In [1]:
```
import pandas as pd
from scipy import stats
import numpy as np
```

In [2]:
```
df = pd.read_csv('Data2.csv', on_bad_lines='skip', encoding='cp1252', delimiter=';')
df
```

Out[2]:

	Country Name	Region	GDP per capita	Populatiion	CO2 emission	Area
0	Afghanistan	South Asia	561,7787463	34656032.0	9809,225	652860
1	Albania	Europe & Central Asia	4124,98239	2876101.0	5716,853	28750
2	Algeria	Middle East & North Africa	3916,881571	40606052.0	145400,217	2381740
3	American Samoa	East Asia & Pacific	11834,74523	55599.0	NaN	200
4	Andorra	Europe & Central Asia	36988,62203	77281.0	462,042	470
...	...	...	...	...	...	...
212	Virgin Islands (U.S.)	Latin America & Caribbean	NaN	102951.0	NaN	350
213	West Bank and Gaza	Middle East & North Africa	2943,404534	4551566.0	NaN	6020
214	Yemen, Rep.	Middle East & North Africa	990,334774	27584213.0	22698,73	527970
215	Zambia	Sub-Saharan Africa	1269,573537	16591390.0	4503,076	752610
216	Zimbabwe	Sub-Saharan Africa	1029,076649	16150362.0	12020,426	390760

217 rows × 6 columns

In [3]:
```
df.columns = ['country_name', 'region', 'gdp_per_capita', 'population', 'co2_emission', 'area']
df.set_index('country_name', inplace=True)
df.gdp_per_capita = df.gdp_per_capita.astype(str).str.replace(',', '.').astype(float)
df.co2_emission = df.co2_emission.astype(str).str.replace(',', '.').astype(float)
df.area = df.area.astype(str).str.replace(',', '.').astype(float)
df.gdp_per_capita = df.gdp_per_capita.abs()
df.area = df.area.abs()
df.gdp_per_capita.fillna(df.gdp_per_capita.mean(), inplace=True)
df.population.fillna(df.population.mean(), inplace=True)
df.co2_emission.fillna(df.co2_emission.mean(), inplace=True)
df.population = df.population.astype(int)
df
```

Out[3]:

country_name	region	gdp_per_capita	population	co2_emission	area
Afghanistan	South Asia	561.778746	34656032	9809.225000	652860.0
Albania	Europe & Central Asia	4124.982390	2876101	5716.853000	28750.0
Algeria	Middle East & North Africa	3916.881571	40606052	145400.217000	2381740.0
American Samoa	East Asia & Pacific	11834.745230	55599	165114.116337	200.0
Andorra	Europe & Central Asia	36988.622030	77281	462.042000	470.0
...	...	...	...	...	...
Virgin Islands (U.S.)	Latin America & Caribbean	13445.593416	102951	165114.116337	350.0
West Bank and Gaza	Middle East & North Africa	2943.404534	4551566	165114.116337	6020.0
Yemen, Rep.	Middle East & North Africa	990.334774	27584213	22698.730000	527970.0
Zambia	Sub-Saharan Africa	1269.573537	16591390	4503.076000	752610.0
Zimbabwe	Sub-Saharan Africa	1029.076649	16150362	12020.426000	390760.0

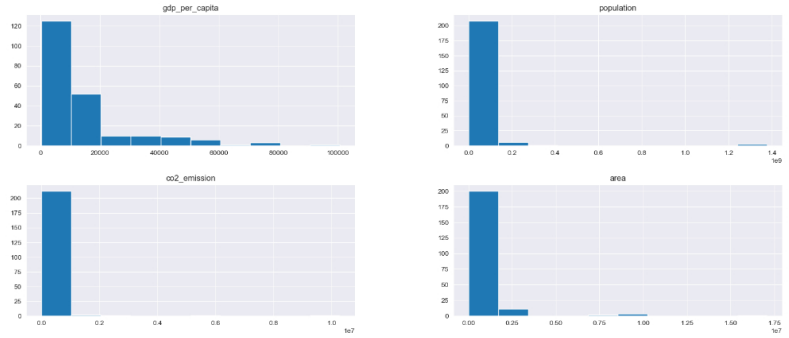
217 rows × 5 columns

In [4]:
```
def test_normality(column: pd.Series, alpha=0.05):
    _, p = stats.normaltest(column)
    return alpha < p
```

In [5]:
```
df[['gdp_per_capita', 'population', 'co2_emission', 'area']].apply(test_normality)
```

Out[5]:
```
gdp_per_capita    False
population        False
co2_emission      False
area              False
dtype: bool
```

In [6]:
```
df[['gdp_per_capita', 'population', 'co2_emission', 'area']].hist(figsize=(20, 8));
```



In [7]:
```
def ttest(column: pd.Series, alpha=0.05):
    stat, pvalue = stats.ttest_1samp(column, column.median())
    return alpha < pvalue
```

In [8]:
```
df[['gdp_per_capita', 'population', 'co2_emission', 'area']].apply(ttest)
```

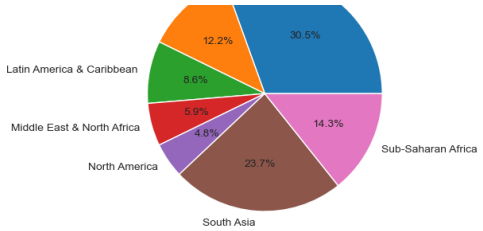
Out[8]:
```
gdp_per_capita    False
population        False
co2_emission      False
area              False
dtype: bool
```

In [9]:
```
def normality_difference(group: pd.Series):
    anderson_result = stats.anderson(group)
    differences = anderson_result.statistic - anderson_result.critical_values[2]
    differences = np.abs(differences)
    return differences.min()
```

In [10]:
```
region_group = df.groupby('region').co2_emission.aggregate(normality_difference)
region_group[[region_group.idxmin()]]
```

Out[10]:
```
region
South Asia    1.375605
Name: co2_emission, dtype: float64
```

In [11]:
```
df.groupby('region').population.sum().plot.pie(ylabel='', autopct='%1.1f%%');
```


30.5%
12.2%
Latin America & Caribbean
8.6%
5.9%
Middle East & North Africa
4.8%
14.3%
Sub-Saharan Africa
North America
23.7%
South Asia