# Energy Conversation on Alternative Energy
# World perspective vs Bangladesh

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## Abstract

The severity of climate change is hitting all of us, so we thought about what part a developing country can play, what resources they have compared to the developed ones, and what their actions have been.
We specifically looked at alternative energy (AE) in the global south, such as Bangladesh, and their position in the upcoming AE movement. Then we compared this with the initiatives taken by the countries in front of the movement. Results revealed that Bangladesh is fulfilling its basic energy needs and has plans set in motion to participate in the AE movement in the coming years.

## Introduction

There is growing global recognition of the need to transition from fossil fuels towards alternative energy sources to address the challenges of climate change. As a result, many countries around the world have committed to increasing the use of renewable energy and reducing their reliance on fossil fuels as part of their efforts to address these challenges.
Some alternative energy sources with widespread adoption are:
1. Solar energy : Solar energy is generated using photovoltaic panels, which convert sunlight into electricity. It is widely considered one of the most promising energy sources due to its low cost and high abundance.
2. Wind energy : Wind energy is generated using wind turbines, converting the wind's kinetic energy to electricity.
3. Hydropower : Hydropower is produced by harnessing the energy of moving water.
4. Hydrogen energy : This is considered one of the cleanest energy sources, as it can be generated through electrolysis using electricity from renewable sources such as solar or wind. It is also a brilliant option for energy storage.
5. Lithium energy : Lithium is primarily used in batteries and is a very popular energy storage system. It can be seen used in electric vehicles.
There are other AE sources, such as geothermal and biomass, but we will be looking at Solar, hydrogen, and Lithium from Worlds perspective and how Bangladesh is doing.

## Materials

Google Colaboratory, Twitter database, Python, Topic Modeling, pyLDAvis, gensim, Excel.

## Methodology

With the help of Professor Chun, we collected 60,000 tweets using Google Colab and Python. The program scraped Twitter, collecting tweets from the past two years on the topic of Lithium energy and Solar energy.

The tweets were cleaned of all the #,@, emojis and links. With the cleaned dataset, we ran visualizations using pyLDAvis ML Principal component analysis(PCA) to perform a dimensionality reduction on the dataset so we could visualize latent topical structure more simply.

## Methodology (Contd.)

We used topic modeling, an application of natural language processing, a statistical model used to find hidden topics within a group of text. The topic modeling program LDA (Latent Dirichlet Allocation) finds the probability of hidden groups, different topics, and insights, by searching the data set (in this case, tweets) for common words and word frequency. Then, we reviewed the generated topics and labeled them. Finally, we used our context of the world and labeled them appropriately to fit what they are likely being used to talk about inside of them.

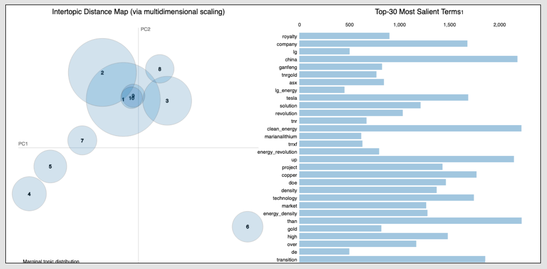


Fig 1: Topic modeling using pyLDAvis and PCA. Top 30 terms that came up during our program runtime and how the topics overlap. This is on the search term Lithium energy.

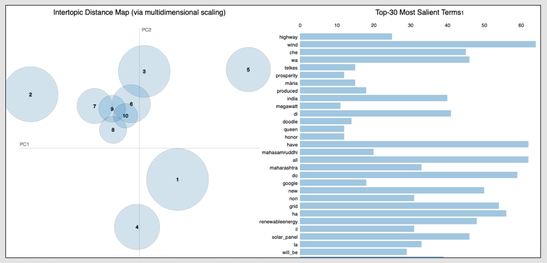


Fig 2: Topic modeling using pyLDAvis and PCA. Top 30 terms that came up during our program runtime and how the topics overlap. This is on the search term Solar energy.

Then we used the annual reports from the Ministry of Power, Energy and Mineral Resources of Bangladesh and the Bangladesh Energy Regulatory Commission to analyze their current standing regarding energy supply, storage, and usage.

## Results and Analysis

The results of the topic modeling and the analysis of the tweets collected are given below. Ten topics were generated on each search term, from which we picked out the most unified and interesting one and then labeled the group with a title that best described what was inside. The topics showed different viewpoints on Lithium energy and then Solar energy.

Lithium Energy

•Tesla and the energy revolution

*Top words for topic #1:
(royalty, ganfeng, trrxf, revolution, lit, marianalithium, tsla, energy_revolution, batt, transition, company)

This is an interesting group because tesla is a company that brought a revolution to the electric vehicle market and many people are shifting to alternative energy because of that. We saw Mariana lithium in the word list as well since this is a project located in Argentina that is one of the biggest lithium brine deposits in the world.

The top 30 most salient terms in pyLDAvis visualization (refer to fig 1) showed that similar terms were there alongside China, transition, clean energy, fossil, oil, and copper, which led me to believe that China is also joining the transitioning of energy resources and using Lithium energy as a viable option. The revolution is cutting out fossil fuels since they damage our environment.

Solar Energy

- Solar panel and grid

*Top words for topic #0:
(highway, panel, solar_panel, produced, Maharashtra, megawatt, battery, grid, wind, electricity)

This group had the most relevancy of the search term Solar energy because we can see that "Solar Panel" had been used a lot in the tweets. Solar panels use photovoltaic cells that transform solar energy into usable electricity, both off -grid and on -grid. The justification of wind here can be related to the renewable energy tweet, where both solar panels and wind were addressed. India is making strides in Solar energy as a world leader with massive electricity demand. Hence, it can be understood that a province's name came up here in the top words.

The top 30 most salient terms in pyLDAvis visualization (refer to fig 2) showed me that similar terms were there alongside India, new, renewable energy which reaffirms that Solar energy is gaining a lot of traction especially from India since it is low cost and can be made in abundance which provides people with electricity efficiently.

The annual report from the Power Division showed that Bangladesh had improved its electricity production to 25,411 MW, which made energy accessibility 100% for the population. The majority (55%) of that electricity came from the private and industrial sectors, which can be seen as a sign of transformation from donor financing to investment financing.

51% of this electricity production came from natural gas (non-renewable), which put pressure on the already depleting natural gas reserve of the country. Moreover, the inefficient gas mining tools were not helping since foreign companies could more efficiently mine gas than governmental entities. This insufficient gas in reserve led to importing gas from outside to satisfy demand in exchange for foreign reserves.

The T&D (transmission and distribution ) infrastructure had been established, and they were working on quality and reliability enhancement. For sustainable energy security, Bangladesh was diversifying the primary energy sources integrating coal, Renewable energy, and nuclear energy system. Looking at the energy mix present, we saw that a total of 3% share of Alternate energy was found, considering Off-grid and on-grid Solar. They were the global leader in installing Solar Home systems, which provided Off-grid solar to remote areas.

Wind mapping had been done, and a prospect to produce 20,000 MW from wind sources had been established. Initiatives have been taken to explore the potential for hydrogen energy, including the development of hydrogen fuel cell technology for use in vehicles and stationary power systems.

Bangladesh has been exploring the potential for lithium -ion batteries to store and use renewable energy, including solar and wind energy. The country had also been looking at the potential for using lithium in battery storage systems to help stabilize the grid and improve the reliability of the electricity supply.

As we can see from the pie-chart in fig 3, Renewable and Alternate Energy sources are only 1.01% of the national grid of Bangladesh. So that means the findings from Twitter are not that relevant for Bangladesh.

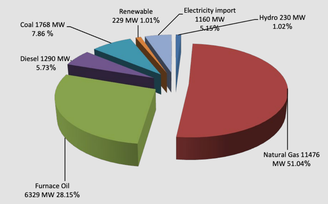


Fig 3: On-grid Energy mix of Bangladesh

## Conclusion

Lithium is a crucial component of lithium -ion batteries, which are considered heavily for energy storage systems. Countries with significant lithium resources, like Argentina, would benefit from it, as seen in the topic modeling. Solar has been widely adopted as well. Bangladesh is progressing very fast and focusing on its generation capacity, access to electricity, T&D, and Pricing. However, adopting Alternative Energy is a bit far now for Bangladesh.

## Future and Ethics Statement

With more time, computing and especially access to propriety data on the global alternative energy sector and Bangladesh, we would expand this research as follows:

•Dichotomy plot of sentiment analysis on different alternative energy sources between the World and Bangladesh
•Augment the Twitter dataset with new social media data from Facebook(Facebook is very popular in Bangladesh)

This project is done by a human.

## References/Acknowledgements

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- https://bpdb.gov.bd/
- http://www.berc.org.bd/