2024 Lok Sabha Election Ad Expenditure and Voting Trends by Mohammed Sohail Mirza

Indepth analysis of impact and distribution of social media ad spending on voter turnout and electoral outcomes in India, with a focus on state-wise and alliance-specific expenditures.

The aim encompasses several key objectives:

1. **Analyzing the distribution of election social ad spending across different states.**
2. **Calculating the average voter turnout percentage for each state and highlighting the top 50 constituencies with the highest voting percentages and the bottom 50 constituencies with the lowest voting percentages..**
3. **Identifying and comparing the top parties by their ad spending and examining net ad spending in the top 5 states governed by the NDA alliance and the top 5 states governed by the INDIA alliance.****
4. **Comparing overall ad expenditures at the national level and by political alliances and studying the distribution of ad spending in entire india and the top allainces.**
5. **Tracking ad spending and voter turnout across different election phases.**

These objectives will help in understanding the correlation between ad spending and voter behavior, as well as identifying patterns and trends in political advertising and voter engagement.

Importing Basic Libraries

Libraries in data analysis provide pre-written code for efficient tasks, enhancing productivity, consistency, and performance, while enabling effective visualization and collaboration among analysts for better insights and decision-making.

1. **`pandas`** : `pandas` is a powerful Python library for data manipulation and analysis. It provides data structures like Series (one-dimensional) and DataFrame (two-dimensional) that are used to store and manipulate tabular data. `pandas` is widely used for data cleaning, preparation, and exploration.
2. **`numpy`** : `numpy` is a fundamental library for numerical computing in Python. It provides support for arrays and matrices, along with a collection of mathematical functions to operate on these data structures. `numpy` is essential for performing efficient numerical computations and handling large datasets.
3. **`matplotlib`** : `matplotlib` is a comprehensive library for creating static, animated, and interactive visualizations in Python. It is particularly known for its 2D plotting capabilities. `pyplot` , a module in `matplotlib` , provides a MATLAB-like interface for creating plots and graphs.
4. **`seaborn`** : `seaborn` is a data visualization library based on `matplotlib` that provides a high-level interface for drawing attractive and informative statistical graphics. It simplifies the process of creating complex visualizations and works seamlessly with `pandas` DataFrames.
5. **`plotly`** : `plotly` is an interactive graphing library that enables the creation of interactive plots, charts, and dashboards. `plotly.express` is a high-level interface for creating quick and easy visualizations, while `plotly.graph_objects` provides more control and customization over the plots.

In [1]:
```
pip install -U kaleido
```

```
Requirement already satisfied: kaleido in /opt/anaconda3/lib/python3.11/site-packages (0.2.1)
Note: you may need to restart the kernel to use updated packages.
```

In [2]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline

import plotly.express as px
import plotly.io as pio
pio.templates.default = "plotly_white"
import plotly.graph_objects as go
```

Dataset Definition:

1. **Result Data**:
   - **Columns**:
     - `_id` : Unique identifier for each record.
     - `Sl No` : Serial number.
     - `State` : Contains the names of the states and union territory where elections took place.
     - `PC_Name` : Contains the names of the constituencies.
     - `Total Electors` : Total number of eligible voters in each constituency.
     - `Polled (%)` : Percentage of voters who cast their vote.
     - `Total Votes` : Total number of votes cast in each constituency.
     - `Phase` : Information about the phase in which the election occurred.
2. **Location Data**:
   - **Columns**:
     - `Location name` : Contains the names of the states and union Ttrritory.
     - `Amount Spent (INR)` : Net amount of money spent on social ads in each state, measured in Indian Rupees (INR).
3. **Advertise Data**:
   - **Columns**:
     - `Page ID` : Unique identifier for each advertising page.
     - `Page name` : Name of the advertising page.
     - `Disclaimer` : Disclaimer associated with the ads, often providing information about who paid for the ad.
     - `Amount spent (INR)` : Total amount of money spent on ads by the page, measured in Indian Rupees (INR).
     - `Number of ads in Library` : Total number of ads associated with the page available in the ad library.

Dataset Link - https://drive.google.com/drive/folders/1myJT4alegcmST8GpHZWfyFJj1Ie_pY-i?usp=sharing

Lets Analyze!!

In [3]:
```
#read the result dataset
result = pd.read_csv('results.csv')
result.head()
```

Out[3]:

	_id	Sl No	State	PC_Name	Total Electors	Polled (%)	Total Votes	Phase
0	1	1.0	Andaman & Nicobar Islands	Andaman & Nicobar Islands	315148	64.10	202018	1.0
1	2	2.0	Arunachal Pradesh	Arunachal East	375310	83.31	312658	1.0
2	3	3.0	Arunachal Pradesh	Arunachal West	517384	73.60	380783	1.0
3	4	4.0	Assam	Dibrugarh	1659588	76.75	1273744	1.0
4	5	5.0	Assam	Jorhat	1727121	79.89	1379749	1.0

In [4]:
```
result.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 550 entries, 0 to 549
Data columns (total 8 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   _id             550 non-null    int64  
 1   Sl No           543 non-null    float64
 2   State           543 non-null    object 
 3   PC_Name         550 non-null    object 
 4   Total Electors  550 non-null    int64  
 5   Polled (%)      550 non-null    float64
 6   Total Votes     550 non-null    int64  
 7   Phase           492 non-null    float64
dtypes: float64(3), int64(3), object(2)
memory usage: 34.5+ KB
```

Since each phase's total information was included in the preceding rows of subsequent phases in the dataset, we deleted these entries to prevent unwanted consequences.

In [5]:
```
result = result.drop(result[result['PC_Name'] == 'Phase 1 Total'].index)
```

In [6]:
```
result = result.drop(result[result['PC_Name'] == 'Phase 2 Total'].index)
```

In [7]:
```
result = result.drop(result[result['PC_Name'] == 'Phase 3 Total'].index)
```

In [8]:
```
result = result.drop(result[result['PC_Name'] == 'Phase 4 Total'].index)
```

In [9]:
```
result = result.drop(result[result['PC_Name'] == 'Phase 5 Total'].index)
```

In [10]:
```
result = result.drop(result[result['PC_Name'] == 'Phase 6 Total'].index)
```

In [11]:
```
result = result.drop(result[result['PC_Name'] == 'Phase 7 Total'].index)
```

Since Phase 7(i.e.,the last phase) was filled with NaN values in Phase Column, we filled the Phase column with 7 to correct this.

In [12]:
```
result['Phase'] = result['Phase'].fillna(7)
```

In [13]:
```
result.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 543 entries, 0 to 548
Data columns (total 8 columns):
 #   Column          Non-Null Count  Dtype  
---  ------          --------------  -----  
 0   _id             543 non-null    int64  
 1   Sl No           543 non-null    float64
 2   State           543 non-null    object 
 3   PC_Name         543 non-null    object 
 4   Total Electors  543 non-null    int64  
 5   Polled (%)      543 non-null    float64
 6   Total Votes     543 non-null    int64  
 7   Phase           543 non-null    float64
dtypes: float64(3), int64(3), object(2)
memory usage: 38.2+ KB
```

In [14]:
```
#read the location dataset
location = pd.read_csv('locations.csv')
location.head()
```

Out[14]:

	Location name	Amount spent (INR)
0	Andaman and Nicobar Islands	377858
1	Andhra Pradesh	100819732
2	Arunachal Pradesh	1385654
3	Assam	17478091
4	Bihar	53619242

In [15]:
```
location.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 36 entries, 0 to 35
Data columns (total 2 columns):
 #   Column              Non-Null Count  Dtype 
---  ------              --------------  ----- 
 0   Location name       36 non-null     object
 1   Amount spent (INR)  36 non-null     int64 
dtypes: int64(1), object(1)
memory usage: 708.0+ bytes
```

In [16]:
```
location['Location name'].unique()
```

Out[16]:
```
array(['Andaman and Nicobar Islands', 'Andhra Pradesh',
       'Arunachal Pradesh', 'Assam', 'Bihar', 'Chandigarh',
       'Chhattisgarh', 'Dadra and Nagar Haveli', 'Delhi', 'Goa',
       'Gujarat', 'Haryana', 'Himachal Pradesh', 'Jammu and Kashmir',
       'Jharkhand', 'Karnataka', 'Kerala', 'Lakshadweep',
       'Madhya Pradesh', 'Maharashtra', 'Manipur', 'Meghalaya', 'Mizoram',
       'Nagaland', 'Odisha', 'Puducherry', 'Punjab region', 'Rajasthan',
       'Sikkim', 'Tamil Nadu', 'Telangana', 'Tripura', 'Unknown',
       'Uttar Pradesh', 'Uttarakhand', 'West Bengal'], dtype=object)
```

*Renaming location names in the location dataset** to match those in the **result dataset** for easier analysis {'Andaman and Nicobar Islands': 'Andaman & Nicobar Islands', 'Delhi': 'NCT of Delhi', 'Dadra and Nagar Haveli': 'Dadra & Nagar Haveli and Daman & Diu', 'Punjab region': 'Punjab'}*

In [17]:
```
location['Location name'].replace({'Andaman and Nicobar Islands': 'Andaman & Nicobar Islands', 'Delhi': 'NCT of Delhi','Dadra and Nagar Have
```

In [18]:
```
#read the advetise dataset
advetise = pd.read_csv('advertisers.csv')
advetise.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20832 entries, 0 to 20831
Data columns (total 5 columns):
 #   Column                   Non-Null Count  Dtype 
---  ------                   --------------  ----- 
 0   Page ID                  20832 non-null  int64 
 1   Page name                20832 non-null  object
 2   Disclaimer               20832 non-null  object
 3   Amount spent (INR)       20832 non-null  object
 4   Number of ads in Library  20832 non-null  int64 
dtypes: int64(2), object(3)
memory usage: 813.9+ KB
```

In [19]:
```
advetise.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20832 entries, 0 to 20831
Data columns (total 5 columns):
 #   Column                   Non-Null Count  Dtype 
---  ------                   --------------  ----- 
 0   Page ID                  20832 non-null  int64 
 1   Page name                20832 non-null  object
 2   Disclaimer               20832 non-null  object
 3   Amount spent (INR)       20832 non-null  object
 4   Number of ads in Library  20832 non-null  int64 
dtypes: int64(2), object(3)
memory usage: 813.9+ KB
```

Though there wasn't proper information about Territory Ladakh in the location dataset, we removed it from the result dataset to simplify further analysis.

In [20]:
```
result = result[result['State'] != 'Ladakh']
```

*Converted the matching columns of the **result** and **location datasets** ('State' and 'Location name') to lowercase and remove any unnecessary spaces.*

In [21]:
```
result['State'] = result['State'].str.strip().str.lower()
location['Location name'] = location['Location name'].str.strip().str.lower()
```

*Renamed the column Location name in the **location dataset** to 'State' to facilitate easier merging with the **result dataset**.*

In [22]:
```
location.rename(columns={'Location name': 'State'}, inplace=True)
```

Merged the **result dataset*** with the ***location dataset*** based on the 'State' column. This allows for combining election information in terms of each state. The resulting ***merged_data DataFrame*** contain all columns from result and additional columns from location where matching 'State' values are found.*

In [23]:
```
merged_data = pd.merge(result, location, on='State', how='left')
```

In [24]:
```
merged_data
```

Out[24]:

	_id	Sl No	State	PC_Name	Total Electors	Polled (%)	Total Votes	Phase	Amount spent (INR)
0	1	1.0	andaman & nicobar islands	Andaman & Nicobar Islands	315148	64.10	202018	1.0	377858
1	2	2.0	arunachal pradesh	Arunachal East	375310	83.31	312658	1.0	1385654
2	3	3.0	arunachal pradesh	Arunachal West	517384	73.60	380783	1.0	1385654
3	4	4.0	assam	Dibrugarh	1659588	76.75	1273744	1.0	17478091
4	5	5.0	assam	Jorhat	1727121	79.89	1379749	1.0	17478091
...	...	...	...	...	...	...	...	...	...
537	545	53.0	west bengal	Jadavpur	2033525	76.68	1559330	7.0	77244996
538	546	54.0	west bengal	Joynagar	1844780	80.08	1477298	7.0	77244996
539	547	55.0	west bengal	Kolkata Dakshin	1849520	66.95	1238256	7.0	77244996
540	548	56.0	west bengal	Kolkata Uttar	1505356	63.59	957319	7.0	77244996
541	549	57.0	west bengal	Mathurapur	1817068	82.02	1490299	7.0	77244996

542 rows × 9 columns

In [25]:
```
merged_data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 542 entries, 0 to 541
Data columns (total 9 columns):
 #   Column              Non-Null Count  Dtype  
---  ------              --------------  -----  
 0   _id                 542 non-null    int64  
 1   Sl No               542 non-null    float64
 2   State               542 non-null    object 
 3   PC_Name             542 non-null    object 
 4   Total Electors      542 non-null    int64  
 5   Polled (%)          542 non-null    float64
 6   Total Votes         542 non-null    int64  
 7   Phase               542 non-null    float64
 8   Amount spent (INR)  542 non-null    int64  
dtypes: float64(3), int64(4), object(2)
memory usage: 38.2+ KB
```

State and Union Territory[UT] ad spent and Voter Percentage Turnout

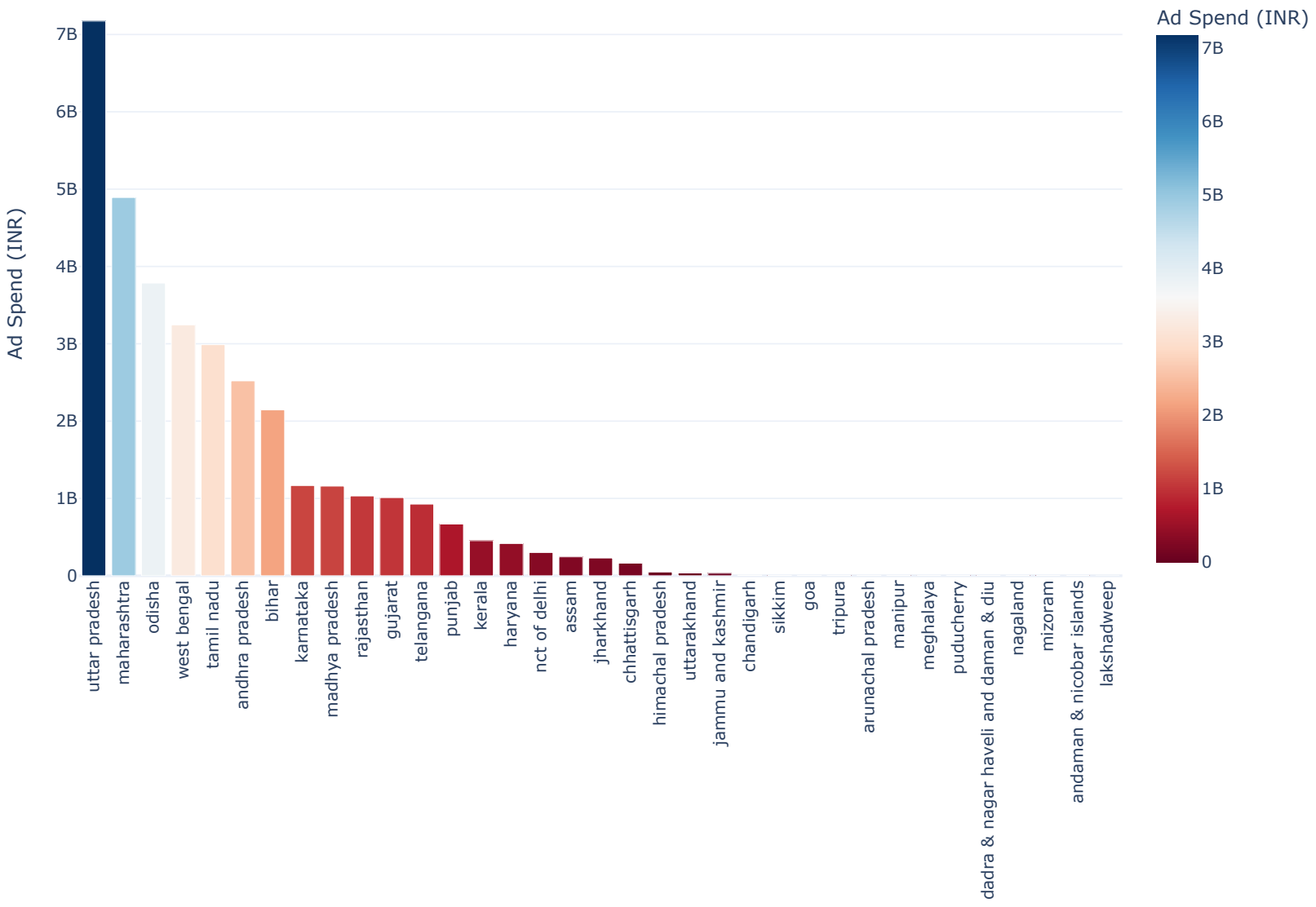
Created a DataFrame based on Calculated total advertising expenditure *(`Amount spent (INR)`)* for each state by grouping by *(`State`), *summing the expenditures, and resetting the index for clarity in further analysis.*

In [26]:
```
state_ad_spend = merged_data.groupby('State')['Amount spent (INR)'].sum().reset_index()
state_ad_spend.head()
```

Out[26]:

	State	Amount spent (INR)
0	andaman & nicobar islands	377858
1	andhra pradesh	2520493300
2	arunachal pradesh	2771308
3	assam	244693274
4	bihar	2144769680

In [27]:
```
# Use the default color scale in Plotly Express
fig = px.bar(state_ad_spend, x='State', y='Amount spent (INR)',
             labels={'State': 'State', 'Amount spent (INR)': 'Ad Spend (INR)'},
             title='State-wise Total Ad Spend (in Billions)',
             color='Amount spent (INR)',  # Color by 'Amount spent (INR)' column
             color_continuous_scale='RdBu',  # Choose a continuous color scale
             range_color=(0, state_ad_spend['Amount spent (INR)'].max()),  # Set color scale range
             hover_name='State',  # Display state name on hover
             hover_data={'Amount spent (INR)': ':,.2f'},  # Format hover data
            )

fig.update_layout(xaxis={'categoryorder': 'total descending'},
                  xaxis_tickangle=-90,
                  width=1000,
                  height=800)

fig.show("svg")
```



The above bar graph shows the total advertising spending in India in billions of rupees (INR) for each state and union territory [UT].

List of five states and UTs with the highest total ad spend

1. **Uttar Pradesh**
2. **Maharashtra**
3. **Odisha**
4. **West Bengal**
5. **Tamil Nadu**

List of five states and UTs with the lowest total ad spend

1. **dadar & nagar haveli and daman and diu**
2. **Nagaland**
3. **Mizoram**
4. **Andaman and Nicobar Islands**
5. **Lakshadweep**

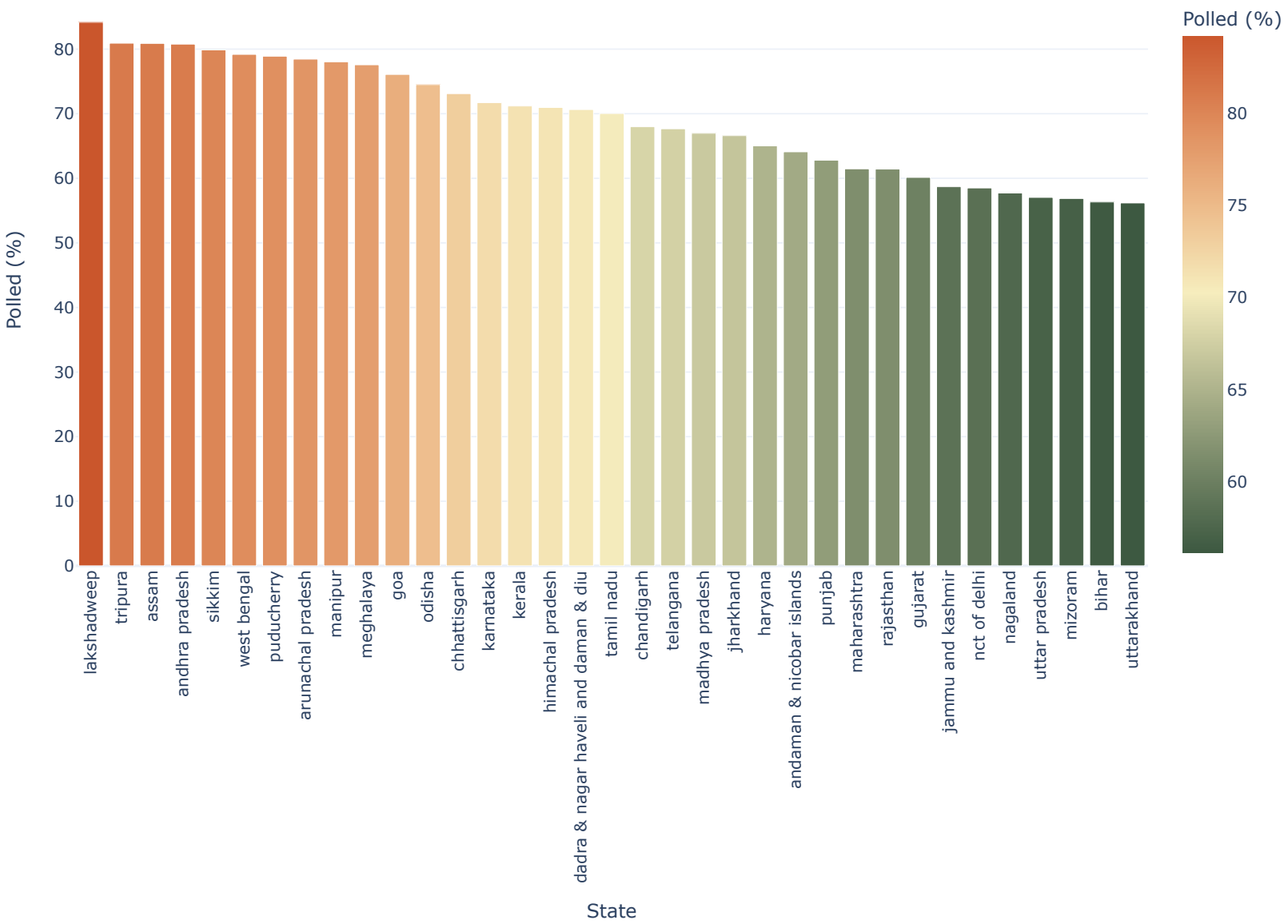
Created a DataFrame based on Calculated average voter turnout *(`Polled (%)`)* for each state by grouping *(`State`)*, computing the mean of voter turnout percentages, and resetting the index for analysis.

In [28]:
```
state_avg_voting = merged_data.groupby('State')['Polled (%)'].mean().reset_index()
state_avg_voting
```

Out[28]:

	State	Polled (%)
0	andaman & nicobar islands	64.100000
1	andhra pradesh	80.770800
2	arunachal pradesh	78.455000
3	assam	80.882857
4	bihar	56.329500
5	chandigarh	67.980000
6	chhattisgarh	73.105455
7	dadra & nagar haveli and\ndaman & diu	70.645000
8	goa	76.080000
9	gujarat	60.140400
10	haryana	65.019000
11	himachal pradesh	70.965000
12	jammu and kashmir	58.696000
13	jharkhand	66.605000
14	karnataka	71.714643
15	kerala	71.189500
16	lakshadweep	84.160000
17	madhya pradesh	66.970345
18	maharashtra	61.460000
19	manipur	78.030000
20	meghalaya	77.575000
21	mizoram	56.870000
22	nagaland	57.720000
23	nct of delhi	58.502857
24	odisha	74.510000
25	puducherry	78.900000
26	punjab	62.803846
27	rajasthan	61.426400
28	sikkim	79.880000
29	tamil nadu	70.035385
30	telangana	67.662941
31	tripura	80.920000
32	uttar pradesh	57.047000
33	uttarakhand	56.184000
34	west bengal	79.188095

In [48]:
```
fig = px.bar(state_avg_voting, x='State', y='Polled (%)',
             labels={'State': 'State', 'Polled (%)': 'Polled (%)'},
             title='State Wise Average Vote Percentage in 2024 General Election',
             color='Polled (%)',
             color_continuous_scale='fall')

fig.update_layout(xaxis={'categoryorder': 'total descending'},
                  xaxis_tickangle=-90,
                  width=1000,
                  height=800,
                  template='plotly_white')

fig.show("svg")
```



The above bar graph shows **Average Vote Percentage in 2024 General Election in state and union territory [UT].**

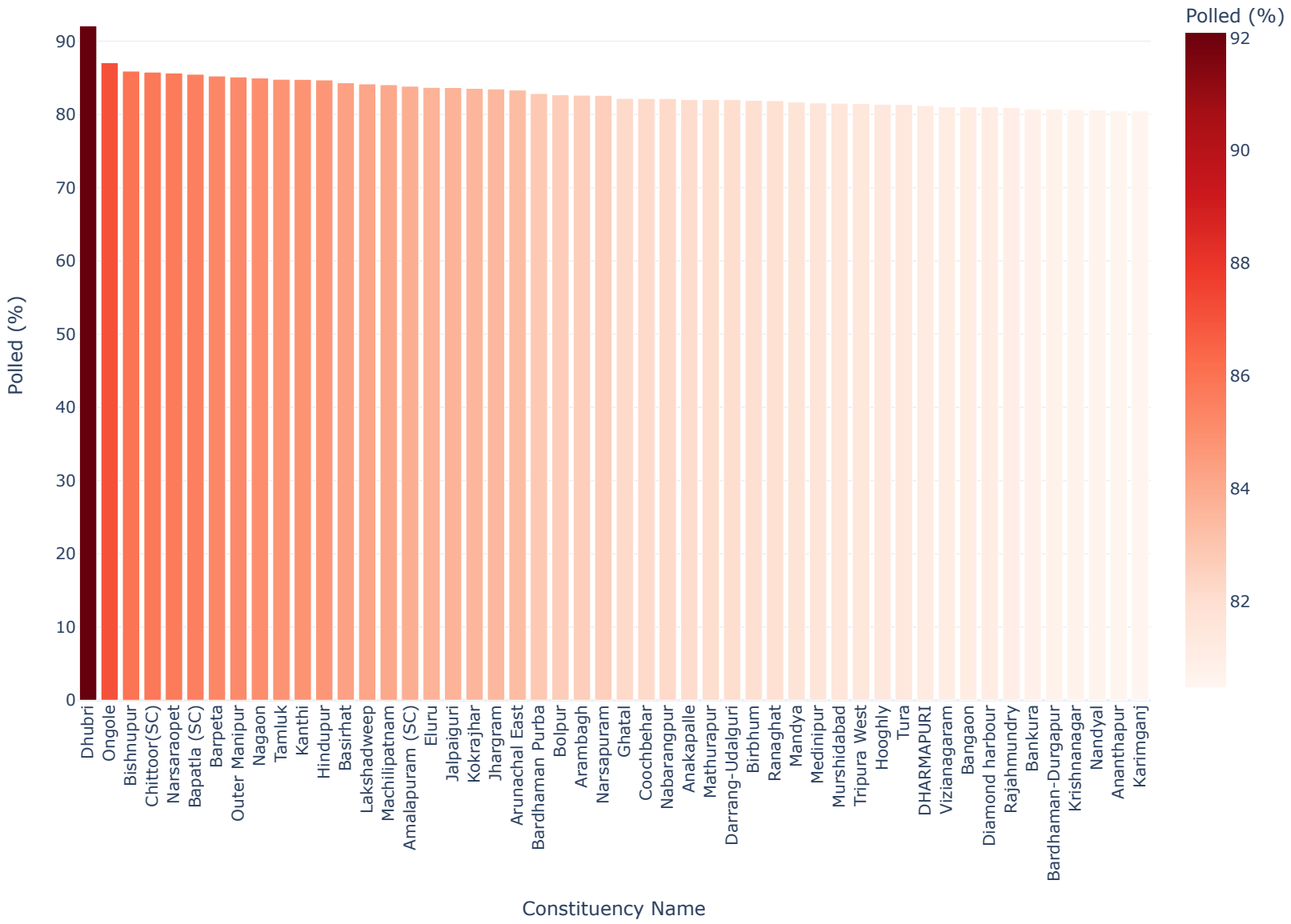
List of five states and UTs with the **highest average vote percent**

1. **Lakshadweep - 84.16 %**
2. **Tripura - 80.92 %**
3. **Assam - 80.88 %**
4. **Andra Pradesh - 80.77 %**
5. **Sikkim - 79.88 %**

List of five states and UTs with the **lowest average vote percent**

1. **Nagaland - 57.72 %**
2. **Uttar Pradesh - 57.04 %**
3. **Mizoram - 56.87 %**
4. **Bihar - 56.32 %**
5. **Uttrakhand - 56.18 %**

In [49]:
```
top_50_constituency_high_vote = merged_data.groupby('PC_Name')['Polled (%)'].nlargest(50).reset_index().sort_values(by='Polled (%)',ascendin
top_50_constituency_high_vote
top_50_constituency_high_vote = top_50_constituency_high_vote.head(50)

import plotly.express as px

# Assuming top_50_constituency_high_vote is a DataFrame with the necessary data
fig = px.bar(top_50_constituency_high_vote, x='PC_Name', y='Polled (%)',
             labels={'PC_Name': 'Constituency Name', 'Polled (%)': 'Polled (%)'},
             title='Top 50 Constituencies by Vote Percentage',
             color='Polled (%)',
             color_continuous_scale='reds')

fig.update_layout(xaxis={'categoryorder': 'total descending'},
                  xaxis_tickangle=-90,
                  width=1000,
                  height=800,
                  template='plotly_white')

fig.update_traces(hovertemplate='<b>%{x}</b><br>Polled: %{y:.2f}%')

fig.show("svg")
```

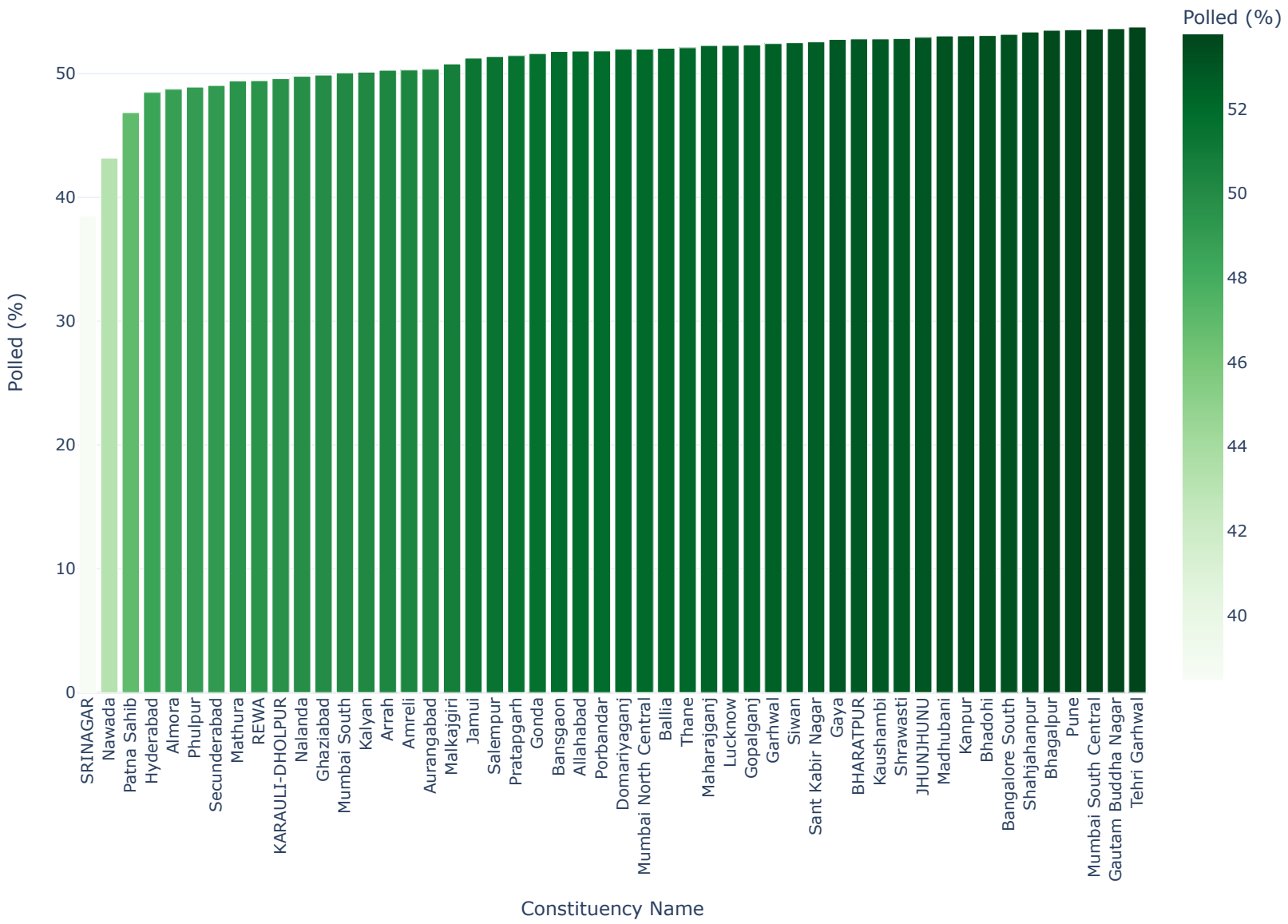


The above bar graph shows **Top 50 Constituency with Highest Vote Percentage** in 2024 General Election in state and union territory [UT].

List of ten constituency in states and UTs with the **highest vote percent**

1. **Dhubri - 92.08 %**
2. **Ongole - 87.06 %**
3. **Bishnupur - 85.91 %**
4. **Chittoor(SC) - 85.77 %**
5. **Narsaraopet - 85.65 %**
6. **Bapatla (SC) - 85.48 %**
7. **Barpeta - 85.24 %**
8. **Outer Manipur - 85.11 %**
9. **Nagaon - 84.97 %**
10. **Tamluk - 84.79 %**

In [50]:
```
least_50_constituency_low_vote = merged_data.groupby('PC_Name')['Polled (%)'].nlargest(50).reset_index().sort_values(by='Polled (%)',ascendi
least_50_constituency_low_vote
least_50_constituency_low_vote = least_50_constituency_low_vote.head(50)

# Assuming least_50_constituency_low_vote is a DataFrame with the necessary data
fig = px.bar(least_50_constituency_low_vote, x='PC_Name', y='Polled (%)',
             labels={'PC_Name': 'Constituency Name', 'Polled (%)': 'Polled (%)'},
             title='Least 50 Constituencies by Vote Percentage',
             color='Polled (%)',
             color_continuous_scale='greens')

fig.update_layout(xaxis={'categoryorder': 'total ascending'},
                  xaxis_tickangle=-90,
                  width=1000,
                  height=800,
                  template='plotly_white')

fig.update_traces(hovertemplate='<b>%{x}</b><br>Polled: %{y:.2f}%')

fig.show("svg")
```



The above bar graph shows **Least 50 Constituency with Lowest Vote Percentage** in 2024 General Election in state and union territory [UT].

List of ten constituency in states and UTs with the **lowest vote percent**

1. **SRINAGAR - 38.49 %**
2. **Nawada - 43.17 %**
3. **Patna Sahib - 46.85 %**
4. **Hydrabad - 48.48 %**
5. **Almora - 48.74 %**
6. **Phulpur - 48.91 %**
7. **Secunderabad - 49.04 %**
8. **Mathura - 49.41 %**
9. **REWA - 49.43 %**
10. **KARAULI - DHOLPUR - 49.59 %**

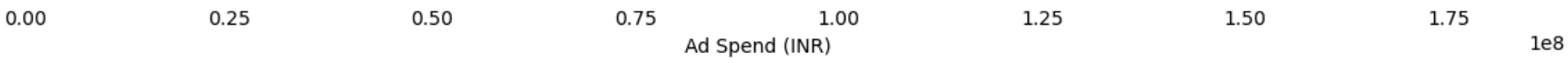
In [32]:
```
plt.figure(figsize=(15, 25))
sns.scatterplot(data=merged_data, x='Amount spent (INR)', y='Polled (%)', hue='State', palette='Set1')

# Customize labels and title
plt.xlabel('Ad Spend (INR)')
plt.ylabel('Voter Turnout (%)')
plt.title('Ad Spend and Voter Turnout by State')

# Show the plot
plt.show()
```

Ad Spend and Voter Turnout by State

Voter Turnout (%)

90
80
70
60
50
40

State
andaman & nicobar islands
arunachal pradesh
assam
bihar
chhattisgarh
jammu and kashmir
lakshadweep
madhya pradesh
maharashtra
manipur
meghalaya
mizoram
nagaland
puducherry
rajasthan
sikkim
tamil nadu
tripura
uttar pradesh
uttarakhand
west bengal
karnataka
kerala
dadra & nagar haveli and daman & diu
goa
gujarat
andhra pradesh
jharkhand
odisha
telangana
haryana
nct of delhi
chandigarh
himachal pradesh
punjab



Ad Expendiure and Average Voter turnout Analysis in states and union territory[UT].

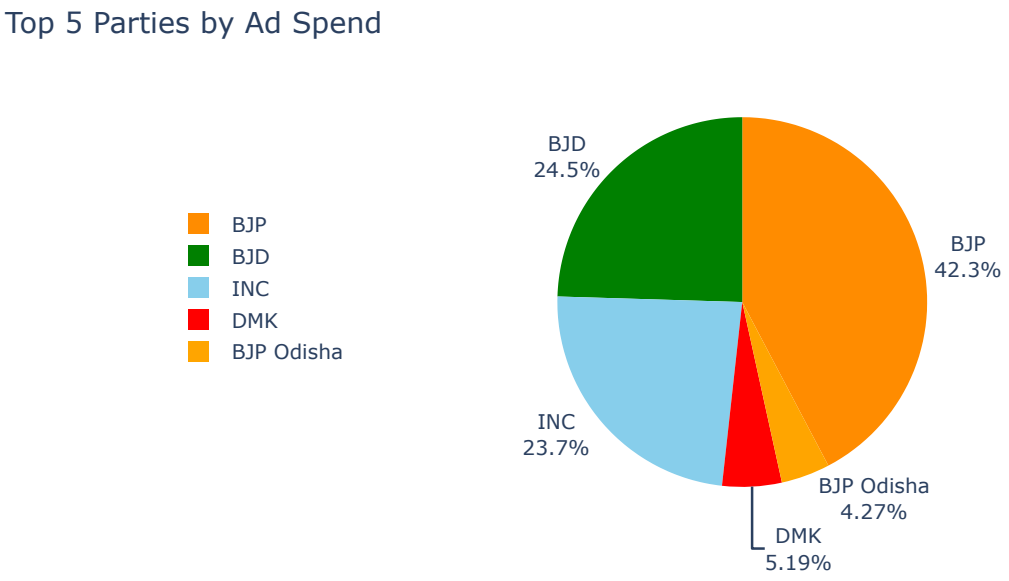
Top 5 Parties' Net Spending in India and Leading Alliance Rulling States

In [33]:
```
party_spend = advetise.groupby('Page name')['Amount spent (INR)'].sum().sort_values(ascending=False)
```

In [34]:
```
advetise['Amount spent (INR)'] = pd.to_numeric(advetise['Amount spent (INR)'], errors='coerce')
advetise.dropna(subset=['Amount spent (INR)'], inplace=True)
party_spend = advetise.groupby('Page name')['Amount spent (INR)'].sum().sort_values(ascending=False)
party_spend
```

Out[34]:
```
Page name
Bharatiya Janata Party (BJP)                193854342.0
Ama Chinha Sankha Chinha                    112412941.0
Indian National Congress                    108787100.0
Ellorum Nammudan                             23806041.0
BJP Odisha                                   19573782.0
                                               ...
Ranjit Nath                                      101.0
Old coin selling company in Mumbai India         101.0
chilliestirupati                                 101.0
nihitsirpolity                                   101.0
महा MTB                                          101.0
Name: Amount spent (INR), Length: 11590, dtype: float64
```

In [51]:
```
top_5_parties = party_spend.head(5).reset_index()


fig = go.Figure(data=[go.Pie(labels=['BJP', 'BJD', 'INC', 'DMK', 'BJP Odisha'],
                             values=top_5_parties['Amount spent (INR)'],
                             textinfo='label+percent',
                             textposition='outside',
                             marker=dict(colors=['darkorange', 'green', 'skyblue', 'red', 'orange']))])

fig.update_layout(
    title_text='Top 5 Parties by Ad Spend',
    showlegend=True,
    legend=dict(
        orientation='v',
        xanchor='left',
        yanchor='bottom',
        x=-0.1,
        y=0.3  # Adjust to ensure it doesn't overlap the graph
    ),
    width=1000,  # Increase figure width
    height=400  # Increase figure height
)

fig.show("svg")
```



The above pie graph shows **Top 5 Parties with the Highest Net Contribution to Spending** in 2024 General Election in state and union territory [UT].

List of top five parties contibution in ad spend in states and UTs among **Top 5 Parties with the Highest Net Contribution to Spending**

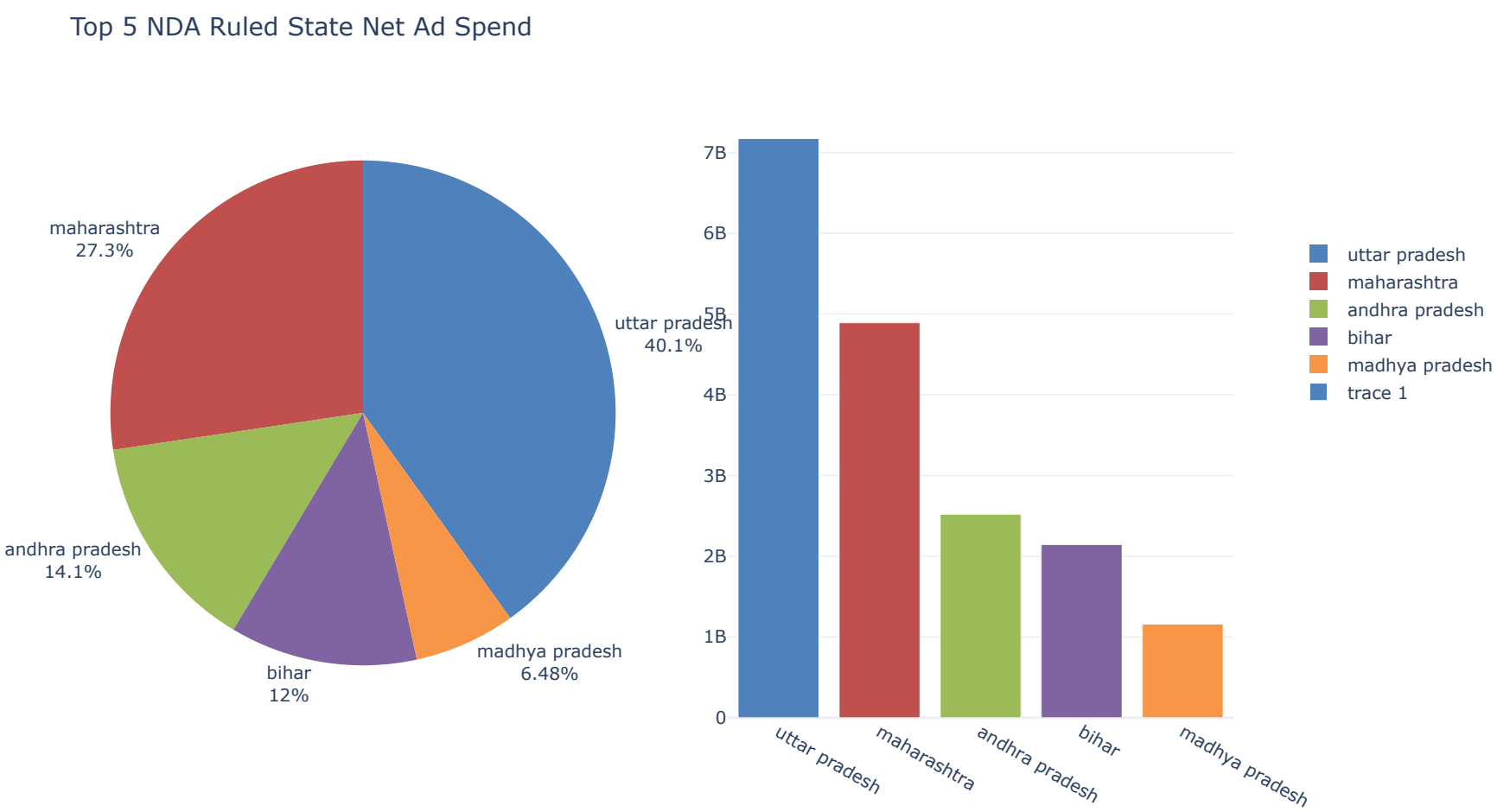
1. **BJP (NDA) - 42.3 %**
2. **BJD - 24.5 %**
3. **INC (INDIA) - 23.7 %**
4. **DMK (INDIA) - 5.19 %**
5. **BJP Odisha (NDA) - 4.27 %**

Top 5 Parties' Net Spending in NDA Alliance Rulling States

In [36]:
```
#Checking on BJP and NDA Ruling State
#List of NDA and its alliance Rulling State UK, HR, RJ, GJ, MH, AP, CG, MP, UP, BR, MN, ML, NL, PY, SK, TR, GA, AR, AS
NDA_States = ['arunachal pradesh', 'assam', 'bihar','chhattisgarh',
       'madhya pradesh', 'maharashtra', 'manipur', 'meghalaya',
       'nagaland', 'puducherry', 'rajasthan', 'sikkim',
       'tripura', 'uttar pradesh', 'uttarakhand',
       'goa', 'gujarat', 'andhra pradesh', 'haryana']
```

```
# Filter rows based of above mentioned state in terms of 'State' column
NDA = merged_data[merged_data['State'].isin(NDA_States)]

#grouping by State and Amount Spent in the extracted NDA States
NDA_State_Spent_by_all_parties = NDA.groupby('State')['Amount spent (INR)'].sum().reset_index()
NDA_State_Spent_by_all_parties_1 = NDA_State_Spent_by_all_parties.sort_values(by='Amount spent (INR)',ascending=False)
Net_NDA_Rulling_Spent_top_5 = NDA_State_Spent_by_all_parties_1.head(5)
```

In [52]:
```
from plotly.subplots import make_subplots
colors = ['#4F81BD', '#C0504D', '#9BBB59', '#8064A2', '#F79646']

# Create subplots: use 'domain' type for pie charts and 'xy' type for bar charts
fig = make_subplots(
    rows=1, cols=2,  # One row and two columns
    specs=[[{'type': 'domain'}, {'type': 'xy'}]],  # Specify the types of subplots
)

# Add pie chart
fig.add_trace(go.Pie(labels=Net_NDA_Rulling_Spent_top_5['State'],
                     values=Net_NDA_Rulling_Spent_top_5['Amount spent (INR)'],
                     textinfo='label+percent',
                     textposition='outside',
                     marker=dict(colors=colors)),
              row=1, col=1)

# Add bar chart
fig.add_trace(go.Bar(x=Net_NDA_Rulling_Spent_top_5['State'],
                     y=Net_NDA_Rulling_Spent_top_5['Amount spent (INR)'],
                     marker=dict(color=colors)),
              row=1, col=2)

# Update layout
fig.update_layout(
    title_text='Top 5 NDA Ruled State Net Ad Spend',
    showlegend=True,
    legend=dict(
        orientation='v',
        xanchor='left',
        yanchor='bottom',
        x=1.05,
        y=0.5
    ),
    width=1050,  # Adjust figure width
    height=600   # Adjust figure height
)

fig.show("svg")
```



The above graph shows the top 5 net amount contribution among NDA alliance rulling states and unioin territory[UT]

List of **top five state and UT** net ad spend among NDA alliance rulling states and unioin territory[UT]

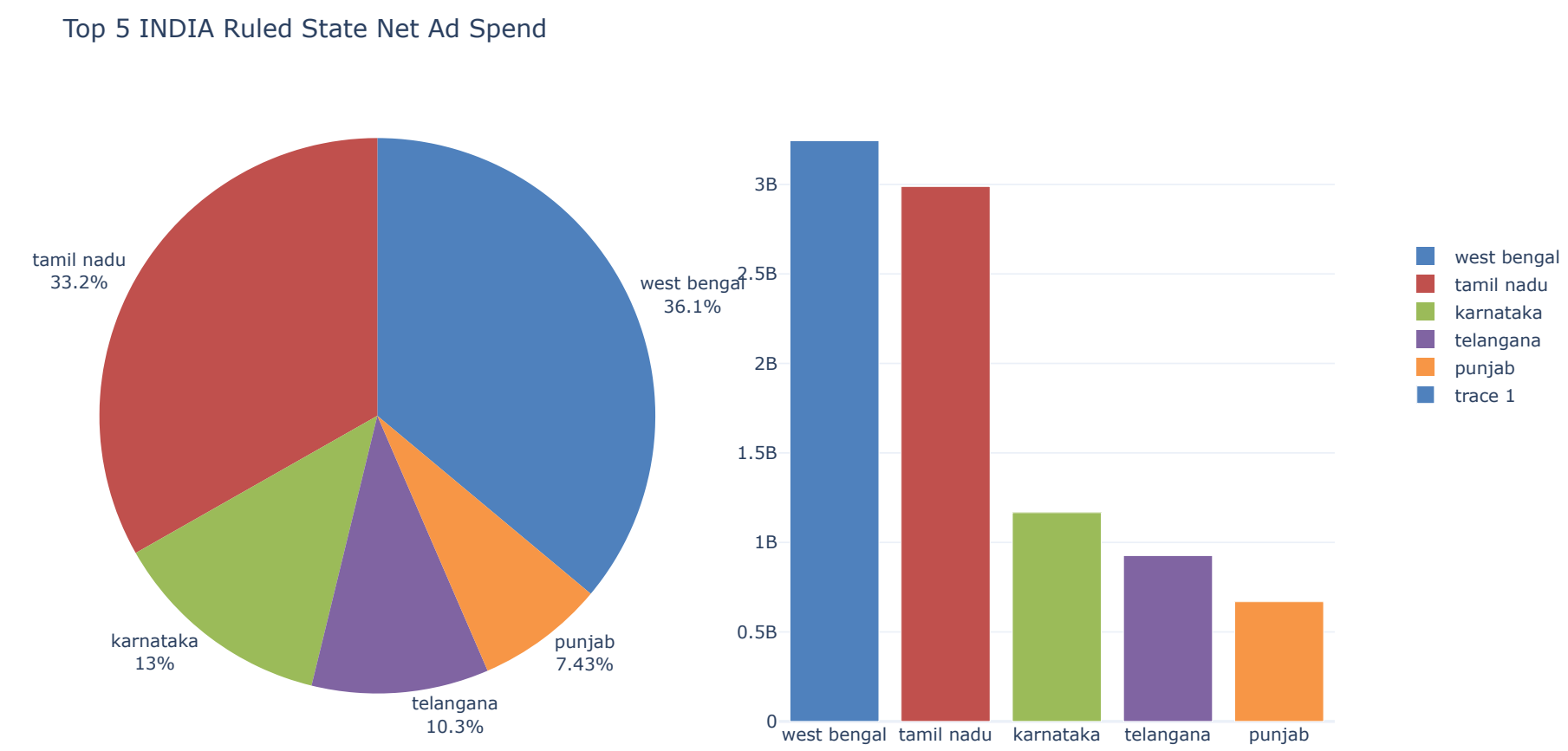
1. **Uttar Pradesh - 40.1 % ~ 7.17B (INR)**
2. **Maharashtra - 27.3 % ~ 4.89B (INR)**
3. **Andra Pradesh - 14.1 % ~ 2.52B (INR)**
4. **Bihar - 12 % ~ 2.14B (INR)**
5. **Madhya Pradesh - 6.48 % ~ 1.15B (INR)**

Top 5 Parties' Net Spending in INDIA Alliance Rulling States

In [38]:
```
#Checking on INDIA and its Allies
#PB, HP, KR, NCT, JK, WB, TN, TS, KL

INDIA_States = ['tamil nadu', 'west bengal',
```

```
       'karnataka', 'kerala', 'jharkhand',
       'telangana', 'nct of delhi',
       'himachal pradesh', 'punjab']

# Filter rows based on 'State' column
INDIA = merged_data[merged_data['State'].isin(INDIA_States)]

INDIA_State_Spent_by_all_parties = INDIA.groupby('State')['Amount spent (INR)'].sum().reset_index().sort_values(by='Amount spent (INR)',asce
Net_India_Ruling_State_top_5 = INDIA_State_Spent_by_all_parties.head(5)
```

In [53]:
```
colors = ['#4F81BD', '#C0504D', '#9BBB59', '#8064A2', '#F79646']

# Create subplots: use 'domain' type for pie charts
fig = make_subplots(
    rows=1, cols=2,  # One row and two columns
    specs=[[{'type': 'domain'}, {'type': 'xy'}]],  # Specify the types of subplots
)

# Add pie chart
fig.add_trace(go.Pie(labels=Net_India_Ruling_State_top_5['State'],
                     values=Net_India_Ruling_State_top_5['Amount spent (INR)'],
                     textinfo='label+percent',
                     textposition='outside',
                     marker=dict(colors=colors)),
              row=1, col=1)

# Add bar chart
fig.add_trace(go.Bar(x=Net_India_Ruling_State_top_5['State'],
                     y=Net_India_Ruling_State_top_5['Amount spent (INR)'],
                     marker=dict(color=colors)),
              row=1, col=2)

# Update layout
fig.update_layout(
    title_text='Top 5 INDIA Ruled State Net Ad Spend',
    showlegend=True,
    legend=dict(
        orientation='v',
        xanchor='left',
        yanchor='bottom',
        x=1.05,
        y=0.5
    ),
    width=1100,  # Adjust figure width
    height=600   # Adjust figure height
)

fig.show("svg")
```



The above graph shows the top 5 net amount contribution among INDIA alliance rulling states and unioin territory[UT]

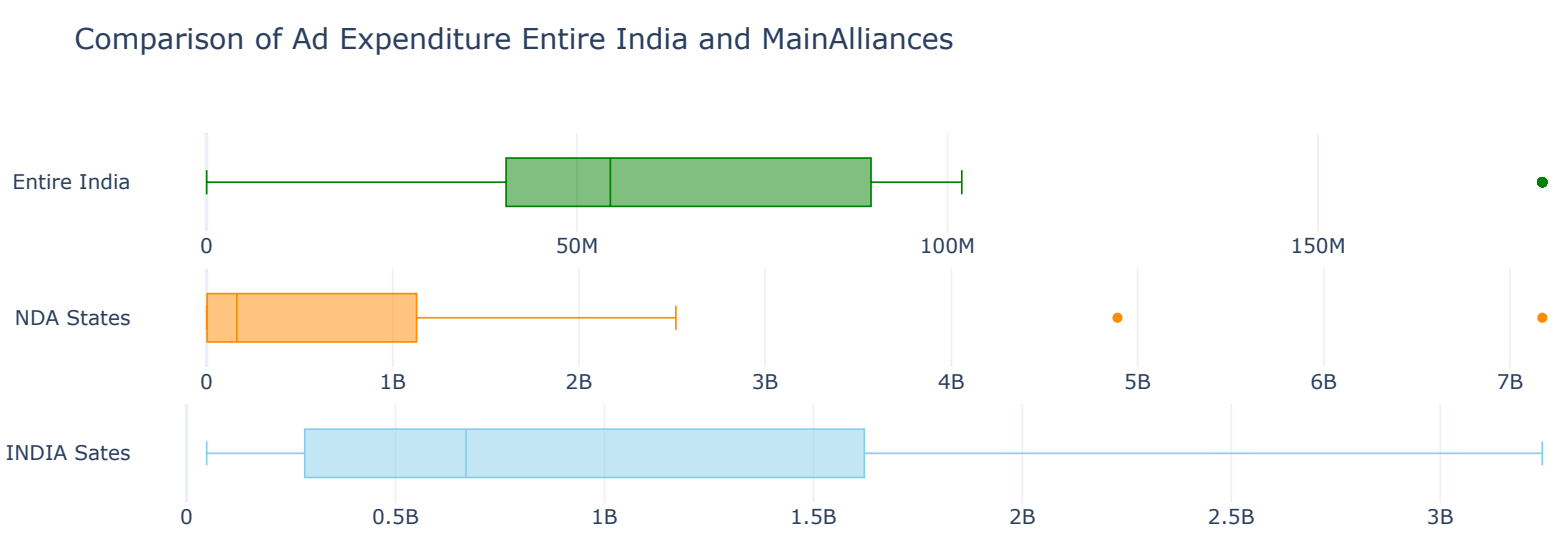
List of **top five state and UT** net ad spend among INDIA alliance rulling states and unioin territory[UT]

1. **West Bengal - 36.1 % ~ 3.24B (INR)**
2. **Tamil Nadu - 33.2 % ~ 2.98B (INR)**
3. **Karnataka - 13 % ~ 1.16B (INR)**
4. **Telengana - 10.3 % ~ 0.92B (INR)**
5. **Punjab - 7.43 % ~ 0.66B (INR)**

Compaisrion of Entire India with main Alliances

In [54]:
```
# Create subplots: one row with two columns
fig = make_subplots(rows=3, cols=1)
```

```
# Add box plot forentire India
fig.add_trace(go.Box(
    x=merged_data['Amount spent (INR)'],
    marker_color='green',
    line_width=1,
    name='Entire India'
), row=1, col=1)

# Add box plot for NDA Alliance
fig.add_trace(go.Box(
    x=NDA_State_Spent_by_all_parties['Amount spent (INR)'],
    marker_color='darkorange',
    line_width=1,
    name='NDA States'
), row=2, col=1)

# Add box plot for India Alliance
fig.add_trace(go.Box(
    x=INDIA_State_Spent_by_all_parties['Amount spent (INR)'],
    marker_color='skyblue',
    line_width=1,
    name='INDIA Sates'
), row=3, col=1)

# Update layout for the entire figure
fig.update_layout(
    title='Comparison of Ad Expenditure Entire India and MainAlliances',
    width=1050,  # Adjust figure width
    height=400,  # Adjust figure height
    showlegend=False  # No need for legend with single trace in each subplot
)

# Update subplot titles and spacing
fig.update_annotations(font_size=16, font_family='Arial', xref="paper", yref="paper", showarrow=False)

fig.show("svg")
```

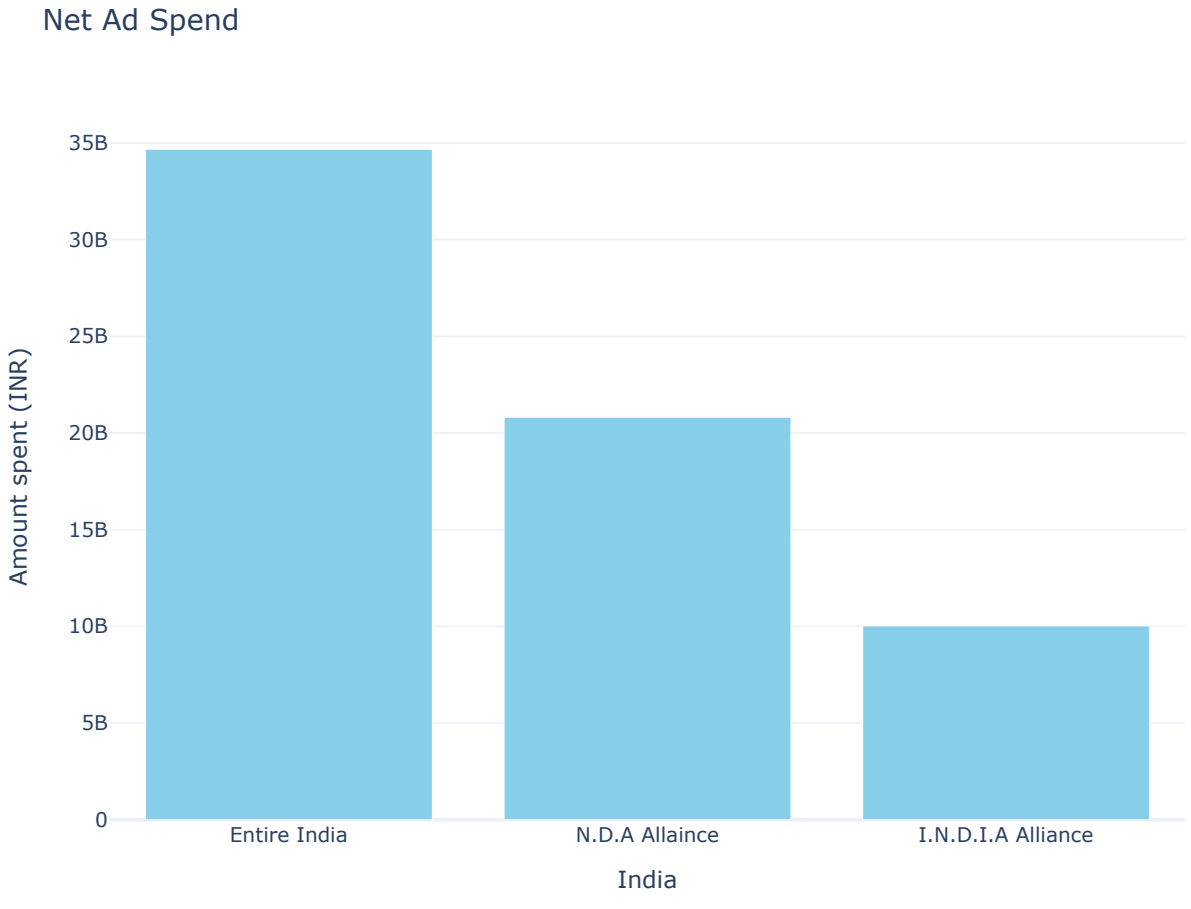


The above graph summerize the net expenditure in terms of five-number summary is the

1. **Minimum**
2. **First quartile**
3. **Median**
4. **Third quartile**
5. **Maximum**

In [41]:
```
net_india_ruling_spent = INDIA_State_Spent_by_all_parties['Amount spent (INR)'].sum()
net_nda_ruling_spent = NDA_State_Spent_by_all_parties['Amount spent (INR)'].sum()
merged_spent = merged_data['Amount spent (INR)'].sum()

# Create a dictionary with the data
data_india_Allaice_wise = {
    'India': ['Entire India', 'N.D.A Allaince', 'I.N.D.I.A Alliance'],
    'Net spent': [merged_spent, net_nda_ruling_spent,net_india_ruling_spent]
}
df = pd.DataFrame(data_india_Allaice_wise)
```

In [55]:
```
fig = go.Figure()

fig.add_trace(go.Bar(
    x=df['India'],
    y=df['Net spent'],
    marker=dict(color='skyblue')  # Customize the color of bars
))

# Update the layout
fig.update_layout(
    title='Net Ad Spend',
    xaxis_title='India',
    yaxis_title='Amount spent (INR)',
    width=800,  # Adjust figure width
    height=600  # Adjust figure height
)

# Show the plot
fig.show("svg")
```

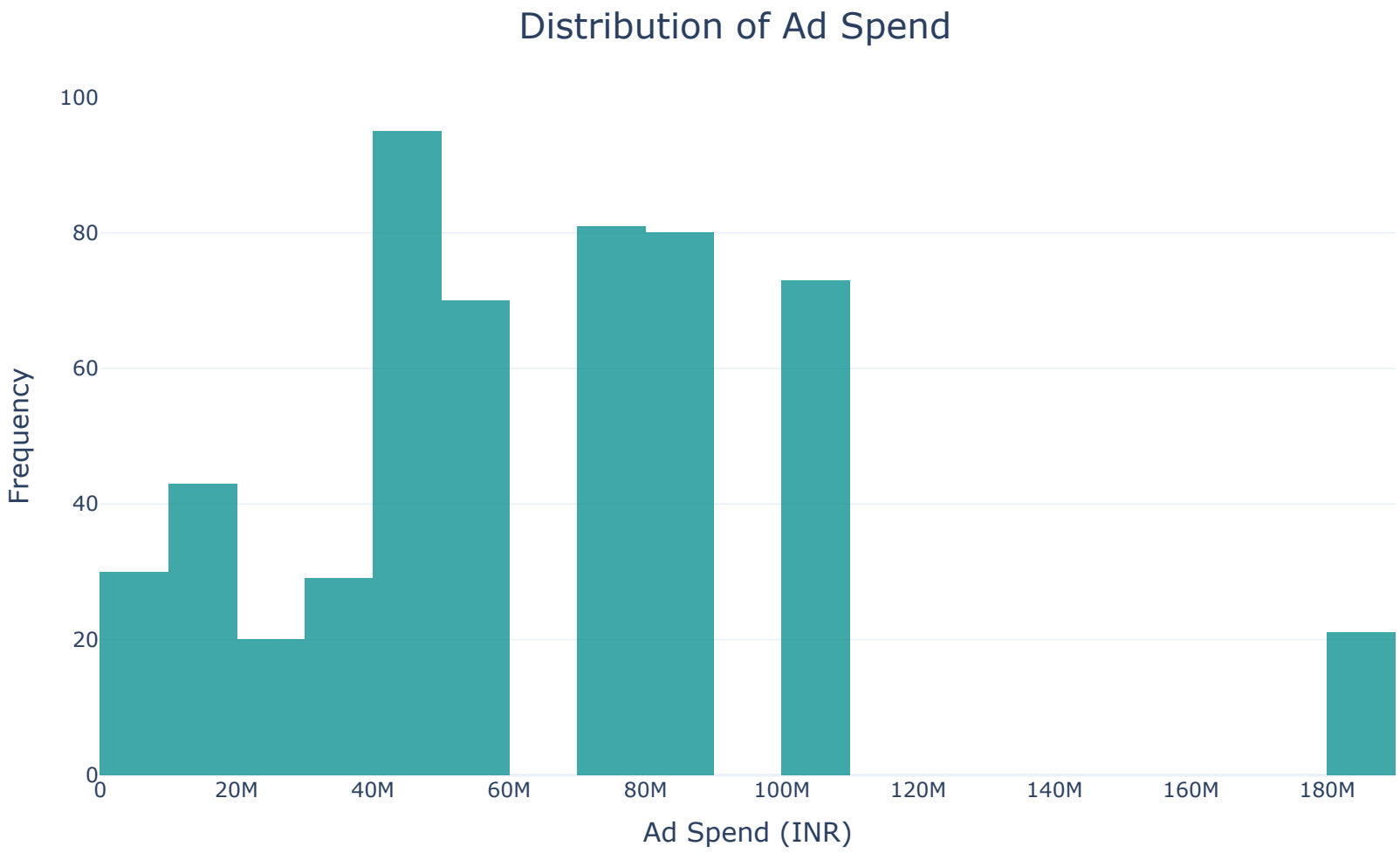


The above bar graph shows a comparison of net expenditure in entire **India and two main alliances ruling state** during the 2024 General Election.

1. **India - 34.66B (INR)**
2. **NDA Alliance Ruling State - 20.18B (INR)**
3. **INDIA Alliance Ruling State - 10.02B (INR)**

Checking the number of constituencies within specific net expenditure ranges.

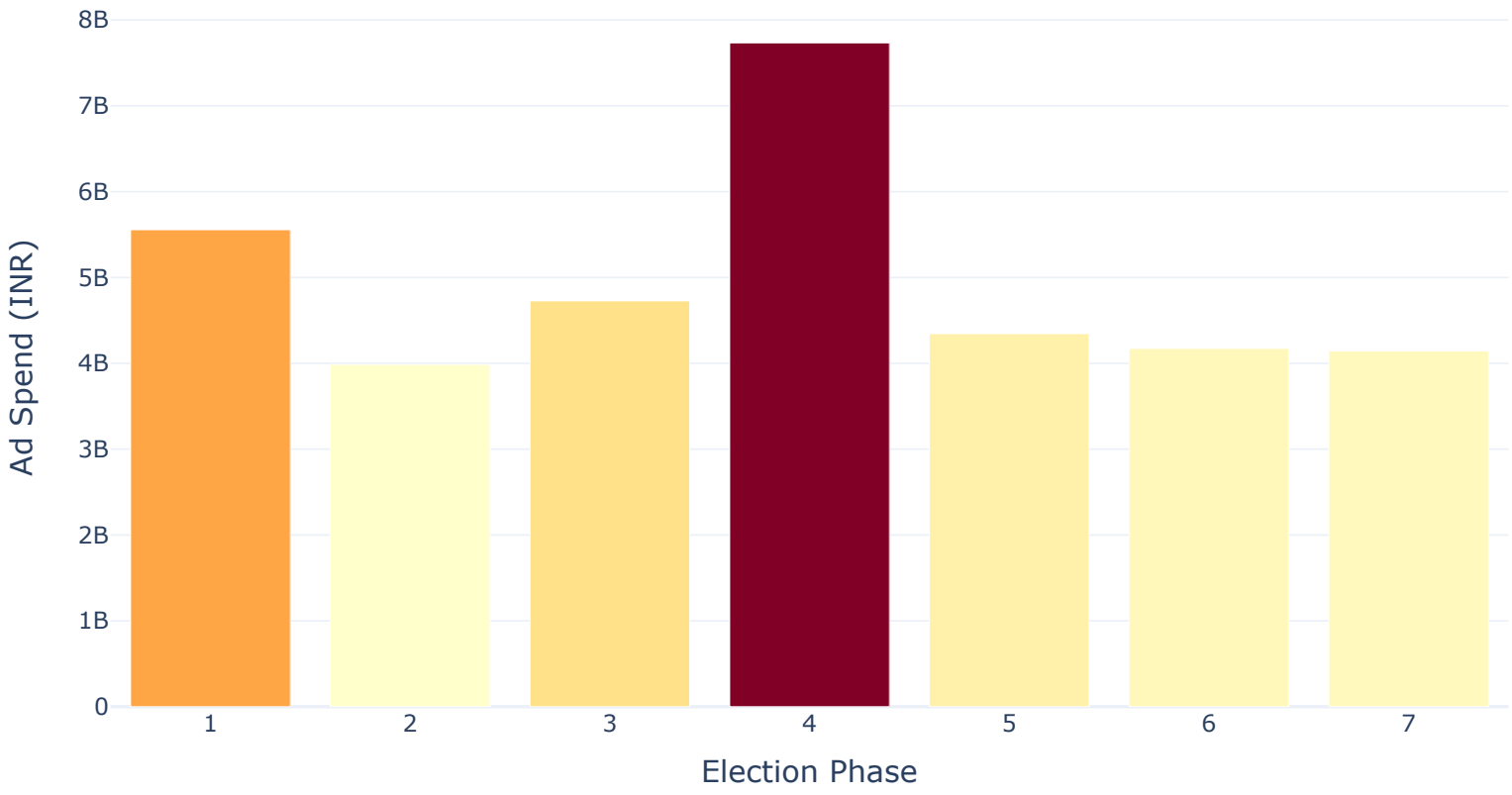
In [56]:
```
# Create the histogram plot
fig = go.Figure()

# Add histogram trace
fig.add_trace(go.Histogram(
    x=merged_data['Amount spent (INR)'],
    nbinsx=30,  # Number of bins
    marker_color='darkcyan',
    opacity=0.75,
    name='Histogram',
    hoverinfo='x+y'
))

# Update layout for better aesthetics
fig.update_layout(
    title=dict(
        text='Distribution of Ad Spend',
        font=dict(size=24),
        x=0.5,
        xanchor='center'
    ),
    xaxis=dict(
        title='Ad Spend (INR)',
        titlefont=dict(size=18),
        tickfont=dict(size=14)
    ),
    yaxis=dict(
        title='Frequency',
        titlefont=dict(size=18),
        tickfont=dict(size=14)
    ),
    width=1000,  # Adjust figure width
    height=600,  # Adjust figure height
    legend=dict(
        font=dict(size=14),
        x=1,
        xanchor='right',
        y=1,
        yanchor='top'
    ),
    margin=dict(l=50, r=50, t=80, b=50),
    plot_bgcolor='rgba(0,0,0,0)',  # Make background transparent
    paper_bgcolor='rgba(0,0,0,0)',  # Make background transparent
)

# Show the plot
fig.show("svg")
```



Phase Wise Expenditure and voter turnout analysis

In [44]:
```
phase_data = merged_data.groupby('Phase').agg({
    'Amount spent (INR)': 'sum',
    'Polled (%)': 'mean'
}).reset_index()
```

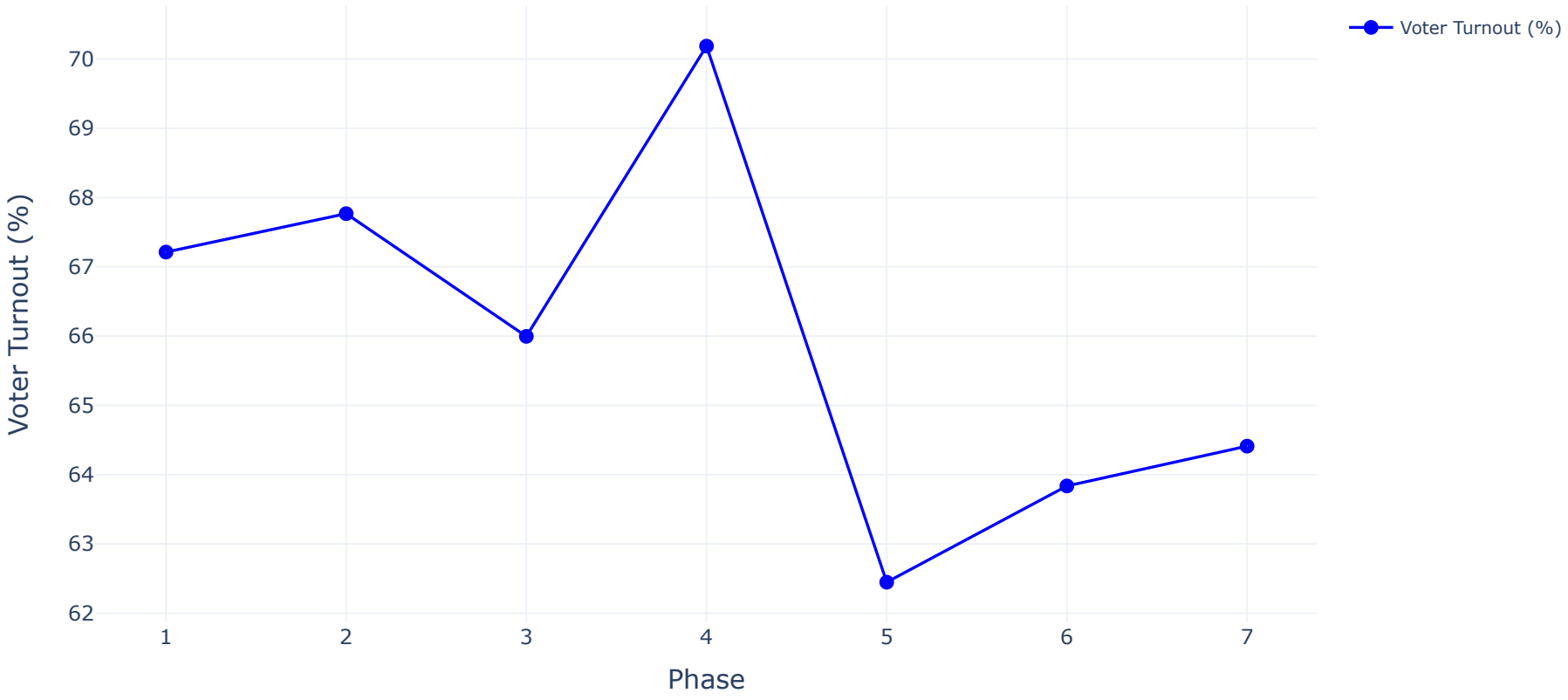
In [57]:
```
fig = px.bar(
    phase_data,
    x='Phase',
    y='Amount spent (INR)',
    title='Ad Spend by Election Phase',
    labels={'Amount spent (INR)': 'Ad Spend (INR)', 'Phase': 'Election Phase'},
    color='Amount spent (INR)',
    color_continuous_scale='ylorrd'
)

# Customize the layout
fig.update_layout(
    title=dict(
        text='Ad Spend by Election Phase',
        font=dict(size=24),
        x=0.5,
        xanchor='center'
    ),
    xaxis=dict(
        title='Election Phase',
        titlefont=dict(size=18),
        tickfont=dict(size=14)
    ),
    yaxis=dict(
        title='Ad Spend (INR)',
        titlefont=dict(size=18),
        tickfont=dict(size=14)
    ),
    width=1000,  # Adjust figure width
    height=600,  # Adjust figure height
    plot_bgcolor='rgba(0,0,0,0)',  # Make background transparent
    paper_bgcolor='rgba(0,0,0,0)',  # Make background transparent
    coloraxis_showscale=False  # Hide color bar
)

# Show the plot
fig.show("svg")
```



The above bar graph shows a comparison of net expenditure in India **among diffrent phases** of 2024 General Election.

1. **Phase 1 - 5.55B (INR)**
2. **Phase 2 - 3.98B (INR)**
3. **Phase 3 - 4.72B (INR)**
4. **Phase 4 - 7.73B (INR)**
5. **Phase 5 - 4.34B (INR)**
6. **Phase 6 - 4.17B (INR)**
7. **Phase 7 - 4.14B (INR)**

In [58]:
```
fig = go.Figure()

# Add line trace
fig.add_trace(go.Scatter(
    x=phase_data['Phase'],
    y=phase_data['Polled (%)'],
    mode='lines+markers',
    marker=dict(symbol='circle-dot', size=10, color='blue'),  # Customize marker
    line=dict(color='blue'),  # Customize line color
    name='Voter Turnout (%)'
))

# Update layout for better aesthetics
fig.update_layout(
    title=dict(
        text='Voter Turnout by Election Phase',
        font=dict(size=24),
        x=0.5,
        xanchor='center'
    ),
    xaxis=dict(
        title='Phase',
        titlefont=dict(size=18),
        tickfont=dict(size=14)
    ),
    yaxis=dict(
        title='Voter Turnout (%)',
        titlefont=dict(size=18),
        tickfont=dict(size=14)
    ),
    width=1100,  # Adjust figure width
    height=600,  # Adjust figure height
    showlegend=True
)

# Show the plot
fig.show("svg")
```



The above line graph shows **the avearge voter turnout among diffrent phases** of 2024 General Election.

1. **Phase 1 - 67.21 %**
2. **Phase 2 - 67.76 %**
3. **Phase 3 - 65.99 %**
4. **Phase 4 - 70.18 %**
5. **Phase 5 - 62.44 %**
6. **Phase 6 - 63.83 %**
7. **Phase 7 - 64.41 %**

Lets the correlation of (`Amount spent (INR)`) and (`Polled (%)`)

In [47]:
```
correlation = merged_data[['Amount spent (INR)', 'Polled (%)']].corr()
print(correlation)
```

```
                   Amount spent (INR)  Polled (%)
Amount spent (INR)            1.000000   -0.002935
Polled (%)                   -0.002935    1.000000
```

Summary

The analysis of the 2024 General Election in India highlights significant trends and statistics across various categories.

Ad Spending:

- **Top 5 States/UTs with Highest Ad Spend**: Uttar Pradesh, Maharashtra, Odisha, West Bengal, and Tamil Nadu.
- **Lowest Ad Spend**: Dadra & Nagar Haveli and Daman & Diu, Nagaland, Mizoram, Andaman and Nicobar Islands, Lakshadweep.
- **Top Parties by Ad Spend**: BJP (NDA), BJD, INC (INDIA), DMK (INDIA), BJP Odisha (NDA).
- **NDA Alliance States**: Uttar Pradesh (40.1%), Maharashtra (27.3%), Andhra Pradesh (14.1%), Bihar (12%), Madhya Pradesh (6.48%).
- **INDIA Alliance States**: West Bengal (36.1%), Tamil Nadu (33.2%), Karnataka (13%), Telangana (10.3%), Punjab (7.43%).
- **Total Expenditure**: India (34.66B INR), NDA (20.18B INR), INDIA (10.02B INR).

Voter Turnout:

- **Highest Average Vote Percentage**: Lakshadweep (84.16%), Tripura (80.92%), Assam (80.88%), Andhra Pradesh (80.77%), Sikkim (79.88%).
- **Lowest Average Vote Percentage**: Nagaland (57.72%), Uttar Pradesh (57.04%), Mizoram (56.87%), Bihar (56.32%), Uttarakhand (56.18%).

Constituencies:

- **Highest Vote Percentage**: Dhubri (92.08%), Ongole (87.06%), Bishnupur (85.91%), Chittoor(SC) (85.77%), Narsaraopet (85.65%).
- **Lowest Vote Percentage**: Srinagar (38.49%), Nawada (43.17%), Patna Sahib (46.85%), Hyderabad (48.48%), Almora (48.74%).

Election Phases:

- **Ad Expenditure by Phase**: Phase 1 (5.55B INR), Phase 2 (3.98B INR), Phase 3 (4.72B INR), Phase 4 (7.73B INR), Phase 5 (4.34B INR), Phase 6 (4.17B INR), Phase 7 (4.14B INR).
- **Voter Turnout by Phase**: Phase 1 (67.21%), Phase 2 (67.76%), Phase 3 (65.99%), Phase 4 (70.18%), Phase 5 (62.44%), Phase 6 (63.83%), Phase 7 (64.41%).

The correlation between ad spending and voter turnout is -0.002935, indicating a very weak negative relationship.

Contact Information

Please contact us for additional inquiries and collaboration opportunities.

Email

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Github

(**tsohail12**)

Thank you for your time and consideration!!!