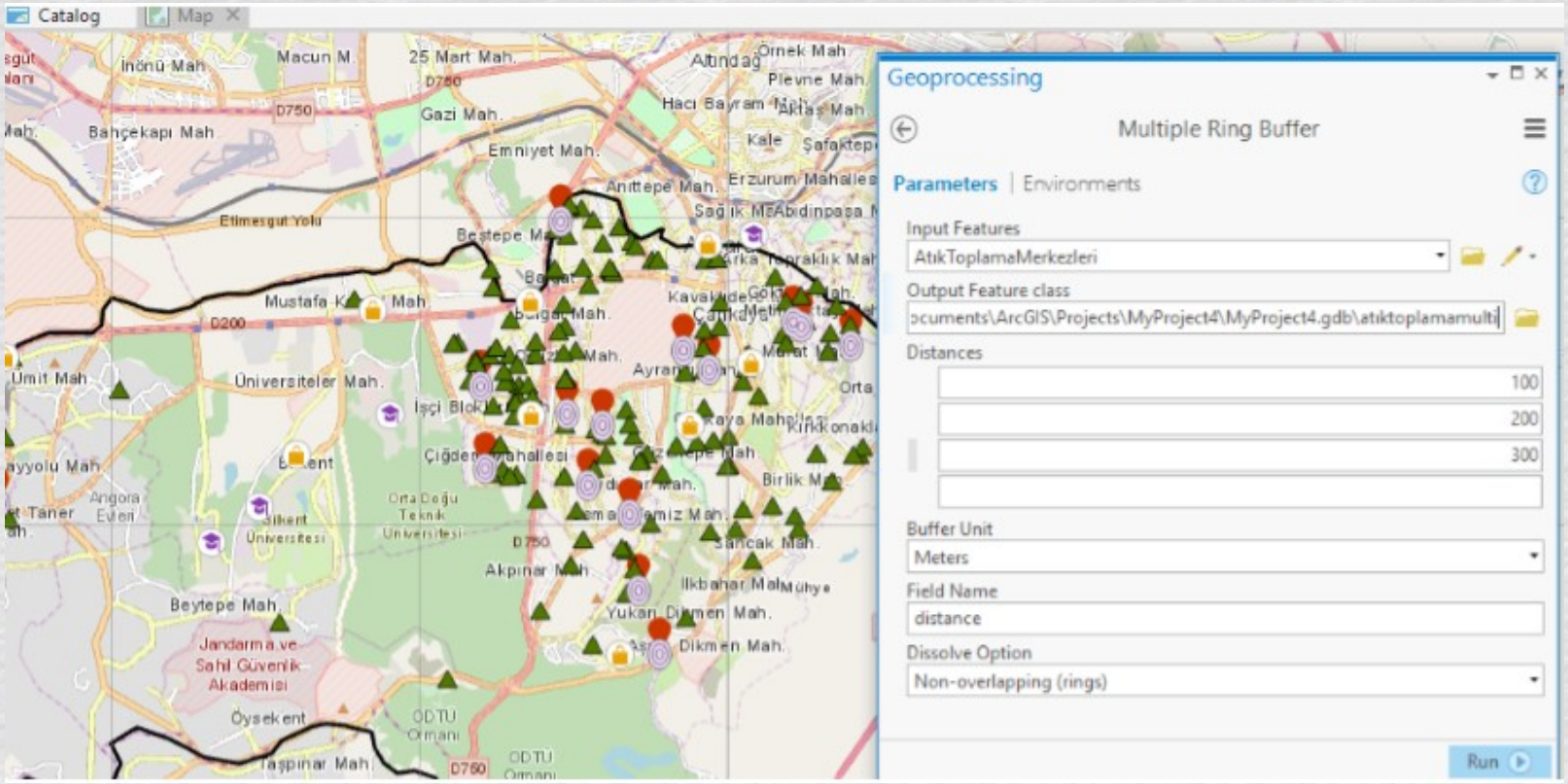
-> After applying Waste Collection Centers Ring Buffer:



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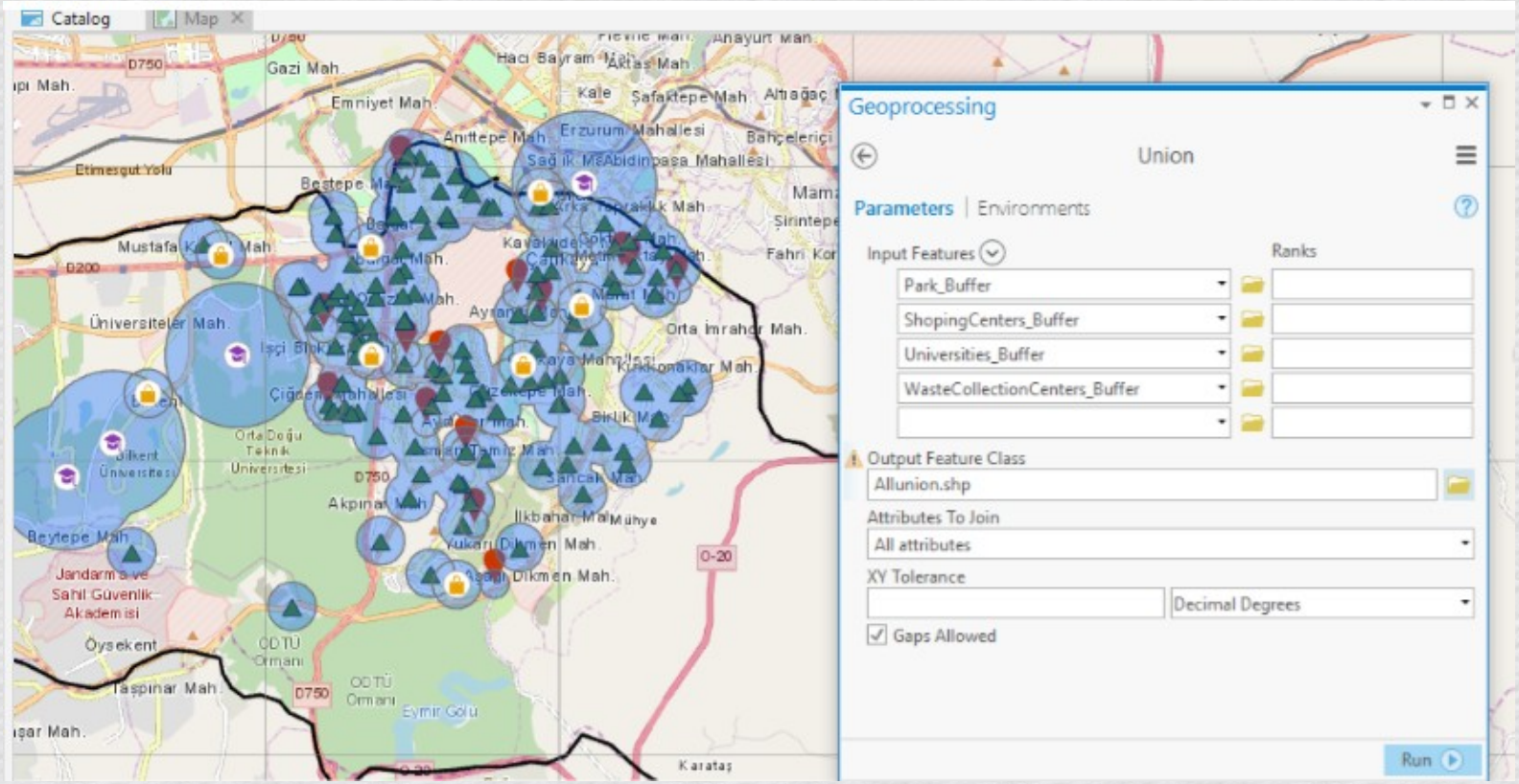

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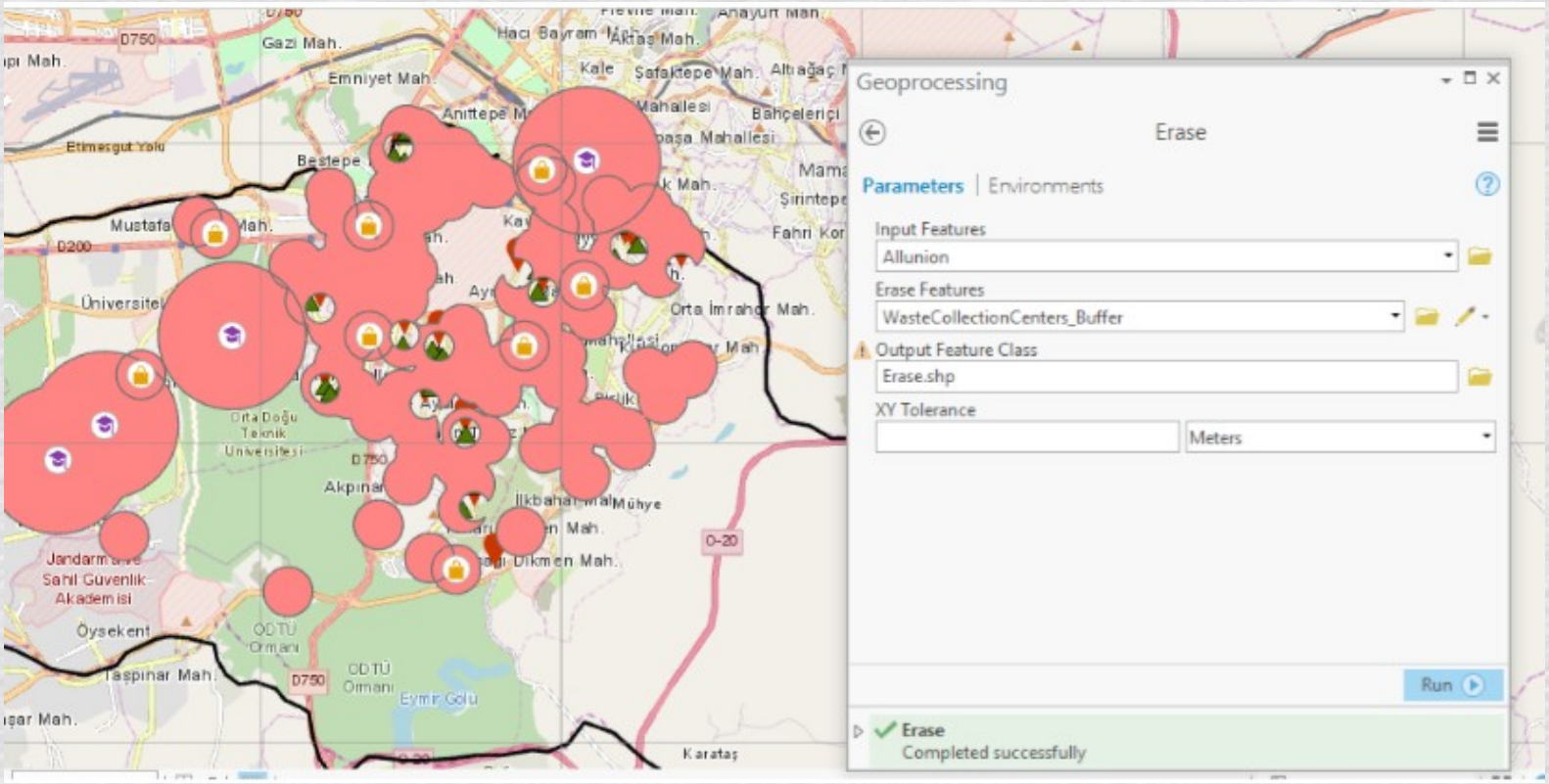
After erase WasteCollectionCenters_Buffer



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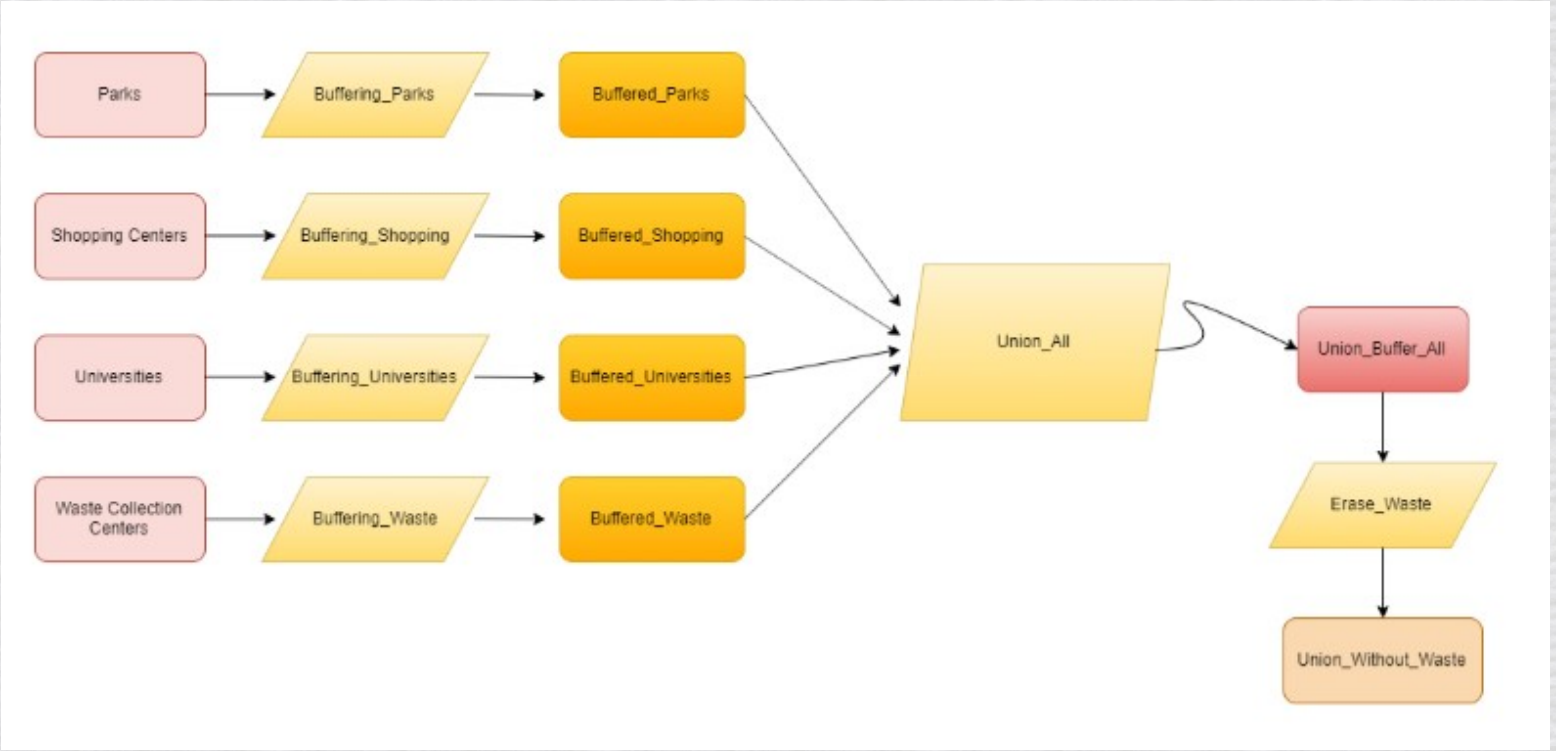
Flowchart representing the sequence of functions



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MAU feature class

- We clipped the fishnet.
- We assigned values to the clipped fishnet‘s attribute table.
- When we assigned the values, they were all NULL.
- After that, we added the values to the table one by one with respect to the relative destinations.
- We deleted the zero valued ones which were on the university, park and shopping center fields but we didn’t delete the zero valued ones on the waste center field because we don’t want Yempati machines to be near the waste collection centers.
- We will calculate each point’s score by their destinations to each other.

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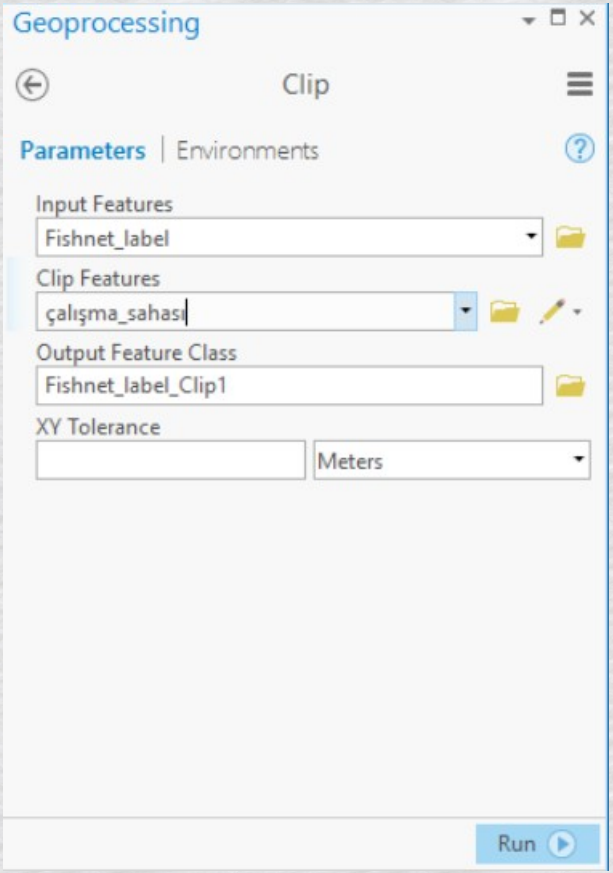

OBJECTID	Shape	Contain_Mall	Contain_Universities	Contain_Parks	Contain_WasteCollectionCenter
1	Point Z	<Null>	<Null>	<Null>	<Null>
2	Point Z	<Null>	<Null>	<Null>	<Null>
3	Point Z	<Null>	<Null>	<Null>	<Null>
4	Point Z	<Null>	<Null>	<Null>	<Null>
5	Point Z	<Null>	<Null>	<Null>	<Null>
6	Point Z	<Null>	<Null>	<Null>	<Null>
7	Point Z	<Null>	<Null>	<Null>	<Null>
8	Point Z	<Null>	<Null>	<Null>	<Null>

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Geoprocessing

Select Layer By Location

Parameters | Environments

Input Feature Layer
çalışma_sahası_Clip

Relationship
Intersect

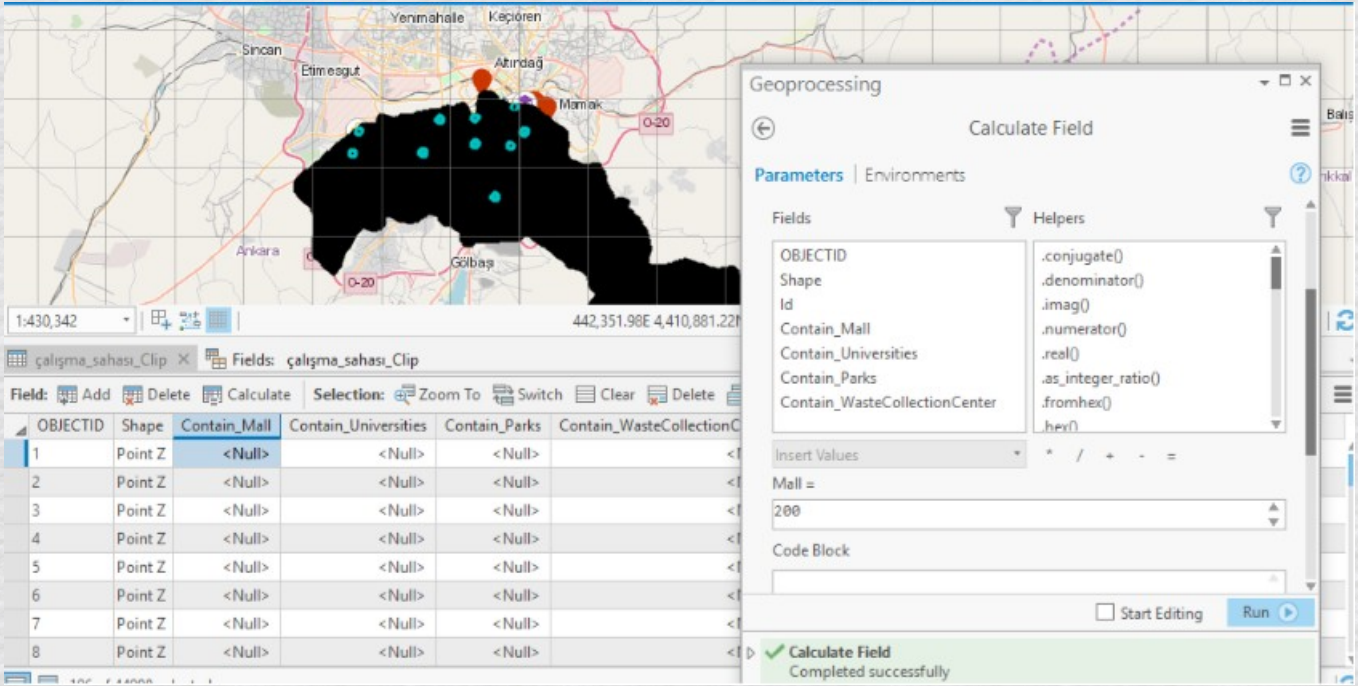
Selecting Features
Parkss

Search Distance
300 Meters

Selection type
New selection

Invert spatial relationship

Run



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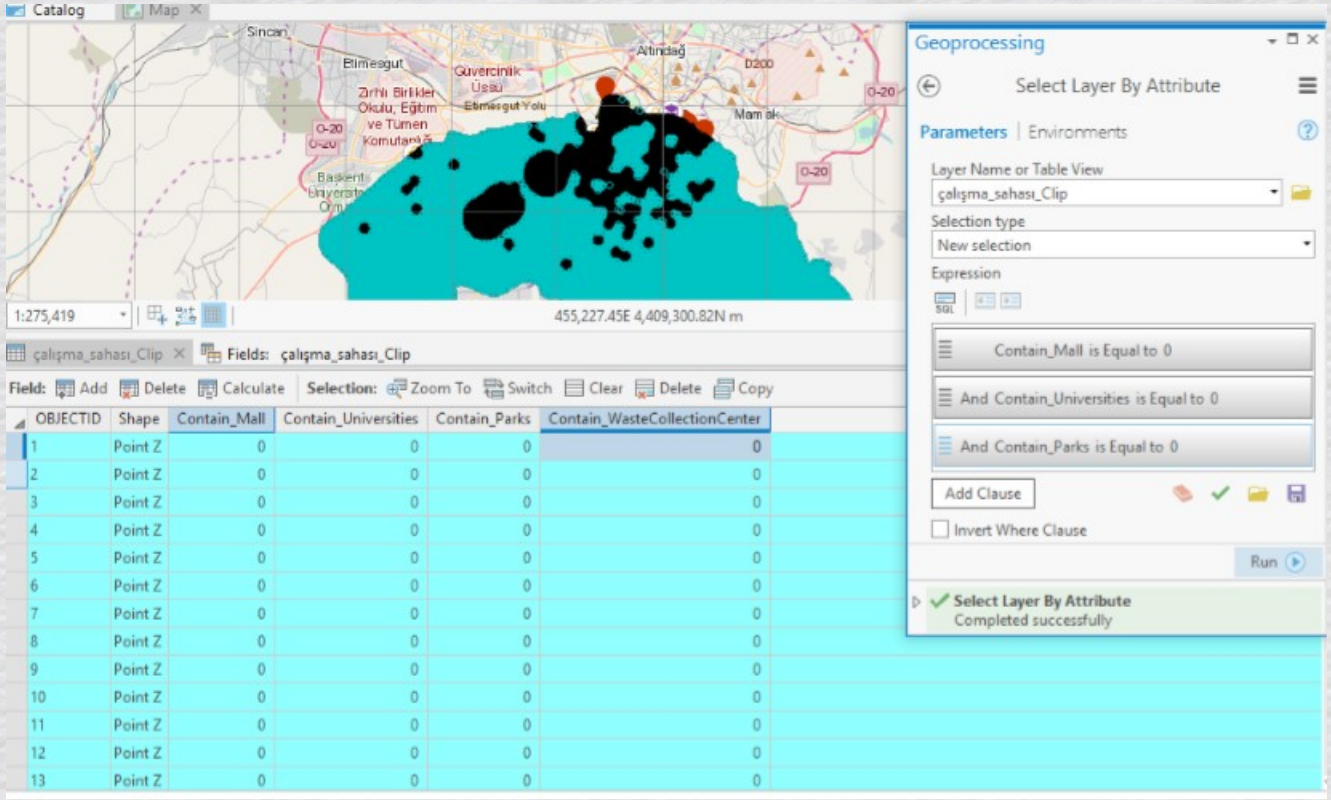
Our data matrix connected to our MAU feature class.



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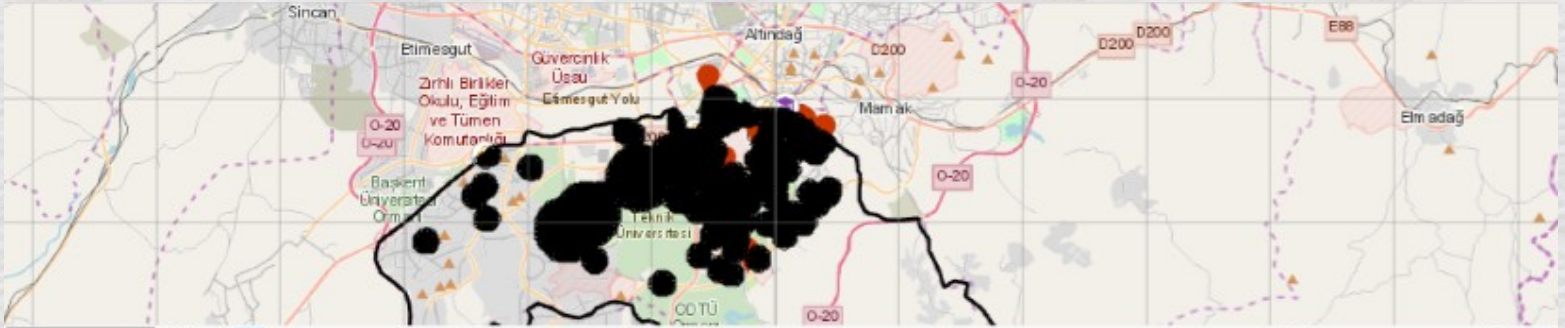

çalışma_sahası_Clip | Fields: çalışma_sahası_Clip

Field: Add Delete Calculate | Selection: Zoom To Switch Clear Delete Copy

OBJECTID	Shape	Contain_Mall	Contain_Universities	Contain_Parks	Contain_WasteCollectionCenter
28490	Point Z	500	0	350	0
28491	Point Z	500	0	350	0
28492	Point Z	350	0	350	0
28493	Point Z	200	0	500	0
28494	Point Z	200	0	0	0
28495	Point Z	200	0	0	0
28496	Point Z	200	0	0	0
28497	Point Z	350	0	0	0
28498	Point Z	350	0	0	0
28499	Point Z	500	0	0	0
28760	Point Z	0	0	500	0
28761	Point Z	0	0	500	0
28762	Point Z	0	0	350	0

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We defined the decision point as:

- Install The Machine
- Not Install The Machine
- Maybe

Then we decided to points’s scores.

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Shopping Centers

<=200	7
200-500	9
<=500	3

Parks

<=200	15
200-500	13
<=500	9

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Universities

<=500	15
500-1500	13
<=1500	11

Waste Collection Centers

<=200	1
200-500	3
<=1000	11

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Score values for the sub-classes of the parameters

Score_ShoppingCenter	Score_University	Score_Parks	Score_WasteCollectionCenter
3	0	0	11
3	0	0	11
9	0	9	11
9	0	9	11
9	0	13	11
9	0	15	11
9	0	15	11
3	0	15	11
0	0	15	11
0	0	13	11

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Modified Analytic Hierarchy Process (M-AHP) technique for calculate the percentage distributions at the decision points

```
import subprocess
import os
import arcpy

def runExe(parameters, totalScores):
    command = subprocess.Popen("start1.bat"+' 4 3 ' +
                               " ".join(parameters) +
                               totalScores,
                               shell=True, stdout=subprocess.PIPE, stderr=subprocess.STDOUT)
    result = command.communicate()[0].decode().split("\n")

    return result[-3].split("\r")[0], result[-4].split("\r")[0], result[-5]


if __name__ == '__main__':
    file = r"C:\Users\Admin\Documents\ArcGIS\Projects\MyProject4\çalışma_sahası_Clip2_Spatial.shp"
    fields = ['Shop', 'Uni', 'Parks', 'Waste', 'Open', 'Maybe', 'NotOpen']
    totalScores = " 9 15 15 11"

    os.chdir("C:/Users/Admin/Desktop")
    counter = 0
    with arcpy.da.UpdateCursor(file, fields) as cursor:
        for row in cursor:
            parameters = list(map(str, row))
            if parameters[0:4] == ['0','0','0','0']:
                ok, maybe, not_ok = '0.06', '0.22', '0.72'
            else:
                ok, maybe, not_ok = runExe(parameters[0:4], totalScores)
            print('ID = {} : 4 3 parameters = {} 9 15 15 11 --> OPEN = {} MAYBE = {}  NOT OPEN = {}'.format(counter, "
".join(parameters[0:4]), ok, maybe, not_ok))
            row[4], row[5], row[6] = float(ok), float(maybe), float(not_ok)
            cursor.updateRow(row)
            counter += 1
```

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Visualization the percentage distributions calculated

n_University	Contain_Park	Contain_WasteCollectionCenter	Score_Mall	Score_Uni	Score_Parks	Score_WasteCenters	PutMachine	Maybe	NotPutMachine	DECISION
1500	0	0	11	0	11	1000	0.48	0.36	0.16	PutMachine
0	0	0	0	0	0	0	0.06	0.22	0.72	NotPutMachine
0	500	0	0	9	11	1000	0.48	0.35	0.16	PutMachine
0	500	0	0	9	3	500	0.17	0.57	0.26	Maybe
0	350	0	0	13	3	500	0.47	0.32	0.21	PutMachine
0	350	0	0	13	3	500	0.47	0.32	0.21	PutMachine
0	350	0	0	13	3	500	0.47	0.32	0.21	PutMachine
0	350	0	0	13	3	500	0.47	0.32	0.21	PutMachine
0	350	0	0	13	3	500	0.47	0.32	0.21	PutMachine
0	200	0	0	15	3	500	0.54	0.27	0.19	PutMachine
0	350	0	0	13	3	500	0.47	0.32	0.21	PutMachine
0	350	0	0	13	11	1000	0.6	0.25	0.14	PutMachine
0	350	0	0	13	11	1000	0.6	0.25	0.14	PutMachine
0	500	0	0	9	11	1000	0.48	0.35	0.16	PutMachine
0	500	0	0	9	11	1000	0.48	0.35	0.16	PutMachine
0	500	0	0	9	11	1000	0.48	0.35	0.16	PutMachine
0	0	0	0	0	0	0	0.06	0.22	0.72	NotPutMachine
0	0	0	0	0	0	0	0.06	0.22	0.72	NotPutMachine

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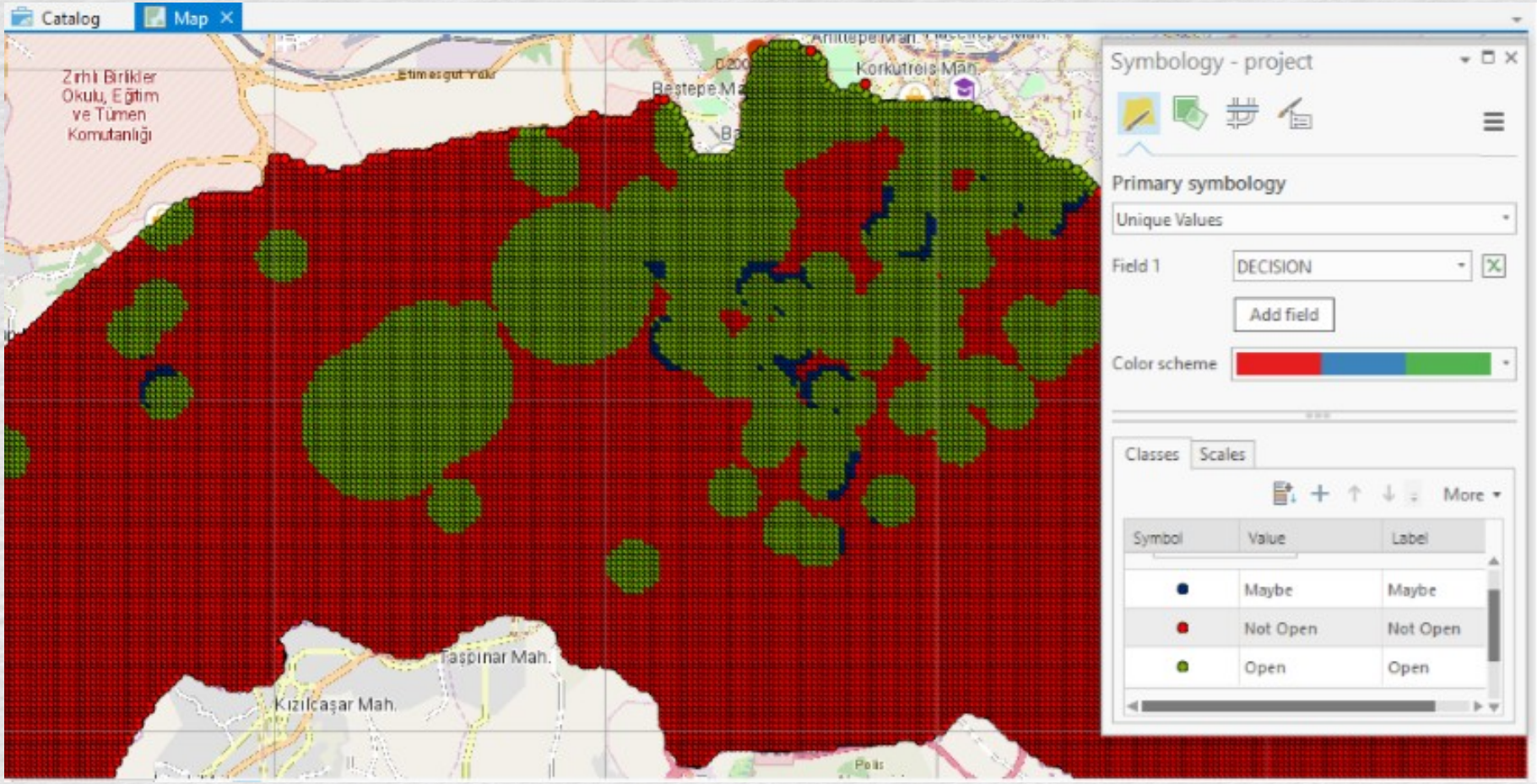

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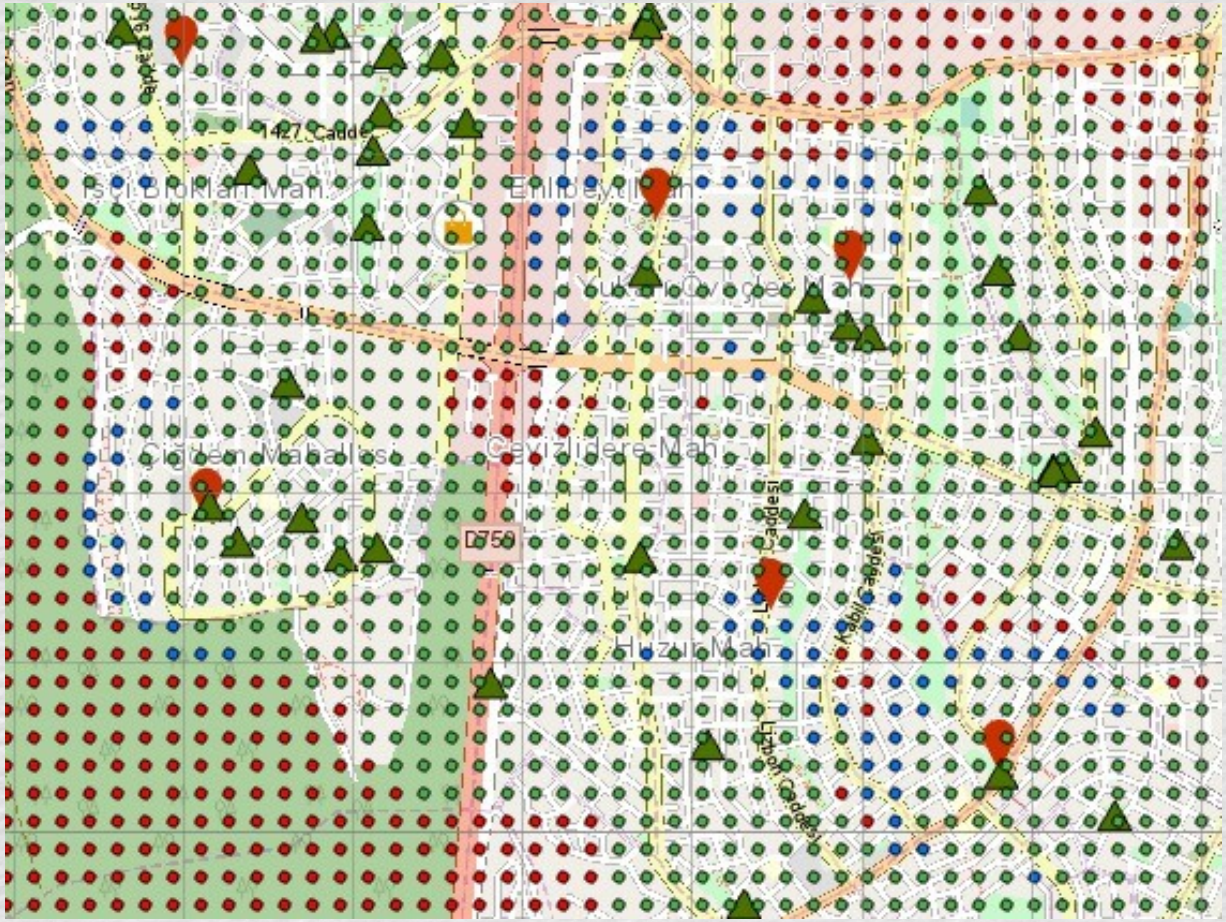

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THANK YOU FOR LISTENING