Task 5

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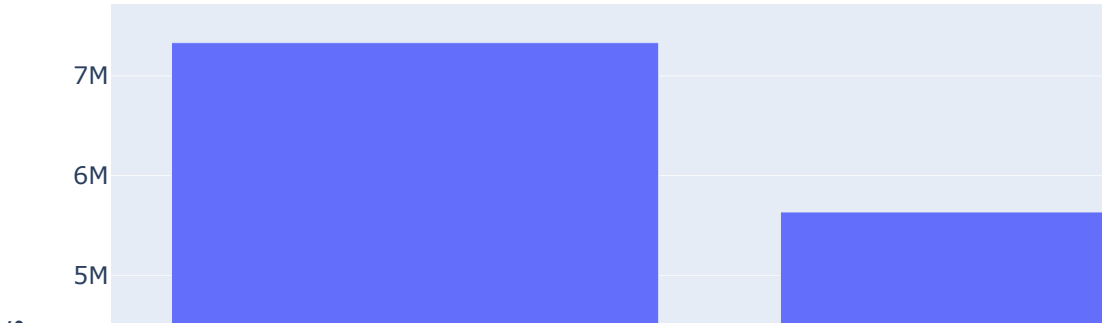
In [8]:
```
import pandas as pd
import numpy as np
import plotly.express as px
import plotly.graph_objects as go

import warnings
warnings.filterwarnings('ignore')

nei = pd.read_csv('summarySCC_PM25.csv', low_memory=False)
scc = pd.read_csv('Source_Classification_Code.csv', low_memory=False)
```

1. Have total emissions from PM2.5 decreased in the United States from 1999 to 2008? Make a plot showing the total PM2.5 emission from all sources for each of the years 1999, 2002, 2005, and 2008.

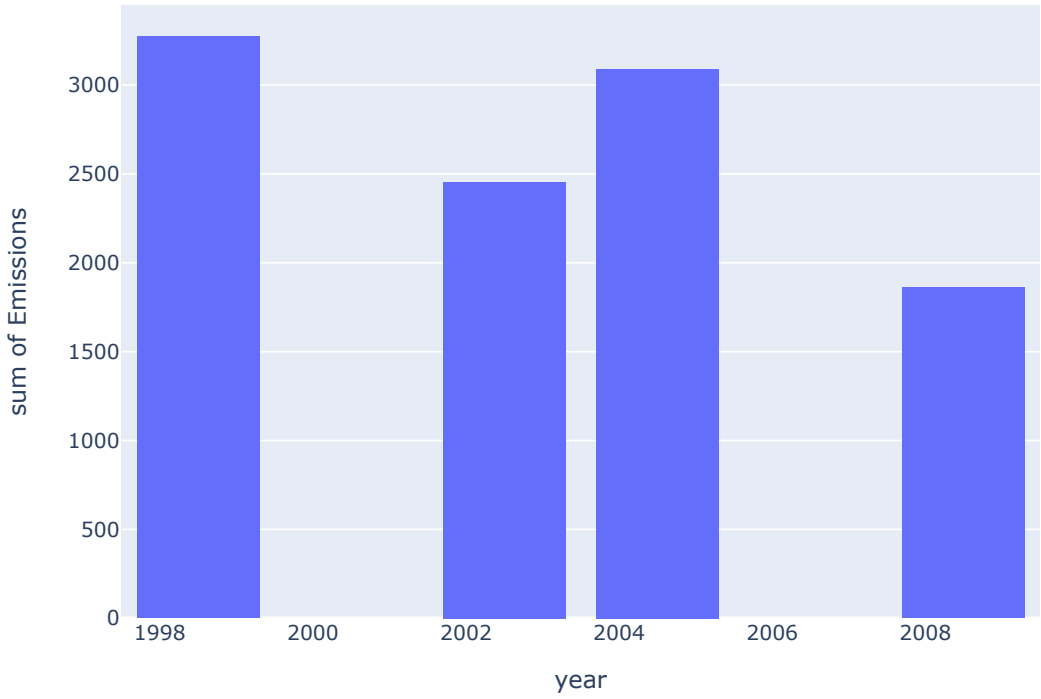
In [2]:
```
px.bar(nei.groupby(['year'],as_index=False).Emissions.sum(), x='year', y='Emission
```



Answer: YES

1. Have total emissions from PM2.5 decreased in the Baltimore City, Maryland (fips == "24510") from 1999 to 2008?

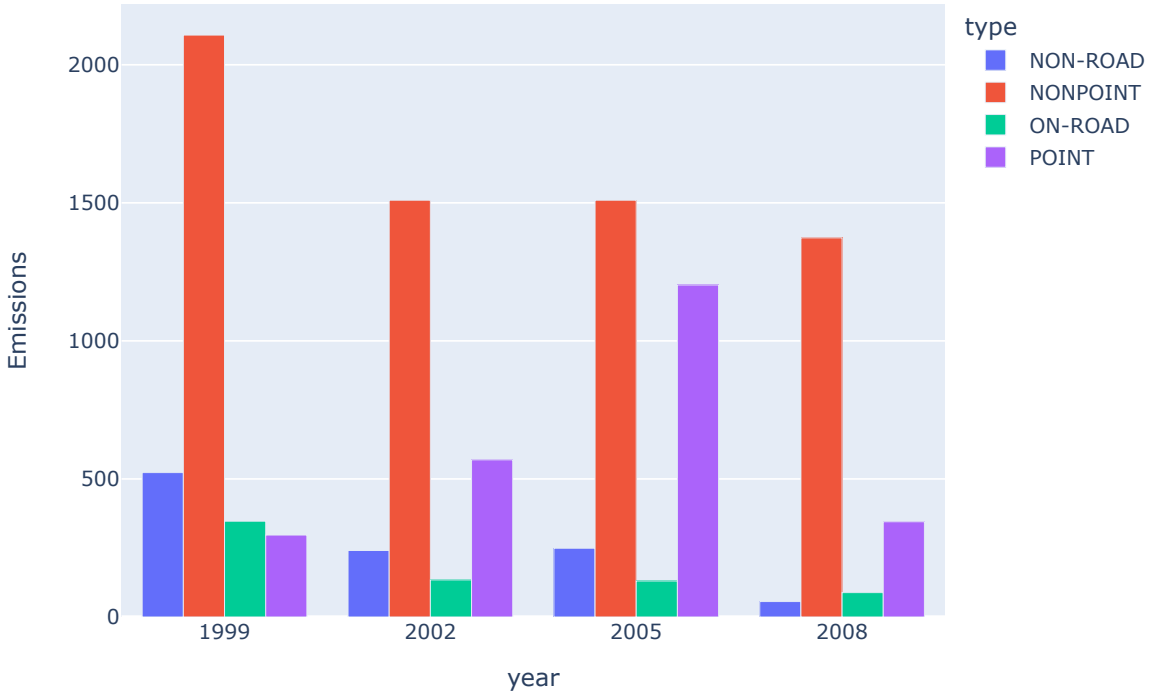
In [3]:
```
fig = px.histogram(nei[nei.fips=='24510'].groupby(['year'],as_index=False).Emissio
fig.show("svg")
```



Answer: YES

1. Of the four types of sources indicated by the type (point, nonpoint, onroad, nonroad) variable, which of these four sources have seen decreases in emissions from 1999–2008 for Baltimore City? Which have seen increases in emissions from 1999–2008?

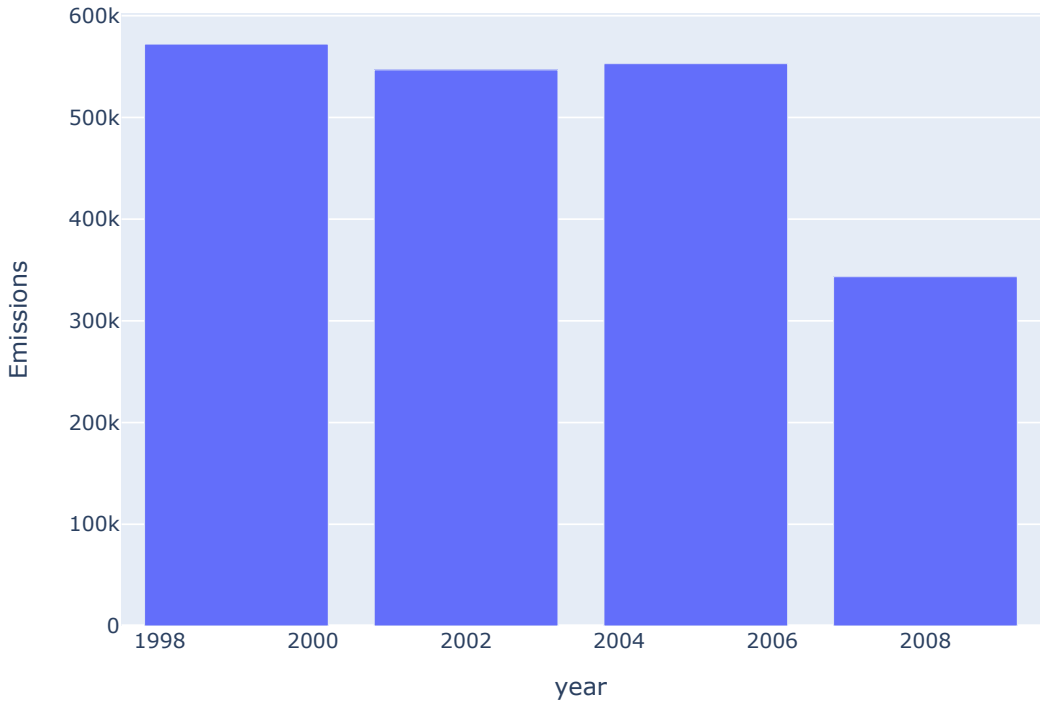
In [4]:
```
fig = px.bar(nei[nei.fips=='24510'].groupby(['year', 'type'],as_index=False).Emiss
fig.show("svg")
```



Answer: Both decreased

1. Across the United States, how have emissions from coal combustion-related sources changed from 1999–2008?

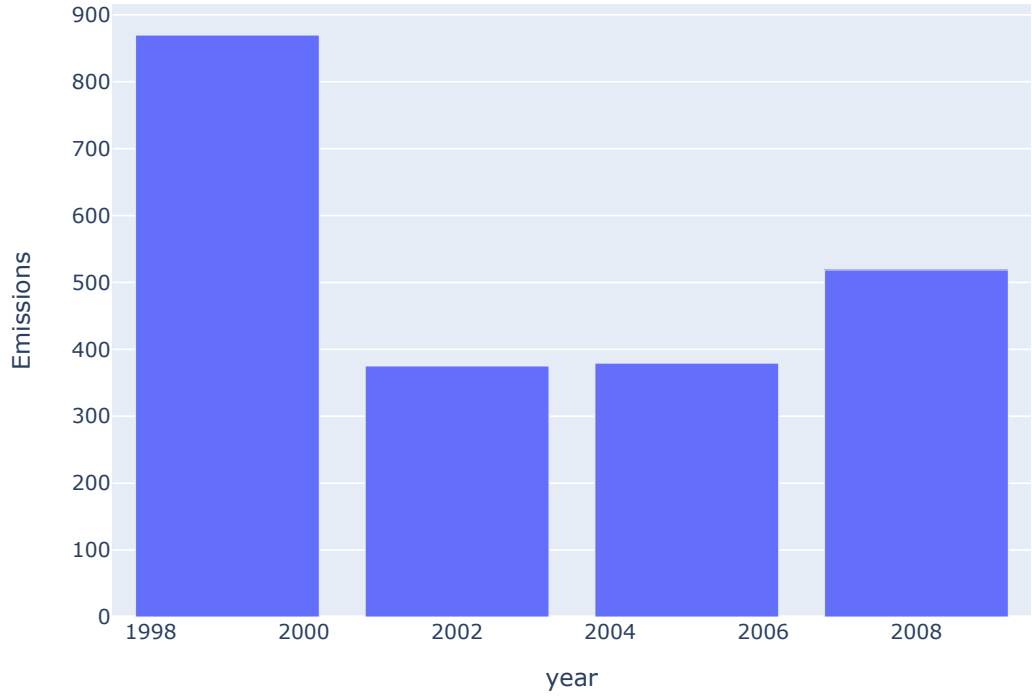
In [5]:
```
fig = px.bar(nei[nei.SCC.isin(scc[scc['EI.Sector'].fillna('').str.lower().str.conta
fig.show("svg")
```



Answer: decreased

1. How have emissions from motor vehicle sources changed from 1999–2008 in Baltimore City (EI.Sector starts from “Mobile”)?

In [6]:
```
mask =  (nei.SCC.isin(scc[scc['EI.Sector'].str.lower().str.contains('mobile')].SCC
fig = px.bar(nei[mask].groupby(['year'], as_index=False).Emissions.sum(),x='year',
fig.show("svg")
```



Answer: Increased

1. Compare emissions from motor vehicle sources in Baltimore City with emissions from motor vehicle sources in Los Angeles County, California (fips == "06037"). Which city has seen greater changes over time in motor vehicle emissions?

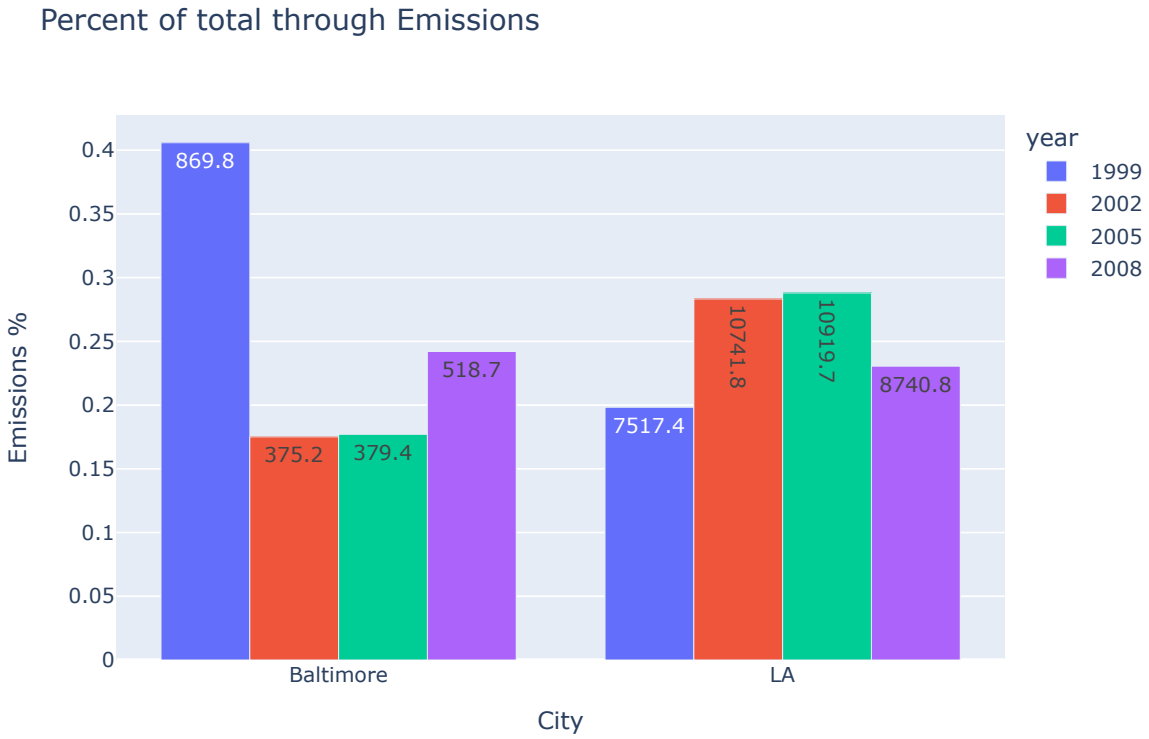
In [9]:
```
motor = (nei.SCC.isin(scc[scc['EI.Sector'].str.lower().str.contains('mobile')].SCC

t6 = nei[ (motor) & (nei.fips.isin(['24510', '06037']))]
d = {
    '24510':'Baltimore',
    '06037':'LA'
}
t6['city'] = t6.fips.apply(lambda x: d[x])

tt = ((t6.groupby(['city','year']
).Emissions.sum()/ t6.groupby(['city']
).Emissions.sum()).reset_index())

tt = tt.rename(columns={"Emissions":'Emissions %'})\
    .merge(
            t6.groupby(['city','year'], as_index=False).Emissions.sum().round(1),
        how='inner',
        on=['city','year']
)
tt.year = tt.year.astype(str)

fig = px.bar(
    tt,
    x='city', y='Emissions %',
    color='year', text='Emissions', barmode='group',
    title='Percent of total through Emissions',
    labels={'city': 'City', 'Emissions':'% of total Emissions'})
fig.show("svg")
```



Answer: Baltimore - increased; LA - decreased