

# Analysis of Energy Crisis in India during Summer using Twitter and NodeXL

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**Abstract**—Twitter is the one of the most used social media platform by the public. Users tend to use it as a platform to communicate, share the thoughts and media. Power Crisis has been an issue in India from quite a long time and especially post pandemic as there is resource shortage, high demand. This paper, analyses how people communicate in twitter to discuss about the current power crisis in the country and helps to draw insights from it by using NodeXL.

**Keywords**—Social Network Analysis; Power Crisis; Resource Shortage; Hashtag; NodeXL;

## I. INTRODUCTION

Social media has seen a huge growth in recent years and especially after the pandemic struck the world. Twitter is one of the most used social media platform these days. People use twitter to communicate, share their ideas, create awareness about issues around them and even more. This creates a virtual community and a type of network among people who share same type of ideologies. Twitter acts as a stage, where people share and visualize different kinds of contents like videos, audio, text, pictures in a short and easy way known as tweets.

Researchers uses Social media for their research purpose as it contains various types of users and many information can be obtained.

Power crisis has been an issue in India and its states lately, due to high demand, low supply of resources like coal. Many states are undergoing load shedding for long ours. Coal –based power is currently meeting 73% of nation’s power demand. But majority of country’s thermal power plant are suffering from low coal stocks[1]. There is high demand of power due to the economic recovery from post pandemic and also high heat temperature in major parts of India are also the factors that are straining the country’s domestic coal supply chain with addition of coal shortage. People uses Twitter as a platform to share their views on power crisis and problems they are facing through it.

In twitter, people usually communicate using @mention, @replies,#hastags. In this study, we mainly concentrate on better understanding of how and what people in twitter

community communicate among themselves about the current power crisis in India during Summer.

## II. LITERATURE REVIEW

There are many researches invested in finding out the prime causes for the power crisis across the world in these recent few years. In the research investigations the reasons for energy crisis in India are stated as follows [2]. Every five-year plan, a goal is set to produce “X” Kilo Watts of power and most of the 5 year terms India has fallen short of this target, sometimes by a large fraction of difference. Also India is changing its focus from thermal to renewable energy which hampers the maximum production rate of any country much less India. A large portion of countries power comes from coal production and oil, changing prices of these commodity affects the production rates. Researches similar to one conducted for Indian conditions were also conducted for European nations [3][4][6]. Their primary findings were, the seasonal changes and the change in this pattern across Europe has demanded more power to be produced. The wind energy generation in Europe is down and European nation’s policy of reducing nuclear power usage in power generation. The above mentioned factors causing increase in oil and coal prices. Recovery from a pandemic has being rapid which is also causing rise in demand for energy. Climate changes policy that has been implemented has affected every European country’s production capacity and will need time to reach back to its normal production rates. Not just Europe and India, draughts in countries like china and brazil have hampered hydro-electric generation.

Power crisis also has affected china’s dream to dominate the world as a “Industrial super power”, their long term goals and short term realities have been redrawn as an aftermath of this global power crisis [5]. China’s “Dual control “policy which is implemented to curb the intensity of the energy usage has been one of the factors of low energy production rates. There is also a theory of local industries rationing power to bounce back after lockdowns which is causing power shortage across china. The supply of coal has gone down because of stricter inspections and rules in coal mines across china, as a part of their climate change initiative.

Floods in Indonesia and ban on Australian imports are another reason for lack of supply. China is trying to combat this by implementing measures to protect the industries and public from such power cuts in future [5]. Price reforms are being placed into all coal based power sectors to help access to power, permission to increase in the rate of production(coal), ramping up the construction works of solar and wind plants as alternative in such drastic events (pandemic, floods, draught etc.). Focus on solar energy by 2060 as climate change policy target set by china. Not just in china, the world is investing into solar energy, 22 Giga Watts of renewable energy was the target by the world as of 2013 [2]. India are also on the offensive to combat climate changes effect on energy generation. The next step is to make masses aware of solar energy and its benefits, as many don't indulge in the usage of solar/renewable energy [2]. Majorly know solar use in public is water heater, but heating is a big component of energy usage in fact one of the biggest need for energy in the form of cooking, water heating, drying and temperature maintenance during winter months. Corporate sector and the normal household's both participate in usage of energy for heat, but most of the needs are met by LPG. Only 19% of population is using solar lights which can be a contributing factor in helping the load on the power grids. Solar energy will cut down the electric city bill and cost of energy production, but needs time and investment to match up the production needs of a vast country like India.

III. METHODOLOGY

A. Data Collection

a. The data is collected using "Export from twitter search" in NodeXL. For, this study we obtained various hastags that were used by the users in the community. Hashtags are the words that are prefixed with '#' symbol that signifies a situation or topic which is on trend. Various hashtags were #powercrisis, #powercut, #coalshortage, #heatwaveinIndia, #electricitycut. There are many actors in the network which included common people, reputed celebrities, politicians, media. This study, basically concentrates on two majorly used hashtag: #powercrisis and #coalshortage. For each hashtag a sample of 150 tweets were collected.

B. Data Cleaning

As there were repeated nodes on the edges,we used merge edges using weights in NodeXL to reduce the repeated edges. Even though, the edges count is reduced, the data is not lost as the total edge weight gives the same data.

C. Data Analysis

Social Media Analysis(SNA) was used to investigate through the data through metrics and graphs. Graphs are drawn using various algorithms. Few metrics that we used to analyse our collected data were degree centrality includes indegree and outdegree, betweenness centrality, closeness centrality. Indegree gives the information about the incoming edges to a node. A node or a user with most incoming edges is termed to be popular in the network. Similarly, outdegree means the outgoing edges from the

node. The user withmost outdegree is termed to be influential in the network. Betweenness Centrality gives information about how much important a user is in the network. Closeness Centrality provides information of how close or the shortest connection a user have with the other users in the network.

IV. RESULTS

The 150 tweets on #powercrisis and #coalshortage is collected. Analysis is done separately for both the hashtags.

A. Social Network Analysis on hashtag #powercrisis

1. The data includes 176 vertices and 193 edges(193 unique and no duplicate).NodeXL graph for #powercrisis is prepared using Fruchterman-Reingo algorithm. The graph gives an idea of how the people form a network and communicate among themselves using tweets, mentions(includes retweets) and replies. Graph is represented in Figure 1.

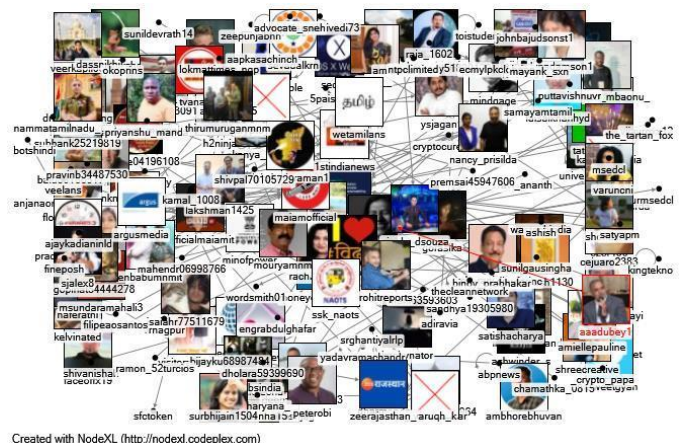


Fig 1.NodeXL Graph for hashtag #powercrisis

After applying graphs metrics, we get data in Table 1 that contains details like, number of vertices(actors), no of unique edges(mentions, replies), self loop(tweets), graph type ,etc.

TABLE 1:OVERALL METRICS FOR HASHTAG #POWERCRISIS

Graph Metric	Value
Graph Type	Directed
Vertices	176
Unique Edges	193
Edges With Duplicates	0
Total Edges	193
Self-Loops	31
Reciprocated Vertex Pair Ratio	0.00621118
Reciprocated Edge Ratio	0.012345679
Connected Components	52
Single-Vertex Connected Components	18
Maximum Vertices in a Connected Component	32
Maximum Edges in a Connected Component	38
Maximum Geodesic Distance (Diameter)	4
Average Geodesic Distance	1.656455
Graph Density	0.00525974
Modularity	Not Applicable

2.Then the insights from the graph are drawn. network.According to the graph, climate\_mission is

popular as it has more incoming edges. From the graph, we can analyse that, @tusharbrahmank2 is influential as he has most outdegree. From the graph, we can analyse that @climate\_mission is most important in the network, as he has highest betweenness value .The maximum and minimum values of Degree,Betweenness and Closeness Centrality is given in Table 2.

TABLE 2:MAXIMUM AND MINIMUM VALUES OF METRICS

Metrics	Minimum	Maximum
In-degree	0	31
Out-degree	0	8
Betweenness Centrality	0	930
Closeness Centrality	0	1

3. The betweenness frequency graph for the hashtag #powercrisis is given in the Figure 2

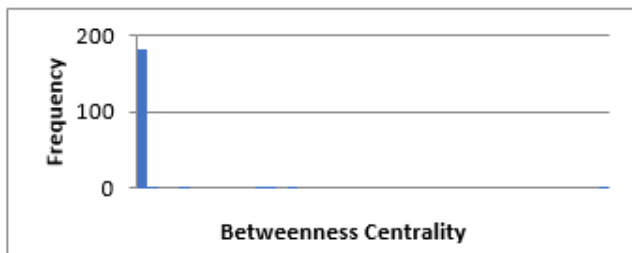


Fig 2.Frequency Graph for Between Centrality of hashtag #powercrisis

B. Social Network Analysis on hashtag #coalshortage

1. There were 169 vertices and 167 unique edges for the data collected on hashtag #coalshortage . The NodeXL graph is drawn using Fruchterman-Reingo algorithm. The graph is given in Figure 3.

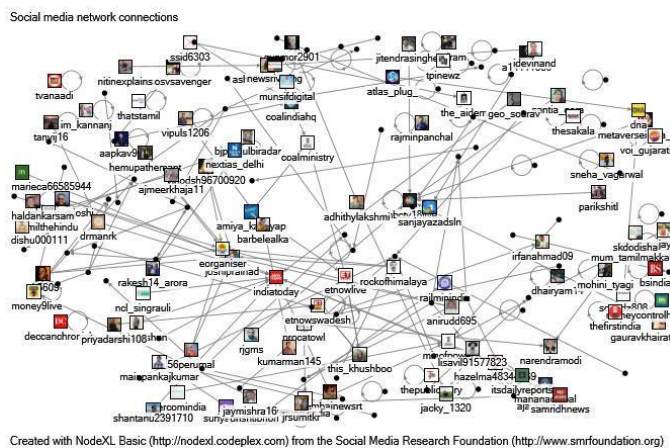


Fig 3.NodeXL Graph for hashtag #coalshortage

2. The overall metrics are calculated to the collected data.The overall metrics table will look like Table 3.

TABLE 3:OVERALL METRICS FOR HASHTAG #COALSHORTAGE

Graph Metric	Value
Graph Type	Directed
Vertices	169
Unique Edges	167
Edges With Duplicates	0
Total Edges	167
Self-Loops	50
Reciprocated Vertex Pair Ratio	0.026315789
Reciprocated Edge Ratio	0.051282051
Connected Components	70
Single-Vertex Connected Components	37
Maximum Vertices in a Connected Component	11
Maximum Edges in a Connected Component	15
Maximum Geodesic Distance (Diameter)	6
Average Geodesic Distance	1.387223
Graph Density	0.004120879
Modularity	Not Applicable

a) According to the graph, @ indiatoday is popular with more incoming edges, @vermadaksha2000 is influential with the most outdegree and @indiatoday acts as a bridge in the network and also important in the network. The minimum and maximum values of metrics like Indegree, Outdegree, Betweenness and Closeness Centrality is given in the Table 4.

TABLE 4 :MAXIMUM AND MINIMUM VALUES OF METRICS

Metrics	Minimum	Maximum
In-degree	0	10
Out-degree	0	4
Betweenness Centrality	0	90
Closeness Centrality	0	1

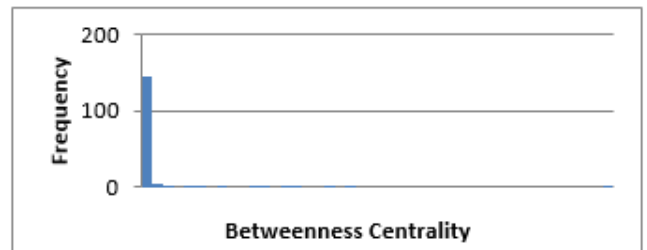


Fig 2.Frequency Graph for Between Centrality of hashtag #coalshortage

V. CONCLUSION

The data obtained from the social media network are very influential, but still quite difficult to perform research on it. Twitter one of the widely used social media platform, attracts researchers and helps the researchers to collect a huge amount of data. The data collected was using hashtags #powercrisis and #coalshortage. These hashtags were the result of the people or users of Twitter sharing their thoughts about the current power crisis of the country. There were also visual representation of analysis that gave insights of how people were influencing others and also how popular they were. From, analysis we could say that, even though people shared thoughts and their situation from the powercrisis , the government and its authorities are not taking that much measures to prevent or reduce the effects of power shortage. Instead, it burdened the people with frequent and long term load shedding.

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