QUESTION 1:

'''Question 1: Which type of complaint should the Department of Housing Preservation and Development of New York City focus on first?'''

'''Notes on Problem 1: In the first question, we should look the 311 data set. 311 service is for New York citizens where citizens can report non-emergency requests from the city. Important note: The actual dataset is much bigger than this one and can be downloaded from the link I've provided in README file, however I selected the columns that I am going to use. I didn't choose the all recommended columns because of size issues. The dataset is in data.csv file and transferred here as df, using pandas. For answering question 1, we should find the column that contains complaint type information and find the complaint type that has occured most.'''

```
import pandas as pd

#lacal path of data from my computer
body1 = r"C:\Users\PRADYUM\Downloads\fhrw-4uyv.csv"

df = pd.read_csv(body1)
df.head()
```

```
               created_date  unique_key        complaint_type
incident_zip  \
0  2020-08-23T09:51:03.000    47338119        HEAT/HOT WATER
11234.0
1  2020-08-23T14:52:28.000    47339485              PLUMBING
11694.0
2  2020-08-23T07:21:11.000    47338136  UNSANITARY CONDITION
10011.0
3  2020-08-23T01:40:51.000    47343253  UNSANITARY CONDITION
11355.0
4  2020-08-23T09:45:44.000    47336184              ELEVATOR
10039.0

                    incident_address                   street_name  \
0               6614 VETERANS AVENUE              VETERANS AVENUE
1              193 BEACH  112 STREET            BEACH  112 STREET
2               103 WEST   14 STREET             WEST   14 STREET
3                137-27 HOLLY AVENUE                 HOLLY AVENUE
4  2890 FREDERICK DOUGLASS BOULEVARD  FREDERICK DOUGLASS BOULEVARD

  address_type           city  \
0      ADDRESS       BROOKLYN
1      ADDRESS  Rockaway Park
2      ADDRESS       NEW YORK
```

```
3      ADDRESS       Flushing
4      ADDRESS       NEW YORK

                                resolution_description    borough
latitude  \
0  The following complaint conditions are still o...   BROOKLYN
40.619789
1  The following complaint conditions are still o...     QUEENS
40.580445
2  The following complaint conditions are still o...  MANHATTAN
40.737564
3  The following complaint conditions are still o...     QUEENS
40.749927
4  The following complaint conditions are still o...  MANHATTAN
40.828110

   longitude closed_date         location_type status
0 -73.913164         NaN  RESIDENTIAL BUILDING   Open
1 -73.833540         NaN  RESIDENTIAL BUILDING   Open
2 -73.997301         NaN  RESIDENTIAL BUILDING   Open
3 -73.820885         NaN  RESIDENTIAL BUILDING   Open
4 -73.938052         NaN  RESIDENTIAL BUILDING   Open
```

```
dff = pd.read_csv(r"C:\Users\PRADYUM\Desktop\PLUTO_for_WEB\
BX_18v122.csv")
```

```
C:\Users\PRADYUM\Anaconda3\lib\site-packages\IPython\core\
interactiveshell.py:3049: DtypeWarning: Columns (19,20,22,23,64,65,80)
have mixed types. Specify dtype option on import or set
low_memory=False.
  interactivity=interactivity, compiler=compiler, result=result)
```

```
dff.head()
```

```
  Borough  Block  Lot   CD  CT2010  CB2010  SchoolDist  Council
ZipCode  \
0      BX   2260    1  201    19.0  1022.0         7.0      8.0
10454.0
1      BX   2260    4  201    19.0  1022.0         7.0      8.0
10454.0
2      BX   2260   10  201    19.0  1022.0         7.0      8.0
10454.0
3      BX   2260   17  201    19.0  1022.0         7.0      8.0
10454.0
4      BX   2260   18  201    19.0  1022.0         7.0      8.0
10454.0

  FireComp  ...  ZMCode  Sanborn   TaxMap  EDesigNum  APPBBL
APPDate  \
0     L029  ...     NaN  209S016  20901.0      E-143     0.0     NaN
```

```
1     L029  ...     NaN  209S016  20901.0      E-143     0.0     NaN

2     L029  ...     NaN  209S016  20901.0      E-143     0.0     NaN

3     L029  ...     NaN  209S016  20901.0      E-143     0.0     NaN

4     L029  ...     NaN  209S016  20901.0      E-143     0.0     NaN


  PLUTOMapID FIRM07_FLAG PFIRM15_FLAG Version
0          1         NaN          NaN    18V1
1          1         NaN          NaN    18V1
2          1         NaN          NaN    18V1
3          1         NaN          NaN    18V1
4          1         NaN          NaN    18V1

[5 rows x 87 columns]
```

```
dff.dropna(subset = ['ZipCode'], inplace=True)

dff.ZipCode.unique()
```

```
array([10454., 10455., 10451., 10456., 10452., 10453., 10465., 10474.,
       11370., 10459., 10472., 10457., 10460., 10458., 10468., 10463.,
       10467., 10470., 10466., 10473., 10462., 10461., 10469., 10475.,
       10464., 10471.])
```

Therefor 26 unique zipcodes in Bronx PLUTO dataset

```
dff2 = pd.read_csv(r"C:\Users\PRADYUM\Desktop\PLUTO_for_WEB\
QN_18v1.csv")
dff2.dropna(subset = ['ZipCode'], inplace=True)
```

```
array([11101., 11109., 11104., 11377., 11106., 11102., 11103., 11105.,
       11370., 11369., 11372., 11373., 11385., 11368., 11421., 11355.,
       11374., 11375., 11367., 11415., 11378., 11379., 11418., 11432.,
       11356., 11420., 11357., 11354., 11697., 11693., 11358., 11361.,
       11365., 11364., 11360., 11359., 11435., 11366., 11423., 11363.,
       11362., 11427., 11426., 11428., 11004., 11005., 11040., 11001.,
       11416., 11417., 11419., 11433., 11413., 11434., 11412., 11429.,
       11411., 11414., 11430., 11436., 11422., 11691., 11692., 11694.,
       11695.])
```

```
len(dff2.ZipCode.unique())
```

```
65
```

Therefor 65 unique zipcodes in QUEENS PLUTO dataset

Coming back to main dataset df

```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 4220047 entries, 0 to 4220046
Data columns (total 15 columns):
created_date              object
unique_key                int64
complaint_type            object
incident_zip              float64
incident_address          object
street_name               object
address_type              object
city                      object
resolution_description    object
borough                   object
latitude                  float64
longitude                 float64
closed_date               object
location_type             object
status                    object
dtypes: float64(3), int64(1), object(11)
memory usage: 482.9+ MB
```

```
df["complaint_type"].unique()
```

```
array(['HEAT/HOT WATER', 'PLUMBING', 'UNSANITARY CONDITION',
'ELEVATOR',
       'WATER LEAK', 'PAINT/PLASTER', 'GENERAL', 'FLOORING/STAIRS',
       'SAFETY', 'APPLIANCE', 'DOOR/WINDOW', 'ELECTRIC',
       'OUTSIDE BUILDING', 'Appliance', 'Unsanitary Condition',
'Safety',
       'Electric', 'HPD Literature Request', 'HEATING',
       'GENERAL CONSTRUCTION', 'PAINT - PLASTER', 'NONCONST',
       'CONSTRUCTION', 'General', 'AGENCY', 'VACANT APARTMENT',
       'STRUCTURAL', 'Outside Building', 'Plumbing', 'Mold'],
dtype=object)
```

```
df.incident_address.isnull().sum()
```

```
52821
```

```
df["complaint_type"].isnull().sum()
```

```
0
```

```
df["complaint_type"].value_counts()
```

```
HEAT/HOT WATER             1306687
UNSANITARY CONDITION        474493
PLUMBING                    425976
PAINT/PLASTER               353335
DOOR/WINDOW                 213033
HEATING                     205564
ELECTRIC                    202684
WATER LEAK                  200478
GENERAL                     153518
FLOORING/STAIRS             141572
GENERAL CONSTRUCTION        139580
PAINT - PLASTER             101832
APPLIANCE                    91452
NONCONST                     80239
SAFETY                       53618
HPD Literature Request       52820
OUTSIDE BUILDING              7299
ELEVATOR                      7259
Unsanitary Condition          5499
CONSTRUCTION                  1481
General                       1163
Safety                         424
Plumbing                        11
AGENCY                           9
VACANT APARTMENT                 8
Outside Building                 6
Appliance                        4
Mold                             1
Electric                         1
STRUCTURAL                       1
Name: complaint_type, dtype: int64
```

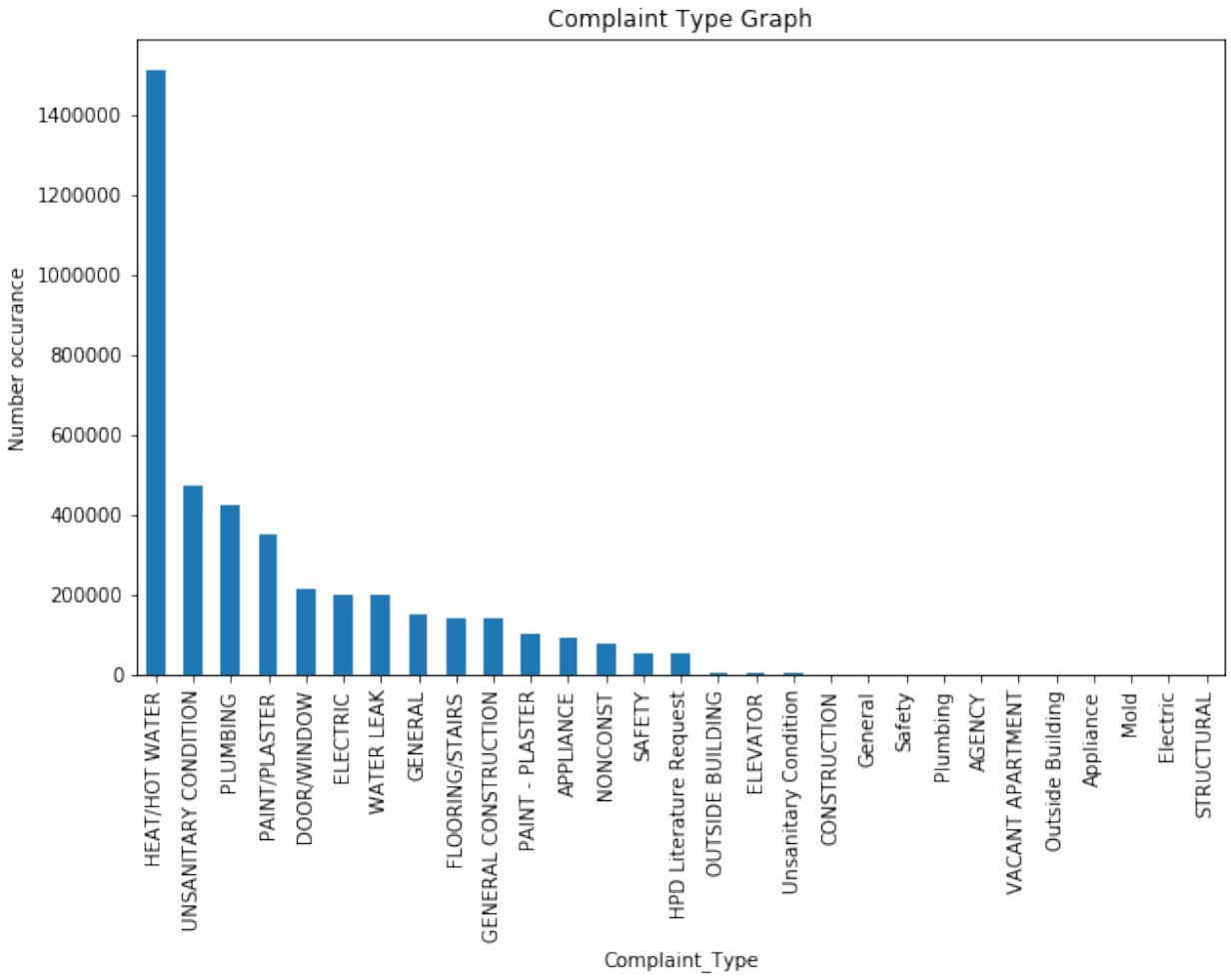
It is clear that the Heat/Hot Water problem is the one that NYC should focus on first! However, it's tricky. You may notice that there is big similarity between two groups. HEAT/HOT WATER and HEATING. Before 2014, this dataset is using HEATING label but after 2014, the label changed as "HEATING/HOT WATER". So, we need to change "HEATING" labels as "HEATING/HOT WATER" and analyze them together.

```
import numpy as np
import datetime as dt
df['complaint_type'] =
np.where(df['complaint_type']=='HEATING','HEAT/HOT
WATER',df['complaint_type'])

df["complaint_type"].value_counts().head()
```

```
HEAT/HOT WATER          1512251
UNSANITARY CONDITION     474493
PLUMBING                 425976
```

```
PAINT/PLASTER             353335
DOOR/WINDOW               213033
Name: complaint_type, dtype: int64
```

```
import matplotlib.pyplot as plt
import seaborn as sns

df["complaint_type"].value_counts().plot(kind='bar', figsize=(10, 6))
#
plt.xlabel('Complaint_Type') # add to x-label to the plot
plt.ylabel('Number occurance') # add y-label to the plot
plt.title('Complaint Type Graph') # add title to the plot
#
plt.show()
```




```
df["created_date"].tail()
```

```
4220042    2010-11-28T00:00:00.000
4220043    2010-11-28T00:00:00.000
4220044    2010-11-28T00:00:00.000
```

```
4220045    2010-11-28T00:00:00.000
4220046    2010-11-28T00:00:00.000
Name: created_date, dtype: object
```

it is not a datetime type column. Basically it contains dates as strings.

```
complaint_df = df[df.complaint_type == "HEAT/HOT WATER"]

complaint_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 1512251 entries, 0 to 4220046
Data columns (total 15 columns):
created_date              1512251 non-null object
unique_key                1512251 non-null int64
complaint_type            1512251 non-null object
incident_zip              1493218 non-null float64
incident_address          1512250 non-null object
street_name               1512250 non-null object
address_type              1494255 non-null object
city                      1493363 non-null object
resolution_description    1512086 non-null object
borough                   1512251 non-null object
latitude                  1248318 non-null float64
longitude                 1248318 non-null float64
closed_date               1507029 non-null object
location_type             1512251 non-null object
status                    1512251 non-null object
dtypes: float64(3), int64(1), object(11)
memory usage: 184.6+ MB
```

```
heat_year_sum_df = complaint_df[["complaint_type", "created_date"]]
heat_year_sum_df.head()
```

```
    complaint_type            created_date
0   HEAT/HOT WATER  2020-08-23T09:51:03.000
8   HEAT/HOT WATER  2020-08-23T10:09:29.000
11  HEAT/HOT WATER  2020-08-23T19:42:17.000
18  HEAT/HOT WATER  2020-08-23T07:30:14.000
20  HEAT/HOT WATER  2020-08-23T11:53:49.000
```

```
heat_year_sum_df["created_date"].head()
```

```
0     2020-08-23T09:51:03.000
8     2020-08-23T10:09:29.000
11    2020-08-23T19:42:17.000
18    2020-08-23T07:30:14.000
20    2020-08-23T11:53:49.000
Name: created_date, dtype: object
```

```
heat_year_sum_df["created_date"] =
pd.to_datetime(heat_year_sum_df.created_date)
```

```
C:\Users\PRADYUM\Anaconda3\lib\site-packages\ipykernel_launcher.py:1:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas-
docs/stable/indexing.html#indexing-view-versus-copy
  """Entry point for launching an IPython kernel.
```

```
#now we group the incidents by every year
grp = heat_year_sum_df.groupby(heat_year_sum_df.created_date.dt.year)

grp.count()
```

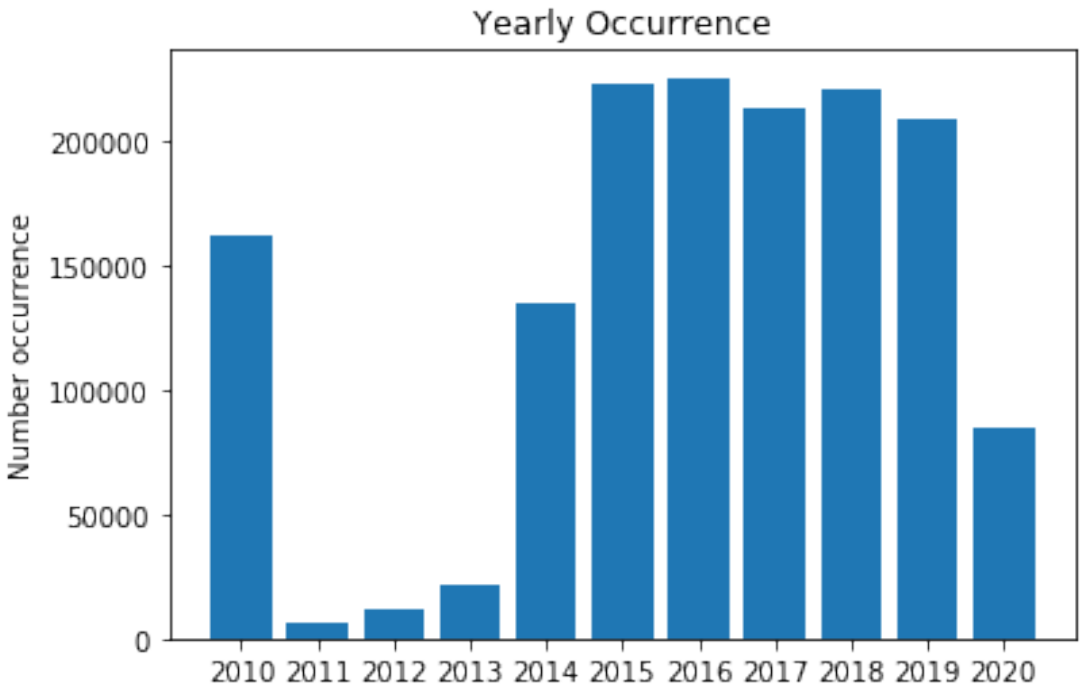
created_date	complaint_type	created_date
2010	161611	161611
2011	6085	6085
2012	11971	11971
2013	21720	21720
2014	135043	135043
2015	223011	223011
2016	225267	225267
2017	213244	213244
2018	221035	221035
2019	208128	208128
2020	85136	85136

```
pd.DataFrame = grp.count()
grp_df = pd.DataFrame
grp_df
```

created_date	complaint_type	created_date
2010	161611	161611
2011	6085	6085
2012	11971	11971
2013	21720	21720
2014	135043	135043
2015	223011	223011
2016	225267	225267
2017	213244	213244
2018	221035	221035
2019	208128	208128
2020	85136	85136

```
plt.bar(grp_df.index, grp_df["complaint_type"])
plt.xticks(grp_df.index.values)
```

```
plt.ylabel('Number occurrence')
plt.title('Yearly Occurrence')

plt.show()
```



CONCLUDING REMARKS: Department of Housing Preservation and Development of New York City should address HEAT/HOT WATER problem first.