In [1]:
```
import matplotlib.pyplot as plt
import seaborn as sns
import numpy as np
import pandas as pd
from pandas import DataFrame
from sklearn.preprocessing import minmax_scale
from matplotlib.colors import rgb2hex
import mapclassify
import adjustText as aT
import matplotlib as mpl
import plotly.graph_objects as go
from plotly.subplots import make_subplots
import re
import plotly.figure_factory as ff
import plotly.express as px

# incorporamos geopandas! geografía + pandas :)
import geopandas as gpd
from sklearn.preprocessing import normalize

%matplotlib inline
sns.set(context='notebook', style='white', palette='plasma')
#https://plot.ly/python/v3/table/
#https://seaborn.pydata.org/tutorial/color_palettes.html
#http://colorbrewer2.org/#type=sequential&scheme=Greens&n=3
#https://jakevdp.github.io/PythonDataScienceHandbook/04.06-customizing-legends.html
```

In [2]:
```
numeroRegion=13
numeroDivisiones=4
fontSizeTitulo=40
fontSizeEnMapa=10
colorSchema='Wistia'
Zoom=3
schemev='natural_breaks'
```

In [3]:
```
dataProsupuestoMunicipal = pd.read_excel('data/datos_municipales_Disponibilidad_Presupuesto_PerCapita.xls')
#dataProsupuestoMunicipal.head()
```

In [4]:
```
dataPobreza = pd.read_excel('data/Indice_Pobreza_Porcentaje_Casem2018.xlsx')
#dataPobreza.head()
```

In [5]:
```
zonas_eod = gpd.read_file('data/Comunas', encoding="utf-8",converters={'cod_comuna':str})
zonas_eod.head()
```

Out[5]:

	objectid	shape_leng	dis_elec	cir_sena	cod_comuna	codregion	st_area_sh	st_length_	Region	Comuna	Provincia
0	48	170038.624165	16	8	6204	6	9.685774e+08	206184.271675	Región del Libertador Bernardo O'Higgins	Marchigüe	Cardenal Caro
1	29	125730.104795	15	8	6102	6	4.157446e+08	151911.576827	Región del Libertador Bernardo O'Higgins	Codegua	Cachapoal
2	30	63026.084422	15	8	6103	6	1.448565e+08	76355.326122	Región del Libertador Bernardo O'Higgins	Coinco	Cachapoal
3	31	89840.903562	15	8	6104	6	3.256572e+08	108874.623150	Región del Libertador Bernardo O'Higgins	Coltauco	Cachapoal
4	78	122626.493264	23	11	9121	9	6.990727e+08	156680.410681	Región de La Araucanía	Cholchol	Cautín

In [6]:
```
zonas_eod = zonas_eod[zonas_eod.cod_comuna != 5104]
zonas_eod = zonas_eod[zonas_eod.cod_comuna != 5201]
```

In [7]:
```
dataset = pd.merge(zonas_eod, dataPobreza, left_on='cod_comuna',right_on='CODIGO',how='inner')
dataset = pd.merge(dataset, dataProsupuestoMunicipal, left_on='cod_comuna',right_on='CODIGO',how='inner')
dataset.head()
```

Out[7]:

	objectid	shape_leng	dis_elec	cir_sena	cod_comuna	codregion	st_area_sh	st_length_	Region	Comuna	Provincia
0	48	170038.624165	16	8	6204	6	9.685774e+08	206184.271675	Región del Libertador Bernardo O'Higgins	Marchigüe	Cardenal Caro
1	29	125730.104795	15	8	6102	6	4.157446e+08	151911.576827	Región del Libertador Bernardo O'Higgins	Codegua	Cachapoal
2	30	63026.084422	15	8	6103	6	1.448565e+08	76355.326122	Región del Libertador Bernardo O'Higgins	Coinco	Cachapoal
3	31	89840.903562	15	8	6104	6	3.256572e+08	108874.623150	Región del Libertador Bernardo O'Higgins	Coltauco	Cachapoal
4	78	122626.493264	23	11	9121	9	6.990727e+08	156680.410681	Región de La Araucanía	Cholchol	Cautín

In [8]:
```
codigoRegion=13
datasetRegion=dataset[dataset['codregion']==numeroRegion]
#########
#datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'CALERA DE TANGO']
#datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'COLINA']
#datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'LAMPA']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'PIRQUE']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'CURACAVÍ']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'MARÍA PINTO']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'EL MONTE']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'TALAGANTE']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'ISLA DE MAIPO']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'PAINE']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'TILTIL']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'BUIN']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'SAN JOSÉ DE MAIPO']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'MELIPILLA']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'SAN PEDRO']
datasetRegion = datasetRegion[datasetRegion.MUNICIPIO_x != 'ALHUÉ']
############

datasetRegion=datasetRegion.reset_index()
datasetRegion['Indice'] = datasetRegion.index
#datasetRegion.head()
```

In [9]:
```
datasetRegion["center"] = datasetRegion["geometry"].centroid
datasetRegion_points = datasetRegion.copy()
datasetRegion_points.set_geometry("center", inplace = True)
```

In [10]:
```
datasetRegion.describe()
```

Out[10]:

	index	objectid	shape_leng	dis_elec	cir_sena	cod_comuna	codregion	st_area_sh	st_length_	CODIG
count	39.000000	39.000000	39.000000	39.000000	39.0	39.000000	39.0	3.900000e+01	39.000000	39.000
mean	132.641026	776.384615	36977.124416	10.589744	7.0	13167.820513	13.0	1.441608e+08	44560.435019	13167.820
std	49.757563	2872.995050	36655.028415	2.035448	0.0	127.208050	0.0	3.232383e+08	43922.543865	127.208
min	26.000000	288.000000	10795.433316	8.000000	7.0	13101.000000	13.0	9.056280e+06	12827.159439	13101.000
25%	108.500000	308.500000	13994.375779	9.000000	7.0	13110.500000	13.0	1.595480e+07	17545.506898	13110.500
50%	136.000000	318.000000	23724.899355	10.000000	7.0	13120.000000	13.0	3.337678e+07	28343.661508	13120.000
75%	164.500000	327.500000	46906.835635	12.500000	7.0	13129.500000	13.0	1.040717e+08	56445.848084	13129.500
max	227.000000	18258.000000	172581.447530	14.000000	7.0	13605.000000	13.0	1.469677e+09	206660.187466	13605.000

In [11]:
```
datasetRegion.head()
```

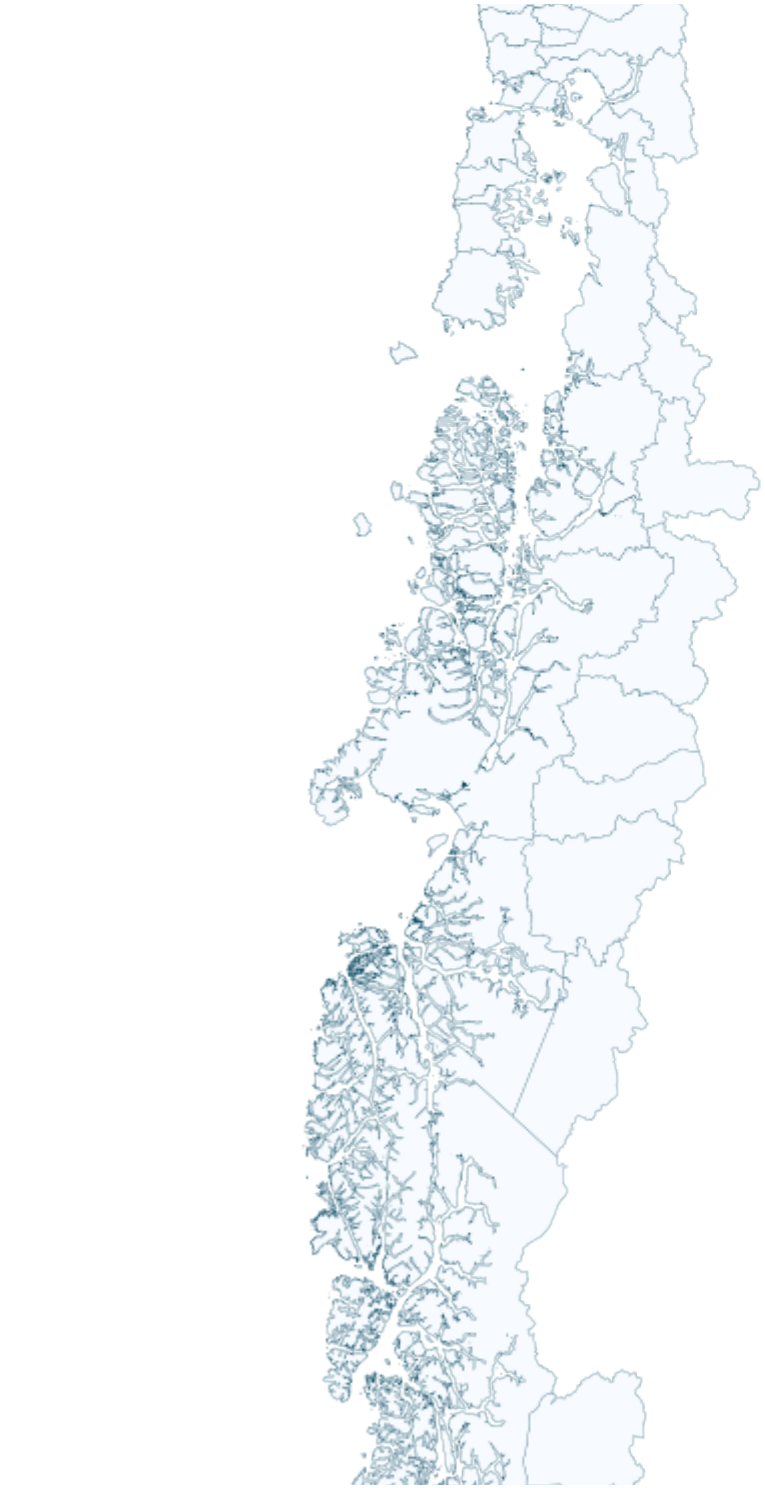
Out[11]:

	index	objectid	shape_leng	dis_elec	cir_sena	cod_comuna	codregion	st_area_sh	st_length_	Region	...	Provincia
0	26	330	13987.326781	10	7	13129	13	1.424341e+07	16812.167615	Región Metropolitana de Santiago	...	Santiago
1	36	331	13311.641304	13	7	13130	13	1.389538e+07	15988.816037	Región Metropolitana de Santiago	...	Santiago
2	47	332	11733.486710	13	7	13131	13	9.056280e+06	14061.528858	Región Metropolitana de Santiago	...	Santiago
3	56	309	11488.695747	9	7	13108	13	1.068637e+07	14088.417488	Región Metropolitana de Santiago	...	Santiago
4	60	310	12797.595762	13	7	13109	13	1.454185e+07	15442.412755	Región Metropolitana de Santiago	...	Santiago

5 rows × 21 columns

Pobreza

In [12]:
```
dataset['Seleccion']=0
dataset.loc[dataset['codregion'] == numeroRegion,'Seleccion'] = 1

ax = dataset.plot(figsize=(20, 50), column='Seleccion', cmap='Blues',
                          legend=False, linewidth=0.2, edgecolor='#125069', scheme=schemev,
                          k=2)
##########################################
#plt.title('Chile', fontsize=fontSizeTitulo)
ax.set_axis_off()
```



In [13]:
```
len(datasetRegion)
```

Out[13]: 39

In [14]:
```
datasetRegion['IndiceNombre']=datasetRegion['Indice'].map(str) +':'+ datasetRegion['Comuna']
datasetRegion['NombreIndice']=datasetRegion['Comuna']+':'+ datasetRegion['Indice'].map(str)

fig = go.Figure(data=[go.Table(
    header=dict(values=list(datasetRegion[['Comuna']].columns),
                fill_color='lightskyblue',
                line_color='#87CEEB',
                align='left'),
    cells=dict(values=[datasetRegion.IndiceNombre],
               fill_color='white',
                line_color='#87CEEB',
               align='left'))
])

fig.update_layout(width=320, height= (26 * len(datasetRegion) ), font=dict(
        family="Courier New, monospace",
        size=14,
        color="black"
    )     )
fig.show()
```

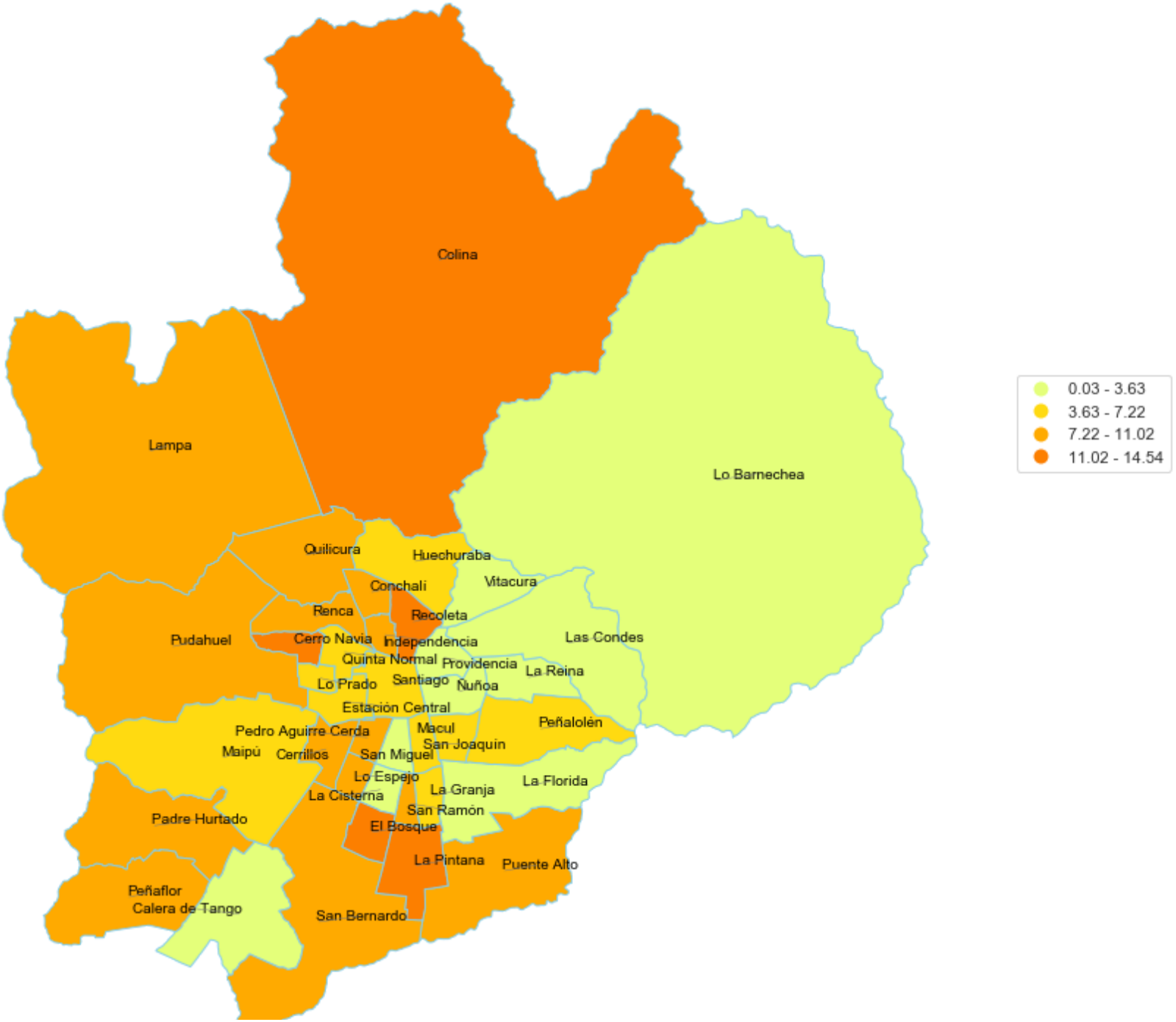
Comuna
0:San Joaquín
1:San Miguel
2:San Ramón
3:Independencia
4:La Cisterna
5:Peñalolén
6:Providencia
7:La Reina
8:Calera de Tango
9:Colina
10:Santiago
11:Lampa
12:Puente Alto
13:Huechuraba
14:San Bernardo
15:Cerrillos
16:Cerro Navia
17:Vitacura
18:Conchalí
19:El Bosque
20:Estación Central
21:La Florida
22:La Granja
23:La Pintana
24:Las Condes
25:Lo Barnechea
26:Lo Espejo

```
27:Lo Prado
28:Macul
29:Maipú
30:Ñuñoa
31:Pedro Aguirre Cerda
32:Pudahuel
33:Quilicura
34:Quinta Normal
35:Recoleta
```

In [15]:
```
ax = datasetRegion.plot(figsize=(15, 15), column='Indice_Pobreza_Porcentaje_Casem2018', cmap=colorSchema,
                        legend=True, linewidth=1, edgecolor='#87CEEB', scheme=schemev,
                        k=numeroDivisiones)
##########################################
#plt.title('Porcentaje de Pobreza', fontsize=fontSizeTitulo)
leg = ax.get_legend()
leg.set_bbox_to_anchor((1., 0.45, 0.2, 0.2))

#'box_plot', 'equal_interval', 'fisher_jenks', 'fisher_jenks_sampled', 'headtail_breaks',
# 'jenks_caspall', 'jenks_caspall_forced', 'jenks_caspall_sampled', 'max_p_classifier',
# 'maximum_breaks', 'natural_breaks', 'quantiles', 'percentiles', 'std_mean', 'user_defined'


#Accent, Accent_r, Blues, Blues_r, BrBG, BrBG_r, BuGn, BuGn_r, BuPu, BuPu_r, CMRmap,
#CMRmap_r, Dark2, Dark2_r, GnBu, GnBu_r, Greens, Greens_r, Greys, Greys_r, OrRd, OrRd_r,
#Oranges, Oranges_r, PRGn, PRGn_r, Paired, Paired_r, Pastel1, Pastel1_r, Pastel2, Pastel2_r,
#PiYG, PiYG_r, PuBu, PuBuGn, PuBuGn_r, PuBu_r, PuOr, PuOr_r, PuRd, PuRd_r, Purples, Purples_r,
#RdBu, RdBu_r, RdGy, RdGy_r, RdPu, RdPu_r, RdYlBu, RdYlBu_r, RdYlGn, RdYlGn_r, Reds, Reds_r, Set1,
#Set1_r, Set2, Set2_r, Set3, Set3_r, Spectral, Spectral_r, Wistia, Wistia_r, YlGn, YlGnBu, YlGnBu_r, YlGn_r,
#YlOrBr, YlOrBr_r, YlOrRd, YlOrRd_r, afmhot, afmhot_r, autumn, autumn_r, binary, binary_r, bone, bone_r,
#brg, brg_r, bwr, bwr_r, cividis, cividis_r, cool, cool_r, coolwarm, coolwarm_r, copper, copper_r, cubehelix,
#cubehelix_r, flag, flag_r, gist_earth, gist_earth_r, gist_gray, gist_gray_r, gist_heat, gist_heat_r, gist_nc
ar,
#gist_ncar_r, gist_rainbow, gist_rainbow_r, gist_stern, gist_stern_r, gist_yarg, gist_yarg_r, gnuplot, gnuplo
t2,
#gnuplot2_r, gnuplot_r, gray, gray_r, hot, hot_r, hsv, hsv_r, icefire, icefire_r, inferno, inferno_r, jet, je
t_r,
#magma, magma_r, mako, mako_r, nipy_spectral, nipy_spectral_r, ocean, ocean_r, pink, pink_r, plasma, plasma_
r,
#prism, prism_r, rainbow, rainbow_r, rocket, rocket_r, seismic, seismic_r, spring, spring_r, summer, summer_
r,
#tab10, tab10_r, tab20, tab20_r, tab20b, tab20b_r, tab20c, tab20c_r, terrain, terrain_r, twilight,
#twilight_r, twilight_shifted, twilight_shifted_r, viridis, viridis_r, vlag, vlag_r, winter, winter_r


##########################################
#ylim = (-3970000,-3920000) # latitude
#xlim = (-7880000,-7830000) # longitude

#ax.set_xlim(xlim)
#ax.set_ylim(ylim)
```

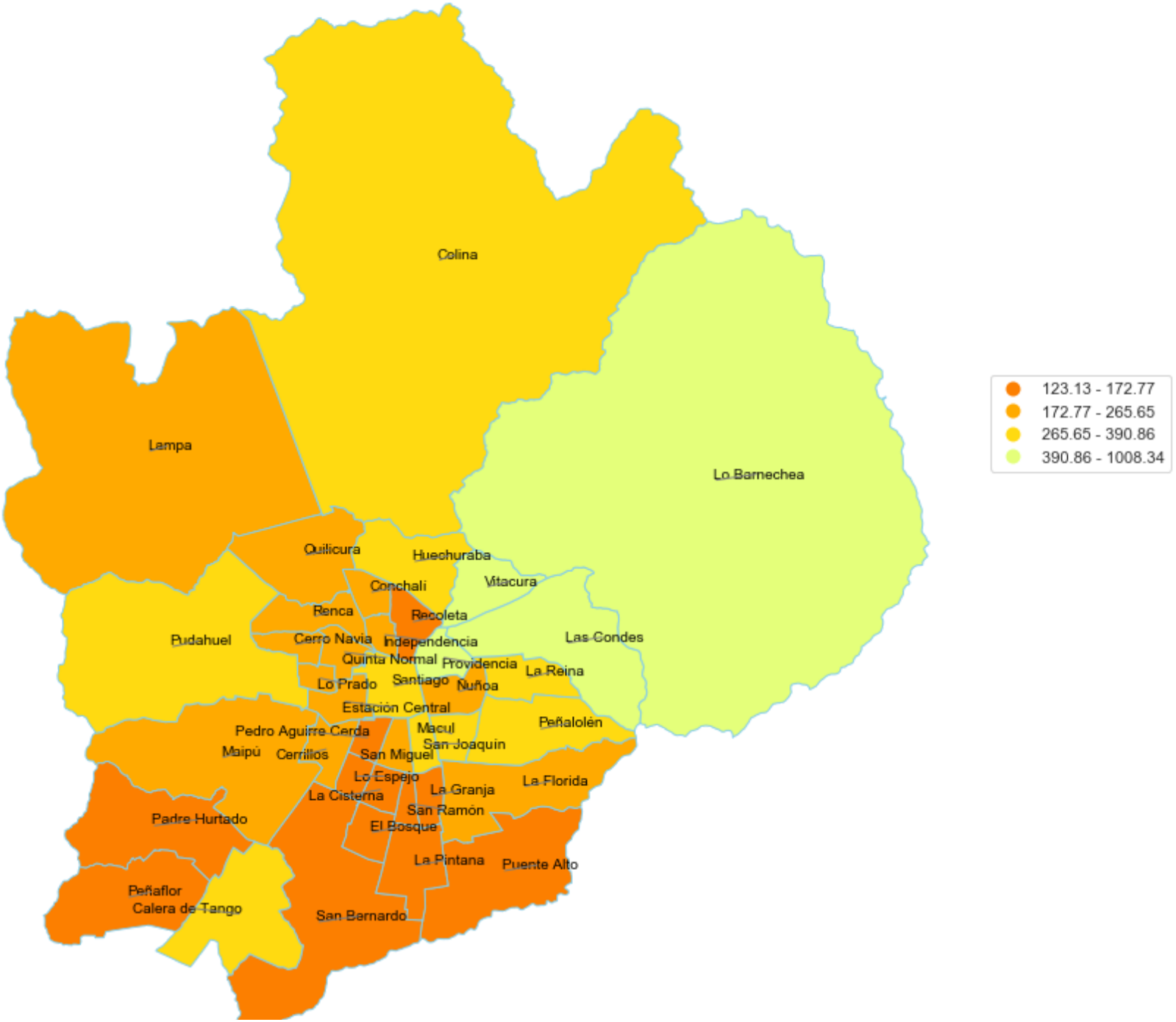
```
ax.set_axis_off()

texts = []
for x, y, label in zip(datasetRegion_points.geometry.x, datasetRegion_points.geometry.y,
                       datasetRegion_points["Comuna"]):texts.append(plt.text(x, y, label, fontsize = fontSize
EnMapa,
                                                                             color='black'))
##########################################
aT.adjust_text(texts, force_points=0.3, force_text=0.5, expand_points=(0,1), expand_text=(0,0), arrowprops=di
ct(arrowstyle="-", color='grey', lw=0.5))
#aT.adjust_text(texts, force_points=0.3, force_text=0.5, expand_points=(0,1), expand_text=(0,0))
```

Out[15]: 1

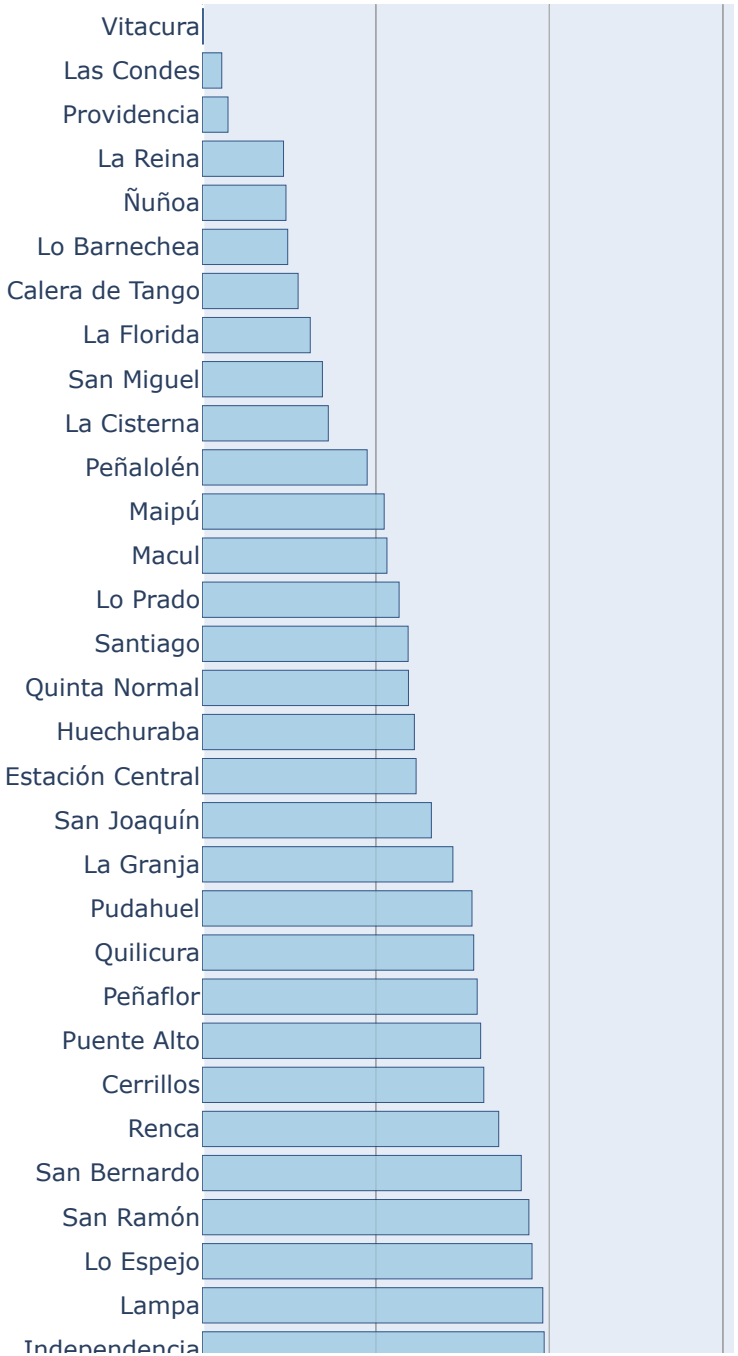

Colina
Lampa
Lo Barnechea
Quilicura
Huechuraba
Conchali
Vitacura
Renca
Recoleta
Pudahuel
Cerro Navia
Independencia
Las Condes
Quinta Normal
Providencia
La Reina
Lo Prado
Santiago
Ñuñoa
Estación Central
Peñalolén
Pedro Aguirre Cerda
Macul
San Joaquín
Maipú
Cerrillos
San Miguel
Lo Espejo
La Florida
La Cisterna
La Granja
San Ramón
Padre Hurtado
El Bosque
La Pintana
Puente Alto
Peñaflor
Calera de Tango
San Bernardo
0.03 - 3.63
3.63 - 7.22
7.22 - 11.02
11.02 - 14.54

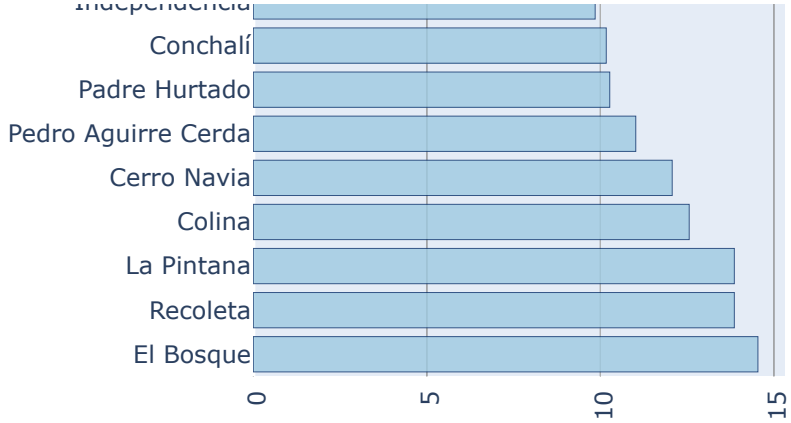
In [16]:
```
ax = datasetRegion.plot(figsize=(15, 15), column='IADM10 (TAS) Disponibilidad Presupuestaria Municipal por Habitante (M$)_2018',
                        cmap=(colorSchema+'_r'),
                         legend=True, linewidth=1, edgecolor='#87CEEB', scheme=schemev,
                         k=numeroDivisiones)
##########################################
#plt.title('Presupuesto por Habitante', fontsize=fontSizeTitulo)
leg = ax.get_legend()
leg.set_bbox_to_anchor((1., 0.45, 0.2, 0.2))
##########################################
#ylim = (-3970000,-3920000) # latitude
#xlim = (-7880000,-7830000) # longitude

#ax.set_xlim(xlim)
#ax.set_ylim(ylim)

ax.set_axis_off()

texts = []
for x, y, label in zip(datasetRegion_points.geometry.x, datasetRegion_points.geometry.y,
                       datasetRegion_points["Comuna"]):texts.append(plt.text(x, y, label, fontsize = fontSizeEnMapa,
                                                                             color='black'))
##########################################
aT.adjust_text(texts, force_points=0.3, force_text=0.5, expand_points=(0,1), expand_text=(0,0), arrowprops=dict(arrowstyle="-", color='grey', lw=1))
#aT.adjust_text(texts, force_points=0.3, force_text=0.5, expand_points=(0,1), expand_text=(0,0))
```

Out[16]: 1

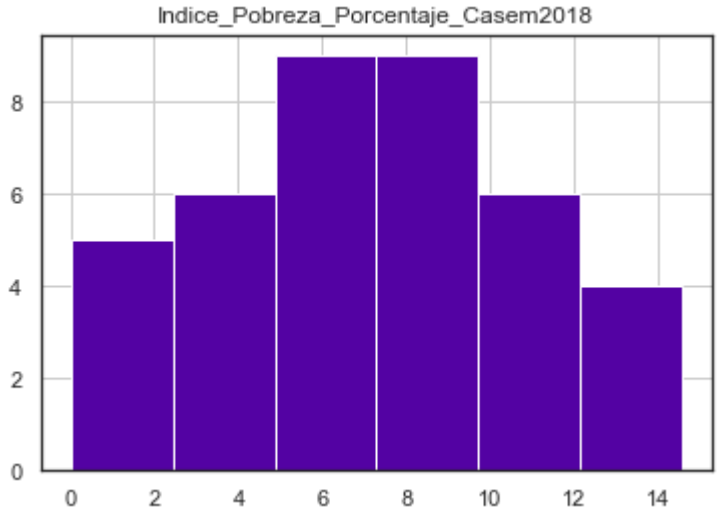

Colina
Lampa
Lo Barnechea
Quilicura
Huechuraba
Conchali
Vitacura
Renca
Recoleta
Pudahuel
Cerro Navia
Independencia
Las Condes
Quinta Normal
Providencia
La Reina
Lo Prado
Santiago
Ñuñoa
Estación Central
Peñalolén
Pedro Aguirre Cerda
Macul
San Joaquín
Maipú
Cerrillos
San Miguel
Lo Espejo
La Florida
La Cisterna
La Granja
San Ramón
Padre Hurtado
El Bosque
La Pintana
Puente Alto
Peñaflor
Calera de Tango
San Bernardo
123.13 - 172.77
172.77 - 265.65
265.65 - 390.86
390.86 - 1008.34

In [17]:
```
chartdf = datasetRegion[['Comuna','Indice_Pobreza_Porcentaje_Casem2018']]

chartdf=chartdf.sort_values(by='Indice_Pobreza_Porcentaje_Casem2018', ascending=False)

fig = px.bar(chartdf, y='Comuna', x='Indice_Pobreza_Porcentaje_Casem2018',orientation='h',
             hover_data=['Indice_Pobreza_Porcentaje_Casem2018','Comuna'],
             labels={'Indice_Pobreza_Porcentaje_Casem2018':'','Comuna':''},
             height=1000,width=500)
fig.update_layout( xaxis_tickangle=-90)
fig.update_traces(marker_color='rgb(158,202,225)', marker_line_color='rgb(8,48,107)',
                  marker_line_width=0.5, opacity=0.8)
fig.show()
```

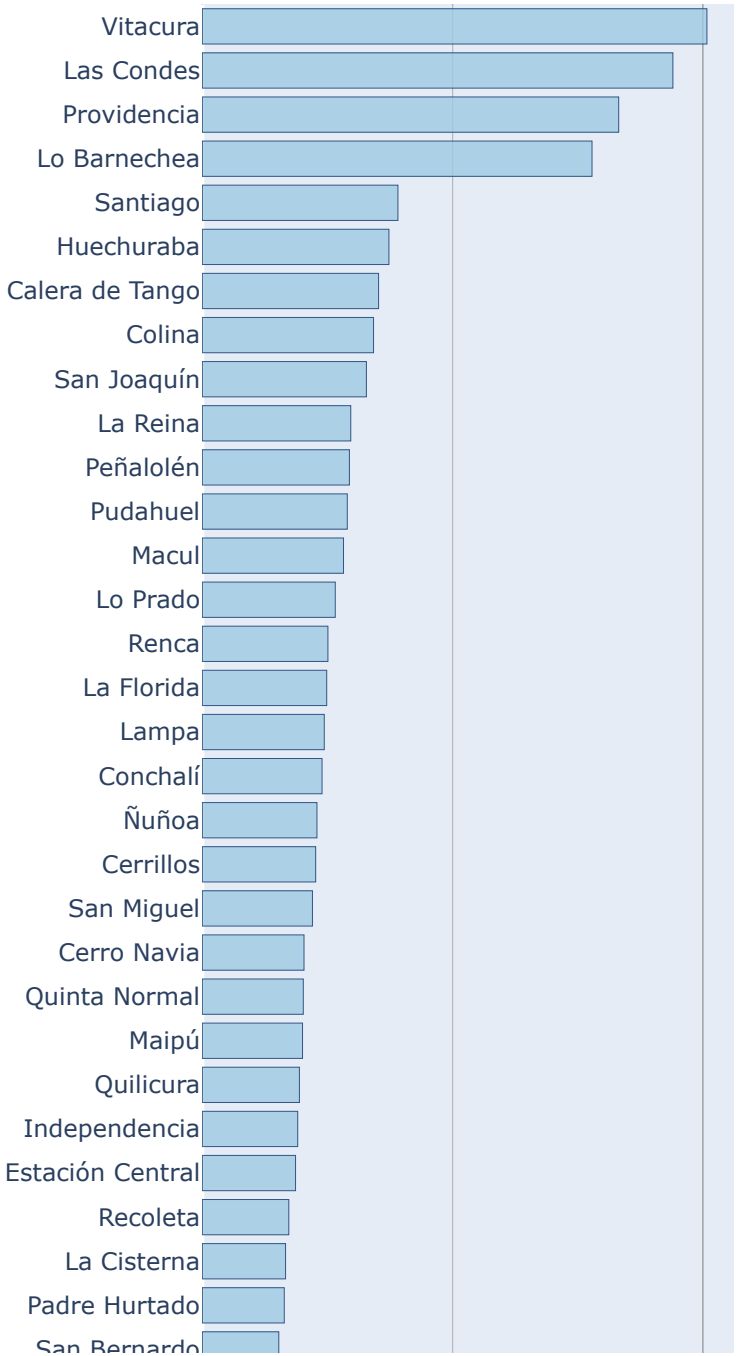

Vitacura
Las Condes
Providencia
La Reina
Ñuñoa
Lo Barnechea
Calera de Tango
La Florida
San Miguel
La Cisterna
Peñalolén
Maipú
Macul
Lo Prado
Santiago
Quinta Normal
Huechuraba
Estación Central
San Joaquín
La Granja
Pudahuel
Quilicura
Peñaflor
Puente Alto
Cerrillos
Renca
San Bernardo
San Ramón
Lo Espejo
Lampa
Independencia

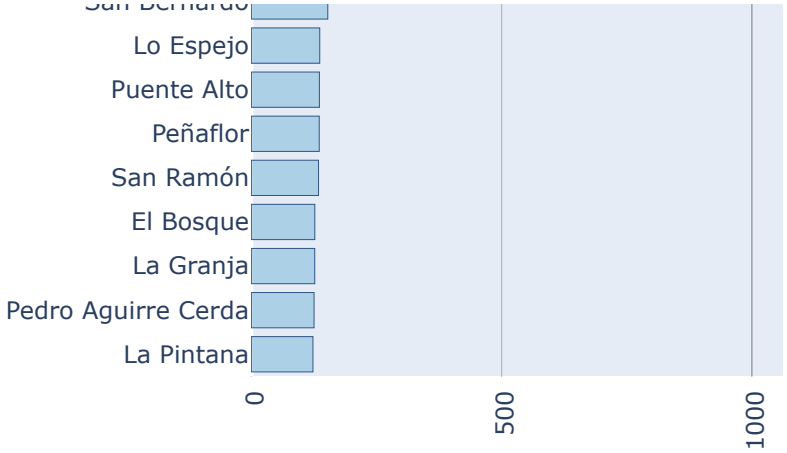


In [18]:
```
hist = chartdf.hist(bins=6)
```

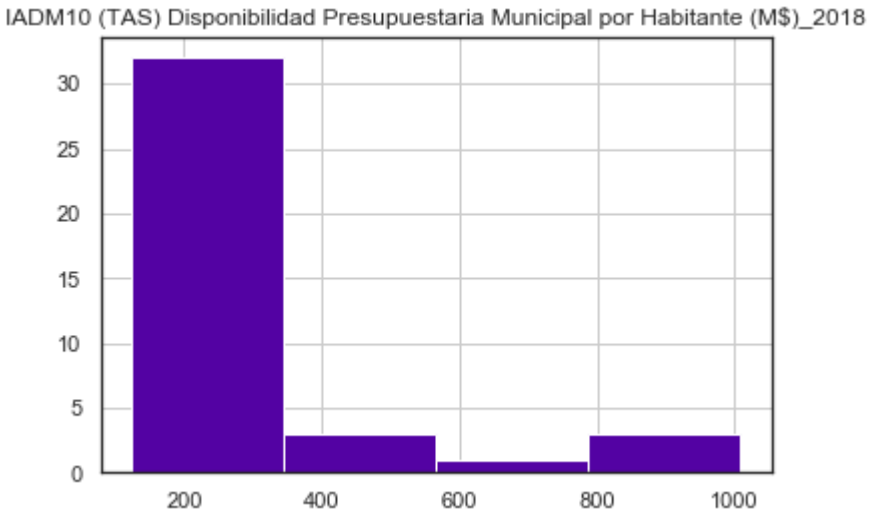


In [19]:
```
chartdf = datasetRegion[['Comuna','IADM10 (TAS) Disponibilidad Presupuestaria Municipal por Habitante (M$)_20
18']]

chartdf=chartdf.sort_values(by='IADM10 (TAS) Disponibilidad Presupuestaria Municipal por Habitante (M$)_2018'
, ascending=True)

fig = px.bar(chartdf, y='Comuna', x='IADM10 (TAS) Disponibilidad Presupuestaria Municipal por Habitante (M$)_
2018',orientation='h',
             hover_data=['IADM10 (TAS) Disponibilidad Presupuestaria Municipal por Habitante (M$)_2018','Comu
na'],
             labels={'IADM10 (TAS) Disponibilidad Presupuestaria Municipal por Habitante (M$)_2018':'','Comun
a':''},
             height=1000,width=500)
fig.update_layout( xaxis_tickangle=-90)
fig.update_traces(marker_color='rgb(158,202,225)', marker_line_color='rgb(8,48,107)',
                  marker_line_width=0.5, opacity=0.8)
fig.show()
```


Vitacura
Las Condes
Providencia
Lo Barnechea
Santiago
Huechuraba
Calera de Tango
Colina
San Joaquín
La Reina
Peñalolén
Pudahuel
Macul
Lo Prado
Renca
La Florida
Lampa
Conchalí
Ñuñoa
Cerrillos
San Miguel
Cerro Navia
Quinta Normal
Maipú
Quilicura
Independencia
Estación Central
Recoleta
La Cisterna
Padre Hurtado
San Bernardo

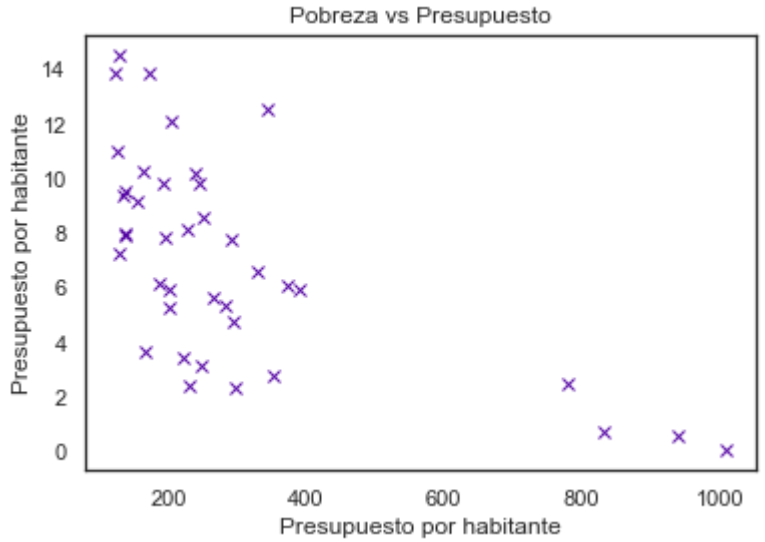


In [20]:
```
hist = chartdf.hist(bins=4)
```



In [42]:
```
plt.plot( 'IADM10 (TAS) Disponibilidad Presupuestaria Municipal por Habitante (M$)_2018',
        'Indice_Pobreza_Porcentaje_Casem2018', data=datasetRegion, linestyle='none', marker='x')

plt.xlabel('Presupuesto por habitante')
plt.ylabel('Presupuesto por habitante')
plt.title('Pobreza vs Presupuesto')
plt.figure(figsize=(10,10))
```

Out[42]: <Figure size 720x720 with 0 Axes>



<Figure size 720x720 with 0 Axes>