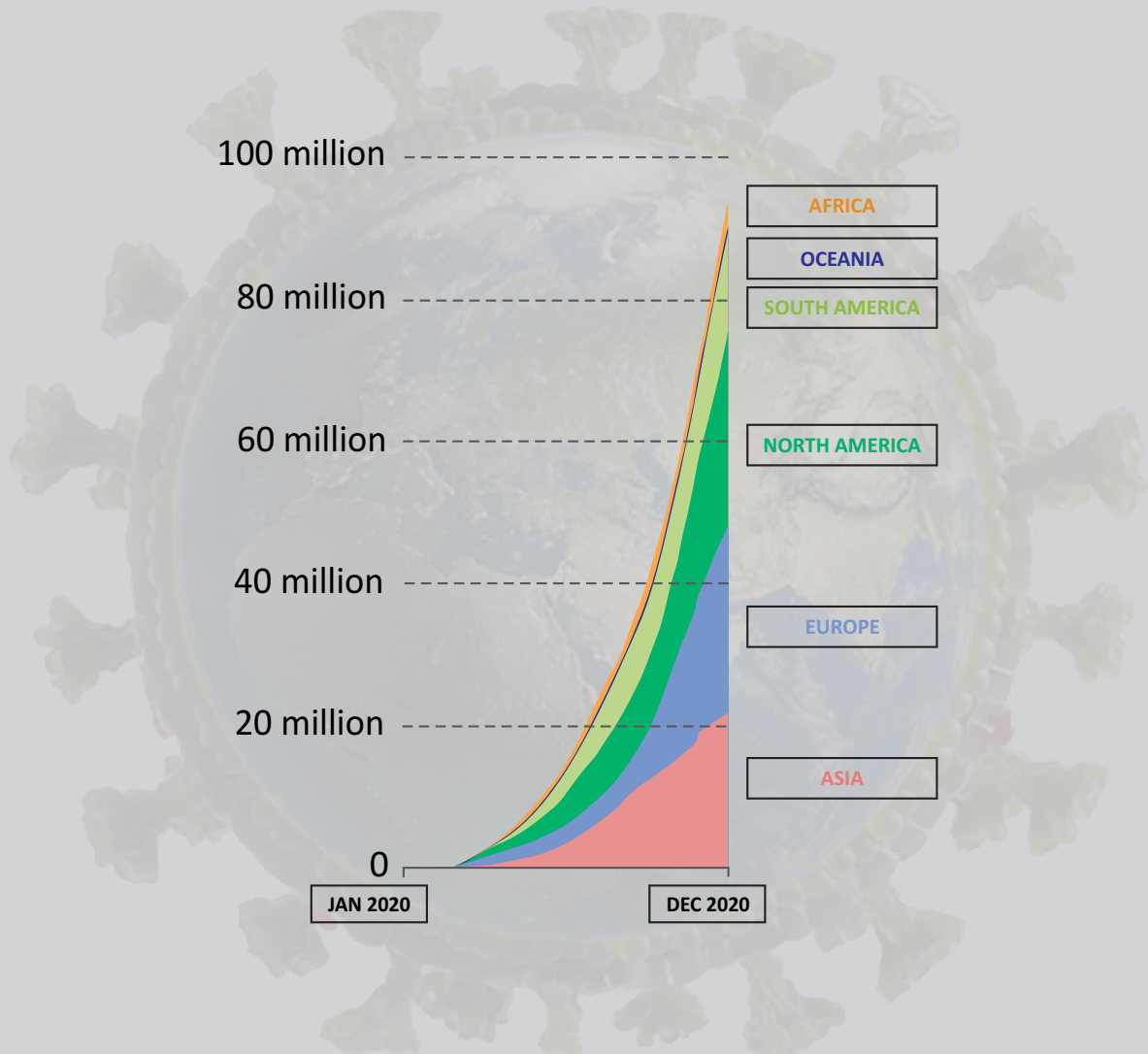


VASUDHA



**An Annual Publication of the
Department of Geography
Shri Shikshayatan College, Kolkata
December, 2020
Volume No. 12**

VASUDHA

*An Annual Publication of the
Department of Geography
Shri Shikshayatan College, Kolkata
December 2020
Volume No. 12*



SHRI SHIKSHAYATAN COLLEGE
KOLKATA

CONTENTS

FACULTY SECTION :

- **A SMALL SLICE OF TIME AT A TEA ESTATE.....AND MEMORIES OF A LIFETIME :** 1
Dr Nivedita Roy Barman, Associate Professor, Department of Geography

ALUMNI SECTION :

- **SOCIO-ECONOMIC AND DEMOGRAPHIC PROFILE OF THE UNDOCUMENTED BANGLADESHI MIGRANTS IN KOLKATA :** 6
Dr. Ankita Siddhanta, Manager (Monitoring & Evaluation), IPE Global, New Delhi

STUDENTS' SECTION :

- **EARTH RESPONSIBLE FOR RUST ON THE MOON :** Arna Ghosh, Class of 2021 12
- **THE GREAT BLUE HOLE OF BELIZE :** Puspika Das, Class of 2021 14
- **TRAVELLING THROUGH THE FOLIAGE :** Rajanya Manna, Class of 2021 16
- **THE MASSIVE CRATER IN SIBERIA :** Shaoni Das, Class of 2021 18
- **THE FLY RANCH GEYSER :** Sreoshi Bhattacharyya, Class of 2021 19
- **CLIMATE CRISIS :** Udita Chowdhury, Class of 2021 21
- **UNDERSTANDING THE MAP OF HAPPINESS (WHY IS INDIA SAD?) :** 23
Adrija Sengupta, Class of 2022
- **COULD SOLAR STORMS DESTROY CIVILISATION :** Ahelee Bera, Class of 2022 26
- **GREAT CURTAINS OF DELICATE LIGHT :** Amrita Datta, Class of 2022 28
- **MISERY OF A PARADISE :** Debanjalee Dutta, Class of 2022 30
- **VOLCANIC LIGHTNINGS :** Fatma Arshad, Class of 2022 32
- **OCEAN ACIDIFICATION AND IT'S EFFECT :** Koyena Das, Class of 2022 34
- **BLACK SUMMER AUSTRALIAN BUSHFIRE (2019-2020) :** 36
Rajeshwari Chakraborty, Class of 2022
- **ONE DAY TOUR TO A CLANDESTINE ISLAND-MOUSUNI :** Shreya Das, Class of 2022 38
- **THE MIRROR WORLD OF MANIPUR :** Soumi Kayari, Class of 2022 40
- **THE CATASTROPHIC YEAR -2020 :** Vartika Banerjee, Class of 2022 42
- **CYCLONE AMPHAN AND IT'S EFFECTS IN WESTBENGAL :** 45
Udita Bhattacharyya, Class of 2023

DEPARTMENTAL TOUR AND ACTIVITIES :

- **FIELD REPORT : INFLUENCE OF THE PHYSICAL SETTING ON THE SOCIO-ECONOMIC LIFE OF MAN IN CHORDA PURULIYA DISTRICT :** 48
Enakshi Mukherjee, Class of 2020
- **PHOTO GALLERY OF DEPARTMENTAL ACTIVITIES, 2020** 52

Published by : Department of Geography, Shri Shikshayatan College

Editor : Dr. N Roy Barman

Cover : Source : Johns Hopkins University CSSE COVID-19 Data –
Last updated 2 April, 06:03 (London time)
OurWorldInData.org/coronavirus • CC BY

Printed by : Pratirup, 35 Nandana Park, Kolkata 700034

EDITORIAL

The 12th volume of VASUDHA has come to you after passing through a full year of one of the most difficult times in human history. Starting just about a year ago, the COVID-19 pandemic virtually challenged the advent of *Homo sapiens* as a race, as we strived to keep ourselves safe from the contagious viral disease that engulfed the whole world, from the narrow confines of our homes. Stringent lockdowns all over India and large parts of Europe and America brought life virtually to a stand still for many months. Transportations in every mode stopped, offices closed down and finally our education field also had to close down the traditional way of learning in classes physically, as we transitioned into a full “online mode” of teaching.

However, all this hasn't changed our resolve at the Department of Geography and we still have articles of various kinds published online this year. As you all can imagine, it hasn't made things easier this year, but we all have tried our best to continue the practice of sharing our views, knowledge and information through VASUDHA. A completely “online” educational experience is not the same as that with the human touch, but we had to adapt to the demands of the pandemic in the shorter term. The faculty, alumni and students of our department have come together once again and kept the flow of ideas and intellect going, even if from safe boundaries of our homes. It is a moment to salute the indomitable spirit of us as humans, as also the key contributors of our department who have made it possible to bring out VASUDHA this year. We take this opportunity to once again thank our Principal Dr. Aditi Dey, for being our constant source of inspiration and guiding light.

Wishing everyone good health and safety in the times of this pandemic, as we pledge to abide by the protocols of the pandemic strictly. We shall always endeavor for continuing and furthering the tradition of knowledge sharing through VASUDHA in future. The show must go on!



A SMALL SLICE OF TIME AT A TEA ESTATE..... AND MEMORIES OF A LIFETIME

Dr. Nivedita Roy Barman, Associate Professor, Department of Geography

A year-long boredom of staying indoors and the sheer frustration of not being able to venture out for fear of contracting Covid-19, took its toll on our minds. As the news of a decreasing load of the pandemic started hitting the news channels from end of 2020, we were desperate to go out and defy our “lives in prison”. As good Kolkatans, we predictably rooted for Darjeeling. However, we wanted to mix a short stay in a tea estate with that of the usual flavour of West Bengal's most popular hill station this time. Accordingly, we zeroed in on Ging Tea Estate, located in the Lebong Valley, 10 kms north-east of Darjeeling.

On the flight to Bagdogra I volunteered to sit in the middle seat, just to get a dash of novelty and culminate the humdrum of a year-long Covid-centric thoughts into something memorable, by putting on the white “Personal Protective Equipment” kit (fondly called PPE). Although I was feeling excited in the beginning, I realized soon enough as the wheels of the flight rolled on for a take-off, that this was not as much fun as I thought it to be. It was pretty warm inside that deceptive white cloak and I never wished for a quicker landing before, as I did then! However, as we touched down at Bagdogra airport following a 55 minutes flight, I could happily utter a “good riddance to bad rubbish” before throwing the murderous white cloak into a designated bin. In a very well maintained SUV waiting for us, we started for Ging Tea House, our coveted destination.

We planned to divide the entire 3.5 hours journey to Ging by stopping for refreshments, as the winding roads of the hills and the fresh mountainous air stoked our appetite considerably. We stopped at “Margaret Deck”, a beautiful café promoted by two of the reputed tea gardens viz. Goodrick and Margaret's Hope.



The entry to the café reminded one in every step of the elegance of tea drinking, as we went up to the really gorgeous “deck” having a few seats in the open and overlooking the tea garden and forest below. The largest part of the café was, however, within the glass-clad enclosure having really comfortable seats. We ordered for Castleton first flush tea in pots and some brownies from the creative menu displayed on old long-playing records. The nice view mingled seamlessly with the elegant ambience and exuded the quality of bespoke café services with such gentle assertiveness, which we don't get to see in the plains. The last leg of the journey to Ging was even better as we followed the winding roads up into the town of Darjeeling, followed by a little down on the incline for half an hour, as we entered into the Ging Tea Estate (27°N; 88°E).



The beautiful colonial building where we would spend the next three days, was standing with its immaculate embellishments in stucco and white-and-pink colour. Ushered in by a pack of well-trained polite staff, we walked into a spotlessly clean guest house which must have been decorated by people having a nice, cultured taste. The aesthetic appeal of the squeaky clean marble steps and floors, enhanced further by the soft furnishings and retro paintings

reminiscent of the British age, as well as appropriate furniture designed with lot of thought, blew us apart! The rooms were large and spacious, with appropriately large toilets and having intricate lace and crochet work even on toilet paper holders! The bed mattress could be warmed up through an electric switch, which we appreciated very much as the temperature dropped down to 3⁰C at night.

Happy as we were at the thought of spending the next three days in regal luxury, we rushed out to cross the beautifully maintained lawn into the deck outside with chairs and tables, which looked straight up into the majestic mountain range and azure sky in front, with the tea garden sloping downwards. It was a marvelous sight to have! As the polite staff brought us Ging's first flush tea and coffee at the deck, we just lost count of time and enjoyed the beautiful sight with its magical tranquility until the temperature started dropping, with the sun showing every indication of calling it a day.



An evening “adda” by the fire place while nibbling at the tasty snacks we ordered, added to our sense of fulfilment. The entire bungalow had a retro-elegance about it, with typical old British artefacts and

paintings that tickled a sense of false déjà vu as we wondered how this place felt about a century ago. A lovely dinner cooked as per order ended with a soufflé to die for, marking the perfect ending to the first day as we went to sleep snugly into the warmed-up beds in the large royal rooms.

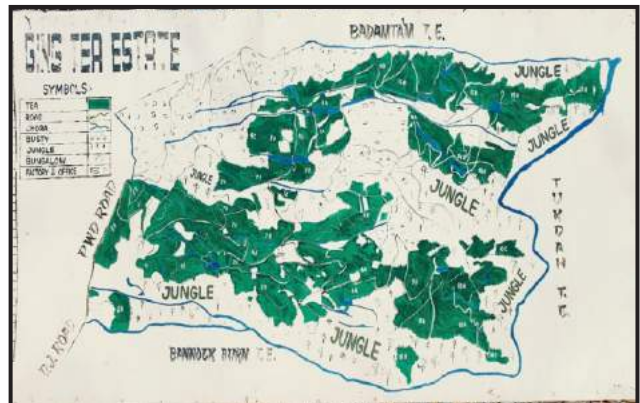
The next two days were spent in really regal luxury as we gazed at the morning sun from the deck, sipping the hot first flush tea from pots made of exquisite china. We continued the breakfast there as well, and were convinced that if one had nothing to do, this was the best place to be. Doing nothing



couldn't be more enjoyable anywhere else. However, some of us just wanted to make sure that we don't get too engrossed into doing nothing for long. So we went out with our dedicated car and driver for a tour of the tea estate. As we drove through the winding roads towards it, we luckily got a clear view of the Kanchenjunga on the way, for which we stopped and clicked about a million pictures.

The world's 3rd highest peak, Kanchenjunga of the Darjeeling Himalayan region rises to an elevation of 8,586m. It is also locally called the 'Sleeping Buddha' because of the composite profile etched along the skyline.

The Ging Tea Garden is located in Pulbazar CD Block in north Darjeeling. Established in 1864, the estate is spread over an area of 632.14 hectares, ranging from 650-1500m in elevation with a total population of approximately 6000 persons. It is a certified producer of organic tea in Darjeeling.



The tea estate boasts of a six bedded small hospital, residences of the Manager and Assistant Manager, as well as a small school called Badamtam Primary and High School. The rest of the estate consisted of the tea gardens (marked in green in the map), jungles and the winding mountainous roads. Most of the residents of the area worked in the tea estate and led a quiet life that started a little late every day and ended with the sunset around 5 pm. However the younger generation has moved out for working in the Indian army and other government jobs.



The tea gardens finally led to a jungle area at the outer boundary of the estate. Darjeeling being a part of the Eastern Himalayas, the flora essentially comprises deciduous forests of sal and oak. This is where the car came to a halt as we had to start a trek through the forest trail which led us to the bank of River Rangit, a tributary of the River Tista. Sandstone and conglomerate formations were seen all along the river bank, which were primarily the solidified detritus of the Himalayan range.

The clear water of the Rangit is bordered by forests on one side and mountains on the other, giving the basin a divine character that many other tourists went to experience. It was truly a picturesque view with a bridge connecting West Bengal with Sikkim. We crossed over the bridge in Majitar and stepped into Sikkim to see a few small local shops, as people lazed around looking with little curiosity at tourists like us.



After spending time on long photo sessions around this place, we drove back to Ging to have a scrumptious lunch, followed by another session of “doing nothing” at the deck with intermittent supply of good quality Darjeeling Tea and coffee. We did walk around our guest house one day, climbing the steep inclines of the hilly roads, but couldn't stretch our sojourn too far for lack of appropriate muscle power and willingness. However, the stay at Ging has undoubtedly been one of the best experiences

any of us ever had in India or abroad in our lifetime. The décor, comfort, services and above all, the fantastic setting in which the Ging Tea House is located, are not easily imitable.

All good things come to an end. We knew it and led credence to it as we reluctantly got into the car at the end of the dreamy three days. We spent a day in Darjeeling city centre, with Glenary's chocolates, dinner and confectionaries; Keventer's hot chocolate; and the mall road's inimitable flavour with tourists, horses and shops around it. However, the memories of Ging were too strong in our minds to let go of and we willfully allowed ourselves to spend a night in Darjeeling in a partially pensive state, always longing to go back to that beautiful Ging's Tea House and “do nothing”!



SOCIO-ECONOMIC AND DEMOGRAPHIC PROFILE OF THE UNDOCUMENTED BANGLADESHI MIGRANTS IN KOLKATA

Dr. Ankita Siddhanta; *Manager (Monitoring & Evaluation), IPE Global, New Delhi*

Background

Historically, India has played host for many nations throughout the world- covering countries from West, middle east and itsneighbours. Till now, being the most developed of all the South Asian countries, India has been a highly sought-after destination by immigrants from neighbouring nations. India shares a long international boundary with Bangladesh, of which a major portion is fenceless, making it porous and easy to infiltrate. According to Behera (2011), one of the causal factors behind this huge stream of Bangladeshi migrants coming to India is that West Bengal shares a long stretch of border with Bangladesh. Geographical contiguity, socio-cultural affinity and the kinship factors have been the major driving force, which have left the Indo-Bangladesh border vulnerable to infiltration. Over the years lakhs of Bangladeshi people have crossed over into Indian territory and a major crux of them have stayed back in West Bengal which is ethnically closest to Bangladesh(Paul, 2011). For Bangladeshi migrants, the main pulling factor is better economic opportunities in India. The migrants moving to a new environment face various kinds of obstacles in the form of loneliness, depression, language barriers, risky and dangerous work, housing conditions, violence and harassment. Further, they may be unable or unwilling to access health and social services because of government restrictions and discriminatory attitudes and behaviour. All these vulnerabilities get heightened when the migration is illegal or unauthorized (Samuels et al., 2011).

Details of The Current Research

This paper highlights the socio-economic and demographic profile of undocumented Bangladeshi migrants residing in Kolkata. This current research paper is a subset of broader doctoral research study done by the author on Context of mobility and STI/HIV vulnerability of undocumented Bangladeshi Migrants in Kolkata, India. In social science research, background characteristics of respondents play a significant role in determining and drawing inference from the main research outcomes. In the broader study, information on basic characteristics of female and male migrants was therefore essential for understanding the context of mobility of the undocumented migrants and their STI/HIV vulnerability at destination.

Data and Methods

This study was carried out in Kolkata. Kolkata, the capital city of West Bengal, is traditionally known as the most migrant receiving city for easy availability of infrastructural facilities especially related to health and education. Not only immigrants from within the state and other states, but Kolkata is also the highest receiver of migrants from other countries as well. Most of the international migrants are from neighbouring countries, especially from Bangladesh.

Within Kolkata, the Bangladeshi migrant population is not evenly distributed. They are concentrated in some pockets of Madhyamgram, Garden Reach, Barasat, Machhalandpur, Cossipore, Rajabazar etc. They are also found in the transit areas of Bongaon and Petrapole. This study was conducted in two selected areas - Garden Reach (situated in proper Kolkata) and Madhyamgram (suburban of Metropolitan City **Kolkata** and nearer to transit areas of Bongaon and Petrapole). Madhyamgram and Garden Reach were therefore selected purposively because most Bangladeshi migrants are concentrated here.

The study was exploratory in nature and was based on primary data collected in the year 2015–2016. A total of 200 respondents (100 males and 100 females) from Madhyamgram and 200 respondents (100 males and 100 females) from Garden Reach areas in the city of Kolkata were interviewed for the study. The data was collected by using Respondent-Driven Sampling. This kind of sampling combines 'snowball sampling' with a mathematical model that weights the sample to compensate for the fact that the sample was collected in a non-random way (Heckathorn, 1997). It is a widely used method for sampling from hard-to-reach human populations, especially from groups that are the most at-risk. Respondent driven sampling was beneficial for mapping and interviewing the undocumented Bangladeshi migrants and for completing the study among them (Siddhanta and Singh, 2017).

The selected respondents were any male or female Bangladeshi migrant in the age group 15–49 and who are staying at the place for at least last three months and who have gone to Bangladesh at least once in the last three to four years.

A combination of quantitative and qualitative methods of data collection was adopted in this study. In this current paper, descriptive statistics has been performed to analyse the background profile of the migrants. Statistical software of SPSS 20 was used for analysis.

Profiling The Undocumented Bangladeshi Migrants

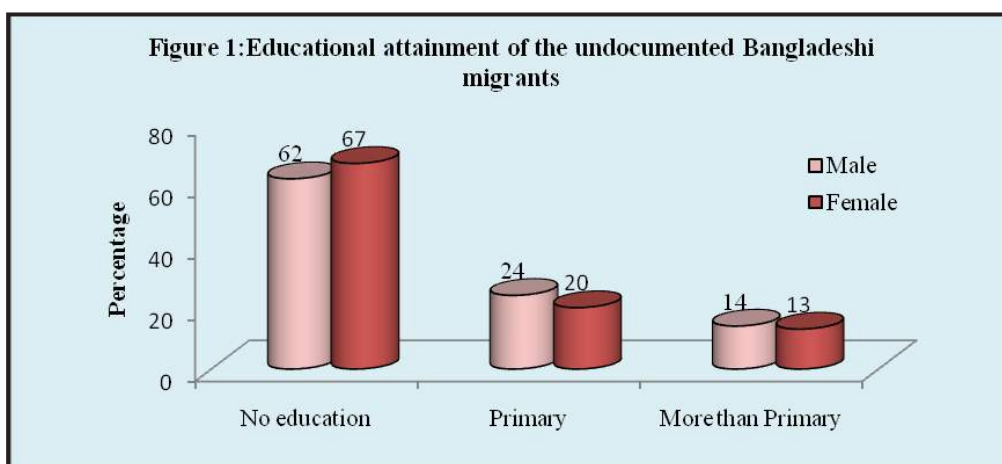
Socio-economic and demographic characteristics of the undocumented migrants and separately for male and female undocumented Bangladeshi migrants has been presented in this paper. These background characteristics of the respondents include age, marital status, educational level, age at marriage, mass media exposure, working status, type of work etc. Religion was not considered, since, during the pilot survey it was found that almost all the migrants (matching inclusion criterion) in Madhyamgram and Garden Reech belonged to Muslim community. The researcher did not find any respondents having religious affiliation other than Islam during the main survey also. Age, education, working status, marital status, and mass media exposure are some important indicators of socio-demographic and economic profile of any study population. A detailed description about these profile indicators of the undocumented Bangladeshi migrants staying in Kolkata, India, has been discussed below.

Age

It was found that one-tenth of the migrants (male migrants-6%; female migrants- 15%) belonged to 15-19 years age group while one-third is between 21-29 years (Table 1). Migrants belonging to age groups of 30-39 years and 40 years and above were of equal proportion (28%).

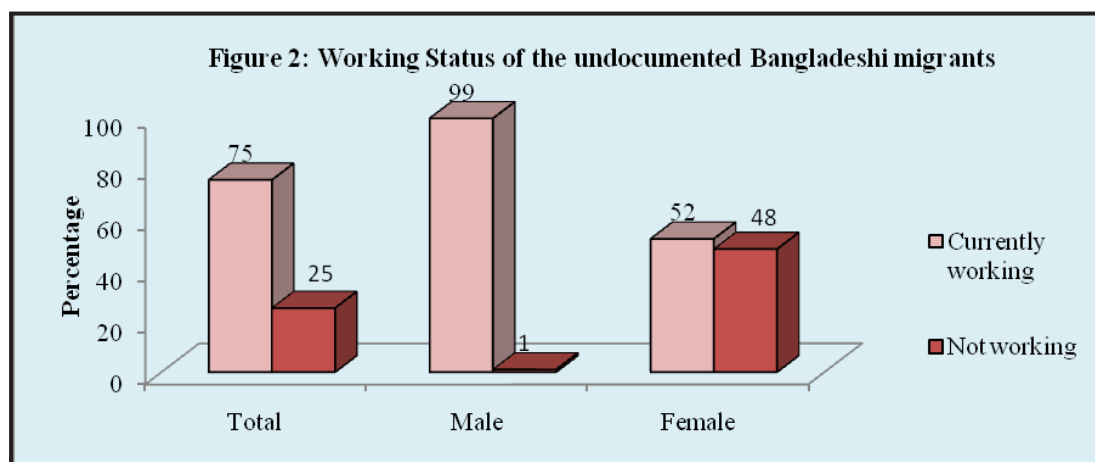
Education

More than three-fifths of undocumented Bangladeshi migrants (64%) had no education and this percentage was a little higher among the female migrants. Only 22percent migrants (male migrants-24%; female migrants-20%) had education upto primary level and a little more than one-tenth had above primary level education. The highest education attained by the male migrants was till tenth standard (8%) and for the female migrants was ninth standard (7%).



Working Status Of The Migrants

Among the undocumented migrants, three-fourths were 'currently' working while a quarter of them were not working. More specifically, almost all the male migrants (99%) were currently engaged in income generating activities as compared to only half of the female migrants. But it was also found that, many female migrants worked at their home in exchange of kind in most of the cases. Some of the female migrants were seen making bidi or stitching clothes in exchange of rice/cereals or room rent.



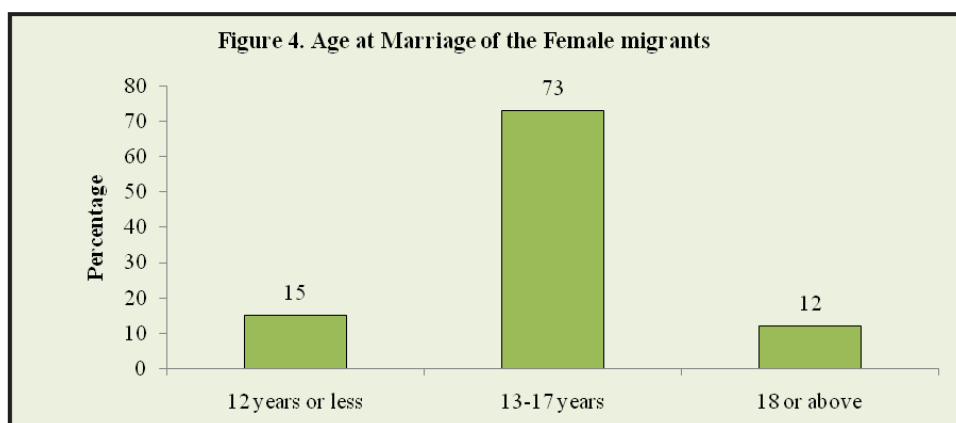
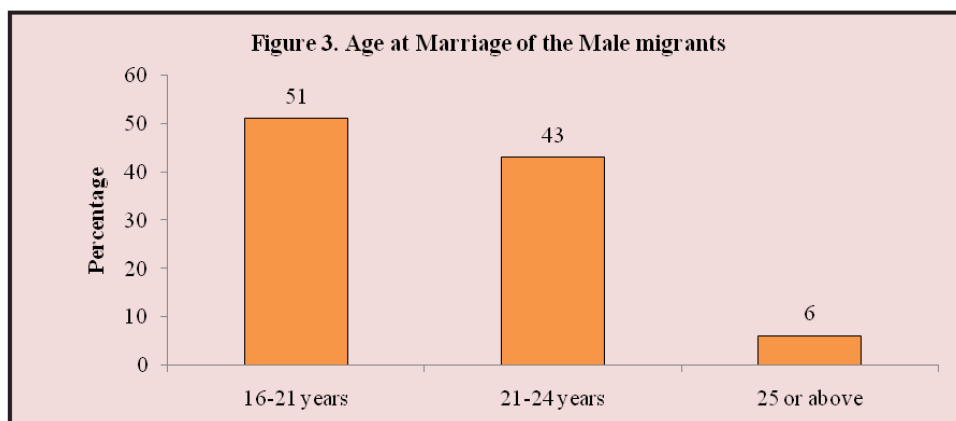
Type Of Work

When type of work is considered, it was found that among all the migrants, more than half of the migrants worked as construction labour, and this percentage was even higher among the male migrants (79%). On the other hand, more than one-tenth of the female migrants worked as domestic

workers or cook. Being in the occupation of van pulling or driving was also common among the male migrants (16%).

Marital Status And Age At Marriage Of The Migrants

Among the male undocumented Bangladeshi migrants, 21percent were never married and almost four-fifths were currently married. Whereas, among the female migrants, almost 95percent were currently married and a few (5.5%) were widowed or separated. Arranged marriage (86%) was the predominant type of marriage among the respondents. Half of the male migrants were married before attaining the legal minimum age at marriage i.e. 21 years. Another 43 percent were married between 21-24 years of age. On the other hand, early marriage was widely prevalent among female migrants; a substantial proportion of female migrants (15%) were married before the age of 12 years, and three-fourths were married at age between 13-17 years of age. The mean age at marriage for the male migrants was 20.8 years and for the female migrants it was 14.8 years. Although majority of the migrants had arranged marriage, around one-tenth of them did love marriage.



Number Of Children

It was found that around 6 percent undocumented Bangladeshi migrants did not have any children while more than three-fifths (64%) had 1-3 children. As high as 30 percent migrants (male migrants-34%; female migrants – 27%) had 4 or more number of children. The mean number of children of the female undocumented migrants was 2.7 while the mean number of pregnancies was 3.7.

Mass Media Exposure Of The Migrants

Mass media exposure scale was constructed on the basis of 5 items concerning exposure to different forms of mass media. The migrants were asked to respond to a statements concerning watching TV, listening to radio or reading newspapers/magazines. Their answers were fitted in answer categories of Never, Once in a month, Once in a fortnight, Once in a week or Daily. The categories of the constructed scale were 'No exposure', 'Low exposure' and 'High exposure'

It was found that mass media exposure was comparatively higher among male migrants than the female migrants. While 17 percent males did not have exposure, it was 35 percent for the female migrants. Proportion having higher media exposure was more among male migrants than among female migrants.

Summary Of Findings

This research paper dealt with the socio- economic and demographic profile of the undocumented Bangladeshi migrants in Kolkata. The key issues emerging from this study has been summarized below.

Age, education and working status are particularly important and basic indicators while studying the socio-demographic and economic profile of a study population. This study observed that, the migrants mainly belonged to middle age groups rather than the younger age groups. Majority of the respondents were not educated, the proportion being higher among the female migrants than the male migrants which may be a reason of their unemployment in their country of origin. It was also observed that work participation was almost universal among the male migrants but was limited among the female migrants which may be because many female migrants come to India accompanying their husbands or family members. The type of work of the migrants also portray that they were mainly involved in blue collar jobs often earning maigre income.

Among the study population, all the female migrants were never married while a substantial portion of the male migrants were never married. Age at marriage among these undocumented Bangladeshi migrants was very low and especially among the female migrants. Most of the female migrants got married before the legal age of marriage and a considerable portion got married even before age of 12 years. The mean age at marriage for the male migrants was much higher than their female counterparts. It is well known that early marriage often exposes women to early as well as multiple pregnancies. This study also found that a substantial proportion of the female migrants had 4 or more children. It was found that most of the migrants were not exposed to mass media, and the proportion was more among the undocumented Bangladeshi female migrants. Low age at marriage, multiple pregnancies and non-exposure to mass media among these migrants especially the female Bangladeshi migrants is an issue of concern and can be linked to poor sexual and reproductive health.

References :

- Behera, S. (2011). Trans-border identities; A study on the impact of Bangladeshi and Nepali migration to India. Indian Council for Research and International Economic Relations (ICRIER) Policy Series,1, 1-31

- Heckathorn, D.D. (1997). Respondent driven sampling: A new approach to the study of hidden populations. *Social Problems*, 44 (2), 174-199.
- Paul, S. (2011, January 14). Illegal immigration: East Bengal in West Bengal, India Today. Retrieved from <http://indiatoday.intoday.in/story/east-bengal+in+west+bengal/1/126587.html>
- Samuels, F., Zarazua, M., Wagle, S., Sultana, T., & Sultana, M. M. (2011). Vulnerabilities of movement : Cross-border mobility between India, Nepal and Bangladesh. ODI Background Notes, London: ODI, 1-12.
- Siddhanta, A and Singh, S.K. (2017). Applying Respondent Driven Sampling for Surveying Cross Border Undocumented Bangladeshi Migrants in Kolkata, India. *Indian Journal of Spatial Sciences*, Vol 8 (1): 41-51.

Table 1: Percent distribution of the undocumented Bangladeshi migrants by their socio-economic and demographic characteristics, Kolkata, India, 2015-2016

Background characteristics	Total (N=400)	Male	
		Migrants (N=200)	Female migrants (N=200)
Age(in completed years)			
15-19	10.3	6.0	14.5
20-29	33.2	35.5	31.0
30-39	28.5	32.5	24.5
40+	28.0	26.0	30.0
Educational attainment			
No education	64.2	62.0	66.5
Primary	22.3	24.0	20.5
More than Primary	13.5	14.0	13.0
Marital Status			
Never married	10.5	21.0	0.0
Currently married	86.3	78.0	94.5
Widowed/Separated	3.3	1.0	5.5
Type of Marriage			
Arranged	88.8	86.1	91.0
Love	11.2	13.9	9.0
Age at Marriage			
Below 15 years/below 21/12 years or below 15-20 /21-24/13-17 years	27.4	50.6	14.5
21 and above/ 25 or above/18 or above	50.5	43.0	73.0
22.1	6.3	12.5	
Number of Children			
No child	5.6	3.8	7.0
1-3 children	64.2	62.0	66.0
4 or more children	30.2	34.2	27.0
Number of Sons			
No son	14.5	13.2	15.5
1-2 sons	69.9	69.7	70.1
3 or more sons	15.6	17.1	14.4
Number of daughters			
No daughter	16.2	8.6	22.5
1-2 daughters	65.8	69.7	62.5
3 or more daughters	18.0	21.7	15.0
Mass media Exposure			
No exposure	26.0	17.0	35.0
Low exposure	58.7	56.0	61.5
High exposure	15.3	27.0	3.5
Work status			
Currently working	75.2	99.0	51.5
Not working	24.8	1.0	48.5
Type of work			
Currently not working	25.3	1.0	49.5
Construction labourer	55.0	79.0	31.0
Domestic worker/cook	5.5	0.5	10.5
Van puller/driver	7.8	15.5	-
Others	6.5	4.0	9.0

EARTH RESPONSIBLE FOR RUST ON THE MOON

Arna Ghosh, Class of 2021

Researchers have discovered that the moon is rusting, and Earth is particularly responsible for causing it. A new paper, studying data from the Indian Space Research Organization's Chandrayaan-1 orbiter, reveals that the moon's poles have significantly different composition than the rest. Studying the light reflected from the poles, the University of Hawaii's Shuai Li found the spectral signature for hematite. Hematite is a form of iron oxide, commonly known as rust; however in order for iron to become rust oxygen must be present- something the moon is infamously lacking. "It's very puzzling", Li said in a statement. " The moon is terrible environment for hematite to form in." To answer this question, Li contacted NASA's Jet Propulsion Laboratory. At first Abigail Fraeman, one of the JPL scientists said that it was unbelievable given the conditions that exist on the moon but since water has already been discovered on the moon, people have been speculating that there could be a greater variety of minerals than we realize if that water had reacted with rocks.

The presence of rust on the moon can be explained in three ways. Although the moon does not have an atmosphere, it does have trace amounts of oxygen present because of the Earth's magnetic field. Earth is encompassed in a magnetic field, and solar wind stretches this bubble to create a long magnetic tail in the downwind direction. The moon enters this tail three days before it's full, and it takes six days to cross the tail and exit on the other side. As oxygen can travel from the planet to the moon by riding Earth's magnetic field, making the 385,000 kilometre trip via this magnetotail. During these six days, Earth's magnetic tail covers the moon's surface with electrons, and all sorts of strange things can happen. Dust particles on the moon's surface might float off the ground, and moon dust might fly into a dust storm, according to NASA.

This would explain why there is a greater amount of hematite on the side of the moon facing the Earth than on it's far side. It is also possible that more oxygen was transferred to the moon when it was closer to the Earth, as the two bodies have been moving further away from each other for billions of years.



Another cause is the amount of hydrogen present on the moon. Travelling across space via solar winds from the sun, hydrogen bombards both the moon and the Earth. Hydrogen is a reducer, which

means it adds electrons to the materials it comes in contact with, as opposed to an oxidizer which removes electrons. The Earth's magnetic field protects it from this, but the moon has no such protection.

However, the magnetic tail also blocks nearly all solar wind during the full moon- meaning the moon is temporarily shielded from the blast of hydrogen, opening a window for rust to form. This means there is an opportunity for the rust to form during the moon's lunar cycle. Our hypothesis is that lunar hematite is formed through oxidation of lunar surface iron by the oxygen from the Earth's upper atmosphere that has been continuously blown to the lunar surface by solar wind when the Moon is in Earth's magnetotail during the past several billion years

The third factor is the water ice that is present on the moon, found under lunar craters on the moon's far side. Li suggested that, the dust particles that regularly hit the moon could free these water molecules, mixing with iron and then becoming heated to increase the oxidization rate. This would explain why hematite was detected far from the moon's craters, however more research is needed to be done to fully explain how the water is interacting with rock. Such research could help explain why hematite found on the other airless bodies like asteroids. However it could be that little bits of water and the impact of dust particles are allowing iron in these bodies to rust.

Conclusion

But some questions remain unanswered – for instance, though most of the rust was found on the nearside of the moon, some smaller traces were also detected on its far side, where the Earth's oxygen shouldn't be able to reach. It's also still unclear how exactly water on the moon is interacting with rock. To gather more data for these unsolved mysteries, NASA is building a new version of the instrument that collected all this existing data about the moon's mineral composition. One of these features will be able to map water ice on the moon's craters – and "may be able to reveal new details about hematite as well," said the NASA release.

Bibliography :

- <https://www.independent.co.uk/life-style/gadgets-and-tech/news/earth-moon-rust-nasa-oxygen-a9702491.html>
- <https://www.universetoday.com/147683/earths-oxygen-could-be-making-the-moon-rust/#:~:text=A%20new%20study%20suggests%20that,iron%20ore%20extracted%20by%20mining.>
- <https://edition.cnn.com/2020/09/05/world/moon-earth-rust-intl-hnk-scli-scn/index.html>



THE GREAT BLUE HOLE OF BELIZE

Puspika Das, *Class of 2021*

Instead of the roaring waves and scary storms, the calm ocean often offers amazing natural wonders below its indeterminate surface. The Great Blue Hole of Belize, which is located approximately 100 kilometres (62 miles) offshore of Belize City, on the eastern coast of Central America, is one of such existing wonders. This unique site first was discovered by world's renowned explorer at that time Jacques Cousteau, who brought his research vessel 'Calypso' to investigate its depth in 1972. He filmed it for his TV series 'The Undersea World of Jacques Cousteau', and declared it one of the top 10 scuba diving sites in the world. However, the name "The Great Blue Hole" was given by British diver and author Ned Middleton in his book "Ten Years Underwater."

Researchers say the Great Blue Hole was formed out of a limestone cavern during the last Ice Age when global sea level was much lower. However, the cave was later flooded and collapsed when the sea began to rise, eventually resulting in the formation of a circular hole. Due to the increasing water levels and the consequent rise in the ocean level, the roof of the cavern was brought down while the inner portion remained intact, even though submerged under the deluge of the water. The cavernous interior contains many geologic features, including limestone stalactites and stalagmites, dripstone sheets, and columns. The Belize Blue Hole stretches 300 meters (about 1,000 feet) across and reaches depths of more than 120 meters (400 feet). Water levels in the surrounding areas of the sinkhole are shallow and the coral often breaks the surface at low tide. The water colour of the swallow hole is deep blue in contrast with the aquamarine colour of the water neighbouring it.

Placing itself right at the centre of the Lighthouse Reef Atoll it seems to be encircled by an island of corals and forms a part of the Belize Barrier Reef system. The Belize Barrier Reef, on the other hand, forms an integral part of the greater Mesoamerican Barrier Reef, the second longest coral reef in the world. Stretching along 1000 kilometres (600 miles) of the coastlines of Mexico, Belize, Guatemala and Honduras this reef system is a major hub for marine species and is considered one of the most biodiverse places on Earth.

This massive submarine sinkhole is also a world-class destination for recreational scuba divers attracted by the opportunity to dive in crystal-clear waters and see spectacular coral formations. The complete absence of water currents and acute temperature changes in the shallow hole allows the divers to make a foray all year round. The elucidation given by the divers pointed the amazing beauty underneath the waters with those geological formations and also suggested that the water becomes clearer as one goes deeper. On account of the intense depth of the Hole, only experienced divers are advised to enter it because they can stabilize their body while deep diving and bringing themselves upwards. In addition to the crystal clear water that tempts divers, the reef surrounding the Hole is home to many exotic fish like the nurse tip shark, reef shark (native to the Caribbean) and various other marine creatures. Despite these, there have been reported sightings of several other species, including midnight parrotfish, the bull shark, hammerheads and other juvenile fish species. However, reports also suggest that the marine life in the hole is relatively low and most of the time species like sharks simply pass through.

Thus, this natural wonder being an internationally renowned diving spot in the world is still considered as a bucket-list dive for many marine divers. Also, believed to be the world's largest feature of its kind, the Great Blue Hole became a World Heritage site in 1996 of the United Nations Educational, Scientific and Cultural Organization (UNESCO). The Discovery Channel ranked the Blue Hole as number one on its list of "The 10 Most Amazing Places on Earth".

Thus, it is clear that among all the most incredible places on earth, with all the wonders it offers, The Great Blue Hole of Belize is truly a natural marvel. Its existence and influence in contemporary lifestyle equally, is quite impressive making it a worthy topic to be discussed.



The Great Blue Hole of Belize
Surrounded by the Lighthouse Reef



The Beautiful Insight View of
Stalactites and Stalagmites

References :

- earthobservatory.nasa.gov
- www.marineinsight.com
- belize.com
- chabilmarvillas.com



TRAVELLING THROUGH THE FOLIAGE

Rajanya Manna, *Class of 2021*

In these few years of my life, I have visited quite a number of places of great natural beauty, each of them, with a special charm of its own. From the mesmerising beaches of Puri to the beautiful snow-capped mountains of Sikkim, the widespread tea-estates of Darjeeling to the mysterious forts of Agra, all of them have gifted me with some of the most extraordinary memories that I will cherish throughout my life.

The latest addition to the list was my visit to the Northeast and the forests of North Bengal. The trip started with our departure from the Howrah station, in the Saraighat Expressat midday. Early next morning, we reached Guwahati, where a bus took us to our place of stay. After having our lunch, we went for a visit to the Kamakhya Temple and were mesmerized with its grandeur and architecture. Next morning, we witnessed a beautiful sunrise by the mountains and started our journey for Shillong, the capital of Meghalaya, the abode of clouds.



Shillong is also known as the Switzerland of India for its breath-taking views. After travelling for almost seven hours, we reached the Don Bosco Museum in Meghalaya, which was a beautiful seven-story building with amazing architecture. Thereafter, we called away off and reached our hotel. The next day was absolutely majestic and it was raining one moment and sunny, the other. Nature has its own way of surprising us it is said and Meghalaya is just the place to experience the beauty. After having our breakfast, we headed to the Air Force Museum and the Elephant Falls, which were absolutely spectacular. From there, we headed for Cherrapunjee and reached by the noon. The natural beauty of the place and its lush greenery soothed our tired souls. The next day we travelled to the Noakhali Falls.



When we went there, however, we were extremely disheartened, as we were unable to see the falls due to the dense layering of fog. Fortunately, the blanket of clouds started clearing gradually and the beautiful Noakhali Falls became visible. The next places we visited were the Mousam Caves, Seven Sister's Falls and the Eco Park. All these places were wrapped in clouds and the views were particularly

spectacular. Being a photographer, it was a real pleasure to capture the amazing beauties of nature. The next day, we headed back to Assam and visited a number of places like the Balaji Temple, Umananda Ashram and also crossed the turbulent river Brahmaputra.

The following day, we took our train from Guwahati to New Alipurduar. Before sunset, we had reached our destination and were given a warm welcome by the local people and we retired for the night at Jaldapara Forest Bungalow. Next morning, we went to visit the Crocodile Park and Phuntsholing, Bhutan. Our tour would have been incomplete without the Jungle Safari in the Jaldapara forest and our encounter with the Elephants, Rhinoceros and the spotted deer.

This tour particularly left a lasting impression on my mind since I was greatly attracted by the natural beauty. I wish to visit the places again, in the years to come.



THE MASSIVE CRATER IN SIBERIA

Shaoni Das, *Class of 2021*

A massive crater of about 50 metres deep and 20 metres wide has been spotted in the tundra region in Siberia. Scientists believe that this is the largest form of crater so far, however they are also expecting that the formation of this huge crater is linked to the buildup of methane which has exploded and led to a frightening result of warming temperature in the region.

The discovery of this massive crater was done by a Russian film crew at the beginning of 2020, while they were flying over the Yamal Peninsula in Siberia on an unrelated assignment.

For further studies, a lead research scientist of Skolkovo Institute of Science and Technology's Centre for Hydrocarbon Recovery, visited the newest crater and said that there are no accepted theories for the formation of such complex phenomenon, though he added that it can be forming for years but the numbers are hard to find.



An Aerial View of the Massive Crater Discovered in Siberia

Permafrost that makes up the two thirds of Siberia is the natural reservoir of methane. Recent hot summers in the region including 2020 may have resulted in the formation of such craters.

Methane and other gases can accumulate in the upper layers of this permafrost and are capable of creating such a strong pressure that it finally results in the bursting of these upper layers of the frozen ground, scattering earth and rocks and creating craters. This process is called “cryovolcanism”. However, they turned into lakes within the two years of formation.

Scientists say that the rise in temperature around the world and as the climate continues to warm, the permafrost is melting and hence, the craters are formed. But some of the scientists believe that the progressing climate crisis is not the reason for these craters to form. As per the records, such craters in the tundra region have been the result of explosions. They instead suggest the cause of the craters to be gas trying to move to the surface from deep layers of the Earth.

However, the lead researcher and his team of Skolkovo Institute of Science and Technology's Centre for Hydrocarbon Recovery have promised to continue more related studies and provide evidences for the processes of formation of these craters in the near future.

Sources : ● earth.org ● nationalgeographic.com ● bbc.com ● cnn.com

THE FLY RANCH GEYSER

Sreoshi Bhattacharyya, *Class of 2021*

Fly Geyser, also known as Fly Ranch Geyser is a small geothermal geyser located on private land in Washoe country, Nevada, about 20 miles (32km) north of Gerlach. Fly geyser is located near the edge of fly reservoir in the Hualapai geothermal flats and is approximately 5 feet(1.5 m) high by 12 feet(3.7m) wide, counting the mound on which it sits.

The fly geyser is a result of man-made drilling in 1916, when water well drilling accidentally penetrated a geothermal source. It can geographically be termed as an Artisan well.



THE FLY RANCH GEYSER, NEVADA

CO-ORDINATES : 40 ° 51' 34" N 119 ° 19' 55" W ELEVATION : 4014 feet (1223m) TEMPERATURE : 93.0 ° C

The source of the Fly geyser field's heat is attributed to a very deep pool of hot rock where tectonic rifting and faulting are common. The first geyser at the site was formed in 1916 when a well was drilled seeking irrigation water. When geothermal water at close to boiling point was found, the well was abandoned and a 10-12 foot calcium carbonate cone formed. In 1964, a geothermic energy company drilled a second well near the site of the first well. They reportedly capped the well, but the seal failed. The discharge from the second well released sufficient pressure that the original geyser dried up. Dissolved minerals in the water, including calcium carbonate and silica accumulated around the new geyser, creating the cones and travertine pools.

The geyser has multiple conic openings sitting on a mound : the cones are about 6 feet (1.8m), and the entire mound is 25 to 30 feet tall. The temperature of the water exiting the geyser can exceed 200o F, which is typical for geysers at high elevation. Water is constantly released, reaching 5 ft in the air. The geyser has formed several travertine terraces, creating 30 to 40 pools over an area of 74 acres.

Carolina Munoz Saez, who was hired by the Burning man owners to study the geyser, reported that the geyser contains " a really high amount of silica". The silica combined with the temperature has caused Quartz to form inside the geyser which typically takes upto 10,000 years to develop in geysers. Saez

said that the fly geyser is unlike any other geyser she has studied. The water produced by the Geyser contains thermophilic algae, which flourish in moist, hot environments, colouring the rocks with brilliant hues of green and red.

Fly ranch is open to small, guided three hour nature walks from April to October of each year. Payments for tickets for the walk are considered to be donations and are used to support Fly ranch and the Friends Organisation. Nevada has more geothermal potential than any other state and is home to perhaps the most Hot springs in the nation.

Bibliography :

All the related information has been taken from the following websites :

- www.flyranch.com
- www.theflygeyser.com



CLIMATE CRISIS

Udita Chowdhury, *Class of 2021*

Climate change is the defining crisis of our time and it is happening even more quickly than we feared. But we are far from powerless in the face of this global threat.

No corner of the globe is immune from the devastating consequences of climate change. Rising temperatures are fueling environmental degradation, natural disasters, weather extremes, food and water insecurity, economic disruption, conflict, and terrorism. Sea levels are rising, the Arctic is melting, coral reefs are dying, oceans are acidifying, and forests are burning. It is clear that business as usual is not good enough. As the infinite cost of climate change reaches irreversible highs, now is the time for bold collective action.

Global Temperatures Are Rising

Billions of tons of CO² are released into the atmosphere every year as a result of coal, oil, and gas production. Human activity is producing greenhouse gas emissions at a record high, with no signs of slowing down. According to a ten-year summary of UNEP Emission Gap reports, we are on track to maintain a “business as usual” trajectory. The last four years were the four hottest on record. According to a September 2019 World Meteorological Organization (WMO) report, we are at least one degree Celsius above preindustrial levels and close to what scientists warn would be “an unacceptable risk”. The 2015 Paris Agreement on climate change calls for holding eventual warming “well below” two degrees Celsius, and for the pursuit of efforts to limit the increase even further, to 1.5 degrees. But if we don't slow global emissions, temperatures could rise to above three degrees Celsius by 2100, causing further irreversible damage to our ecosystems.

Glaciers and ice sheets in polar and mountain regions are already melting faster than ever, causing sea levels to rise. Almost two-thirds of the world's cities with populations of over five million are located in areas at risk of sea level rise and almost 40 per cent of the world's population live within 100 km of a coast. If no action is taken, entire districts of New York, Shanghai, Abu Dhabi, Osaka, Rio de Janeiro, and many other cities could find themselves underwater within our lifetimes, displacing millions of people.

Food And Water Insecurity

Global warming impacts everyone's food and water security. Climate change is a direct cause of soil degradation, which limits the amount of carbon the earth is able to contain. Climate change limits the availability and quality of water for drinking and agriculture.

In many regions, crops that have thrived for centuries are struggling to survive, making food security more precarious. Such impacts tend to fall primarily on the poor and vulnerable.

New Extremes

Disasters linked to climate and weather extremes have always been part of our Earth's system. But

they are becoming more frequent and intense as the world warms. No continent is left untouched, with heatwaves, droughts, typhoons, and hurricanes causing mass destruction around the world.

A Catalyst For Conflict

Climate change is a major threat to international peace and security. The effects of climate change heighten competition for resources such as land, food, and water, fueling socioeconomic tensions and, increasingly often, leading to mass displacement. Climate is a risk multiplier that makes worse already existing challenges. Droughts in Africa and Latin America directly feed into political unrest and violence. The World Bank estimates that, in the absence of action, more than 140 million people in Sub-Saharan Africa, Latin America, and South Asia will be forced to migrate within their regions by 2050.

A Path Forward

While science tells us that climate change is irrefutable, it also tells us that it is not too late to stem the tide. This will require fundamental transformations in all aspects of society — how we grow food, use land, transport goods, and power our economies.

While technology has contributed to climate change, new and efficient technologies can help us reduce net emissions and create a cleaner world. Readily-available technological solutions already exist for more than 70 per cent of today's emissions. In many places renewable energy is now the cheapest energy source and electric cars are poised to become mainstream. In the meantime, nature-based solutions provide 'breathing room' while we tackle the decarbonization of our economy. These solutions allow us to mitigate a portion of our carbon footprint while also supporting vital ecosystem services, biodiversity, access to fresh water, improved livelihoods, healthy diets, and food security. Nature-based solutions include improved agricultural practices, land restoration, conservation, and the greening of food supply chains.

Scalable new technologies and nature-based solutions will enable us all to leapfrog to a cleaner, more resilient world. If governments, businesses, civil society, youth, and academia work together, we can create a green future where suffering is diminished, justice is upheld, and harmony is restored between people and planet.

Reference :

- earth.org
- wikipedia.org



UNDERSTANDING THE MAP OF HAPPINESS (WHY IS INDIA SAD?)

Adrija Sengupta, *Class of 2022*

On 20th March, 2020 The World Happiness Report was released and as the UN declared it was the eighth annual report wherein 156 countries including India, Pakistan, China and Bangladesh participated.

History and the Road to Happiness

The World Happiness Report published by the Sustainable Development Network was first rolled out to the public in the year 2011. It collects its data from the world's most authenticate poll, the Gallup Poll. Over the years numerous other prosperous Research Institutes have contributed to the cause and have helped people understand the reason behind a Nation's happiness. In the year 2020, The World Happiness Report emphasised on the social, urban and natural environment and how it influences the well being of a Nation.

World Happiness Report, 2020

Finland was declared the happiest country in the World for third time in a row. It was followed by Denmark, Switzerland, Iceland and Norway.

On the other hand, India ranked 144 and this is a matter of concern because India's neighbouring countries China and even Pakistan and Bangladesh have surpassed India big time in this run of happiness.

2020 also marked a symbolic year for the Report as it ranked cities on the basis of several parameters for the first time. Helsinki, the capital of Finland topped the list.



Analysis :

1. *Social Environment and Happiness*

The Social Environment as defined in the World Happiness Report mainly takes into account the well-being inequality.

Well-being inequality is mainly determined on the factors such as ill-health, discrimination, low income, unemployment, separation, divorce or widowhood and safety on streets.

India's stand

- Over the years we have seen numerous rape cases, thefts, burglary, eve teasing and all sorts of abuses that have made India a place for the sexual assaults.

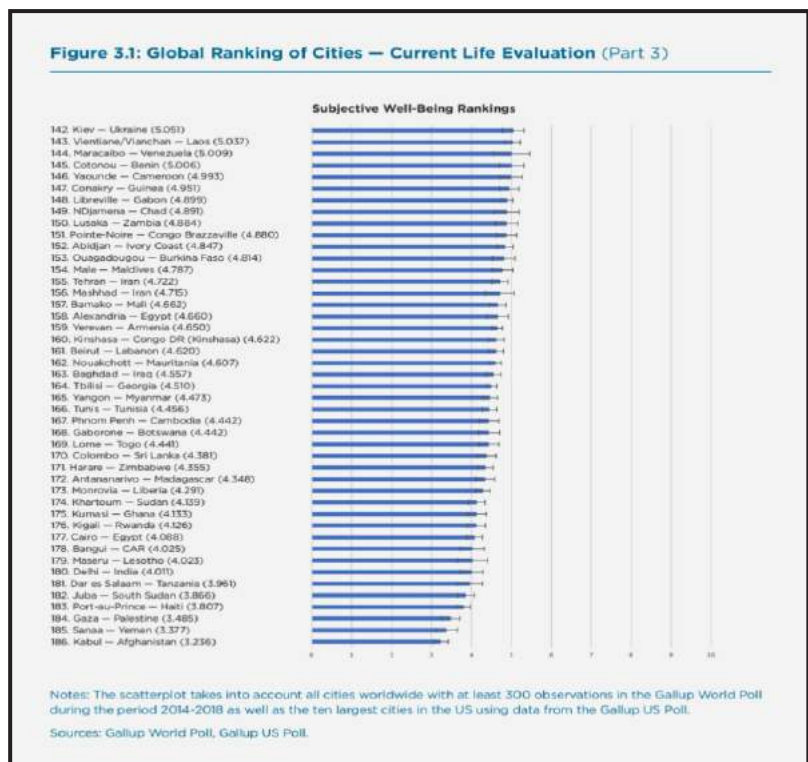
- The number of divorces have increased to such an extent that it has led to the rise in Divorce Lawyers in practically every avenues of the country.
 - Unemployment is in the front row since a long time.
 - India upholds Democracy but there is a part always which brings out discrimination to the forefront.
- All these factors coupled with several others prove that India's social environment is not happy. India is suffering terribly.

2. *Urban Happiness*

With the growing urban areas and more and more urban sprawls it has been taken into account that city dwellers in several places are not that happy as compared to that of their rural counterparts. However this is not the case with the Nordic countries.

The measurement of urban happiness is mainly measured on

- Current life evaluation where the resident's are asked to speak about their everyday life in general
- Expected Future Life evaluation where the residents are asked about their future expectation from their city.



Helsinki tops the list and it can be seen that residents are happy with their job and have faith in their government and feel safe.

New Delhi's position

New Delhi is at 180 which is seventh from the last. This position is not at all a random rank rather it shows how our political leaders have failed us. Underdeveloped Transport and Communication system, low economic stability, mutual distrust, low social security and overpopulation are the indicators that prove that the National Capital is not doing well since a long time.

3. *Natural Environment and Happiness*

For a long time now environmental problems were not addressed. However in recent stream of study it was shown that Geography, natural capital, precipitation and land cover or natural disasters have huge impact on the well being and happiness of an individual and Nation in general.

Here London was taken into account in order to understand how Natural Environment and happiness are interlinked. Factors such as 1) Weather and day light 2) Air Quality 3) Noise 4) Green Spaces 5) Blue Spaces- ponds and lakes

No polls were released regarding natural environment because we have kept quiet for such a huge amount of time that it has now turned into a matter of global concern.

How Happy Are We?

Superpowers are not that happy and Nordic countries have remained happy for a considerable period of time. On the other hand, India is facing terrible problems in its geo-socio-political spheres almost every day. Moreover India has a long way to go and unless there establishes a stability in the internal matters India will face the peril of Sadness.

References :

<https://worldhappiness.report/ed/2020/#read>

<https://worldhappiness.report/ed/2020/how-environmental-quality-affects-our-happiness/>

<https://vividmaps.com/happiest-countries/>

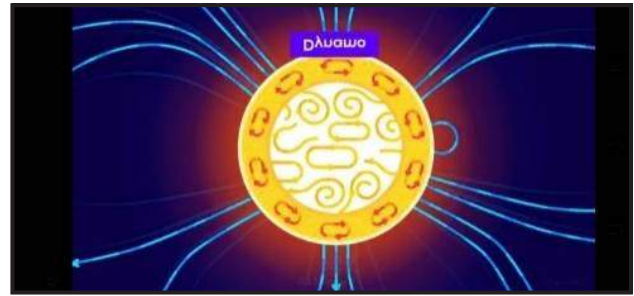
<https://worldhappiness.report/ed/2020/social-environments-for-world-happiness/>



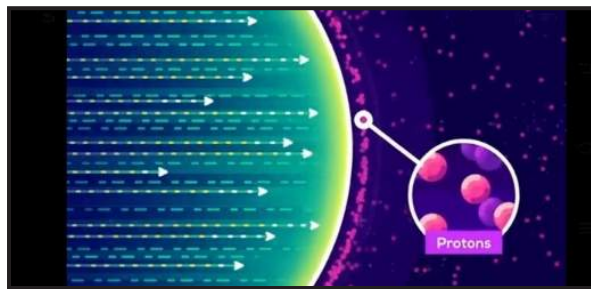
COULD SOLAR STORMS DESTROY CIVILISATION

Ahelee Bera, Class of 2022

The Sun is smooth and round and peaceful, except when it suddenly vomits radiation and plasma in random directions. These solar flares or Coronal Mass Ejections (CME) can hit Earth and have serious consequences for humanity. How exactly do they work ? How bad could they be? And can we prepare for them?



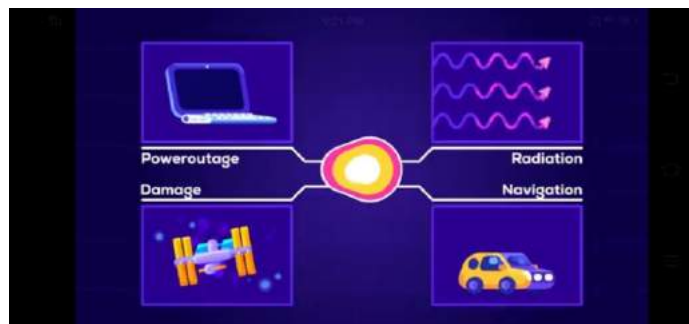
MOVEMENT OF PLASMA ON THE SUN CREATING DYNAMO



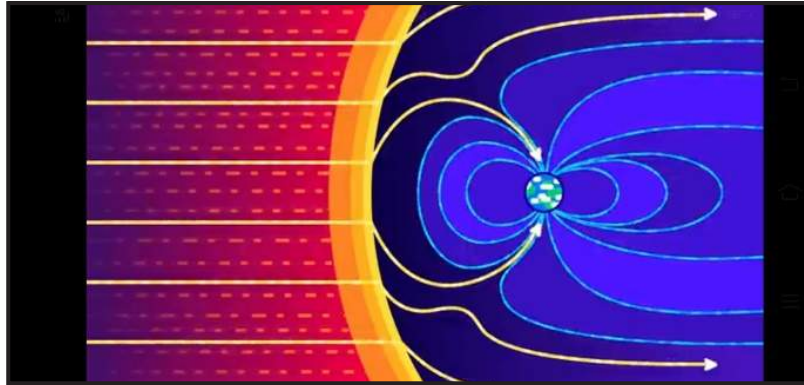
SOLAR PROTON STORM

The Sun is like a very hot ocean. It rips atoms into electrons and nuclei all floating around each other in a plasma. This plasma creates a magnetic field as it moves and shapes the flow of particles and creates a dynamic feedback loop called a dynamo which keeps the Sun's magnetic field alive. The magnetic field stores enormous amounts of energy. As the Sun's plasma churns and flows around itself, it creates magnetic knots. When the magnetic knots break like a tangle of springs exploding outwards the Sun can vomit plasma and other awful things into the Solar System causing solar storms.

These solar storms come in many types like solar flares; a tidal wave of high energy radiation. Then there are coronal mass ejections, which rip millions or billions of tons of plasma from the Sun's atmosphere, catapulting it through the Solar System at speeds of up to 9 million km/hr. When these monsters hit us, nothing happens on Earth because our atmosphere acts as a shield, while even smaller storms can damage satellites, affect radio communication, or be dangerous to astronauts. The electrified plasma from a CME is deflected by the Earth's



magnetic field, diverting the energy storms to the North and South Poles, where energetic particles fall into the atmosphere, causing the atmosphere to glow and creating beautiful auroras. The solar superstorms which happen once or twice every century violently compresses the Earth's magnetic field as it passes over. If it is aligned to the Earth's magnetic field in just the right way it can also cause a geomagnetic storm.



MOVEMENT OF CME AND ITS INTERACTION WITH EARTH'S MAGNETIC FIELD

A few hundred years ago nobody would have cared. This storm is only relevant for machines made out of metal and wire. Earth in the 21st century has millions of kilometers of wires transporting electricity and complex machines like transformers. A CME's energy can completely shut down our power system causing a breakdown of the supply chain, failure of water supply systems, hospital generators and food processing industries. Events like the Quebec power grid failure, 1989 and Carrington Event, 1859 have taught us how to deal with these situations. If we are unprepared, a solar storm now can cause damage of about \$2.6 trillion to US alone and there is about a 50/50 chance of one happening in the next 50 years.

Fortunately, even though solar storms aren't preventable, virtually all of their nasty side effects are. Scientists observing the Sun have a few hours up to a few days to see a CME coming. During this time the engineers can take the transformers and substations offline and open up extra lines to dissipate the extra power. With investment and upgrades cheap compared to those other natural disasters require, we could protect the world's electric grid against even the nastiest of storms. But we do need to prepare. While the risk is manageable, it is real. For while our Sun bathes us in warm and pleasant light, one day, it might send a monster our way that we better be ready for.

Bibliography :

earthsky.org; wikipedia.org; nationalgeographic.com



GREAT CURTAINS OF DELICATE LIGHT

Amrita Datta, *Class of 2022*

Ever wondered how just a little brush of gleams can change the gloom into a spectacular setting !



Erratic, mysterious, dazzling, notoriously unpredictable, but undoubtedly magical, the aurora is one of nature's greatest wonders. A cascade of electronic streamers dancing across the northern hemisphere's night skies, the blaze can occur at the right latitudes whenever there's enough activity and the sky is dark.

Auroras are coloured and twisting ribbons of light that appear to twist and whirl in the atmosphere near the poles. Ancient Greek

poets used the name metaphorically to refer to dawn, often mentioning its play of colours across the otherwise dark sky.

Auroras result from the interaction of Earth's magnetic field with ionic gas particles, protons, and electrons streaming outward from the Sun . Solar storms result in magnetic disturbances that lead to coronal mass ejections of ionic charged particles in solar "winds." As the magnetic particles pass Earth, the plasma streams of charged particles interact with Earth's magnetic field. The magnetic interactions excite electron transitions that result in the emission of visible light.

Charged particles may also travel down Earth's magnetic field lines into Earth's ionosphere. As the charged particles interact with charged atmospheric gases in Earth's ionosphere, the electrons in the gases move to higher energy states. As the excited electrons return to their ground state, light photons are emitted. The colours of light correspond to particular frequencies and wavelengths generated by the energy of particular electron orbital transmissions, and are unique to different gaseous compounds. Oxygen atoms tend to give off red and greenish light. Nitrogen tends to produce wavelengths light in the bluish region of spectrum.



Although they may form anywhere, auroras are usually found in ring like regions that surround Earth's poles. Auroral rings or ovals are readily visible from space. Auroras are normally associated with the polar regions because it is there where the magnetic field lines of Earth converge and are of the highest



density. These forms are consistent with auroras' being shaped by Earth's magnetic field. The appearances of arcs, rays, curtains, and coronas are determined by the shapes of the luminous parts of the atmosphere and a viewer's position.

The auroras also generate high levels of electricity that can exceed 100,000 megawatts within a few hours and sometimes interfere with communications equipment and/or signal transmission or reception.

A whole tourism industry of hotels, tours and even cruises has sprung up around the activity, all aiming to give people a better chance of witnessing the event with their own eyes.

Of course, nothing is ever guaranteed. But when it comes to successful aurora hunting, Norwegian city Tromsø has a lot to offer. Located on the coast, it's set against a backdrop of dramatic, spiky mountains. Best of all, it sits right underneath the aurora oval - meaning it's one of the best places for a neon-streaked sky show, even if activity is low. Whale (Kvaløya) and Senja islands of Norway and Finnish Lapland are the other places from where you can get the maximum chance of witnessing this gleam show in the night sky.



Bibliography :

<https://www.heraldsotland.com/news/19060695.travel-tips-tricks-seeing-northern-lights/>

<https://en.wikipedia.org/wiki/Aurora>



MISERY OF A PARADISE

Debanjalee Dutta, *Class of 2021*

Sunderbans sitting on the sensitive border between India and Bangladesh is the world's largest contiguous mangrove forests. Located at the mouth of the Ganga-Brahmaputra delta in the Bay of Bengal with an area of about 10,000 km², Sunderbans originate its name from sundari i.e., "beautiful" tress. These forests having a complex tidal forests and mudflats act as a salt tolerant due to its breathing roots which can be seen over the surface. On a global perspective it is recognized by UNESCO as a World Heritage Centre. Various climatic and anthropogenic factors are responsible for the depletion and destruction of these forests.

Impacts

In spite of these forests having such a worldwide recognition, this area suffers severe problems due to changing climate and various socio-economic activities which has been a serious threat to the wildlife, marine organisms and several small species. Both man and animals are sufferers for these damage problems began during the post- independence period when Farakka Barrage was constructed to divert water from



the Ganga System. This has lead to decrease in fresh water intrusion in the Sunderban delta allowing greater amount of salt water intrusion in these areas. Further climate change due to global warming has resulted in rising of the sea. When the water is at its high tide level, landward intrusion of saline water takes place which has resulted in destruction of several paddy producing areas in Sunderbans. It has become a core breeding area for the endangered species such as Royal Bengal Tiger, estuarine crocodile, Indian python and several reptiles and small animals. The marine ecology has also been affected for the destruction of these forests.

Tourism has also contributed for the destruction of habitat and wildlife. One of the main attractions of tourism in Sunderbans is because it is the home of the famous Bengal Tigers. Tourists contribute to pollution by waste and garbage disposal from the launch into the sea water, poor sanitation and noise from the mechanical boats and ships.



Socio-Economic Aspects

Sunderbans are basically a group of many small islands and most of the people thriving there suffer great economical issue. Almost the entire population

is dependent on agriculture and its waterways for their livelihood. Most people there are under below poverty level (BPL) and are illiterate. They cut down mangrove forests recklessly for timber without even understanding its significance and impacts on the ecology as a whole. Although the Government has drafted several plans for the upliftment of these people in terms of literacy and economic crisis, Perceived socio-demographic factors such as severe poverty, lack of political commitment and absence of community level institutions are often barriers to the successful implementation of conservation policies.

Recent Mishaps

Recently the Sunderbans was affected by “Amphan”, a tropical cyclone originating in the Bay of Bengal in 2020. Several animals died, people became homeless and the mangrove did not have the power to resist such a storm. Even a death of Bengal Tiger was also reported. Most parts of Sunderbans submerged. In 2014, an oil spill took place in this area which has threatened its vegetation, planktons thriving in such area, vast fish and dolphin population. The heavy metals and production water which was released from this spill can absorb large amount of particles in suspension which sink at the bottom of the deltaic bed and hence polluting these wetland ecosystem. Therefore, Sunderbans comes as a high alert area from both environmental and anthropogenic prospect.

Future of Sunderbans

Conservation is the first step for the future of these forests. Vulnerable to the cyclonic storms, attention must be given by governmental, non-governmental and community level programmes to look into the issue of climatic change. Exploitation of natural resources for timber has to be stopped. The concept of community conservation has to be adopted for both development and upliftment of the people and environment respectively.



Conclusion

Several species have now become extinct and many are on the verge of extinction. Sunderbans is a place where adapting to climate change seems possible because of its huge human resilience. Awareness camps can be set up by governmental and non-governmental associations to literate mass which is a big step towards its conservation. Various international organizations, NGO's or other banks should come forward to grant the funds to save Sunderbans. The local communities should be provided with funds so that they can consume other sources of nourishment.

Reference

- whc.unesco.org
- wwf.india.org
- www.coastalwiki.org

VOLCANIC LIGHTNINGS

Fatma Arshad, *Class of 2022*

Introduction

When hot, molten rock pushes its way up through the Earth's crust and exits through to the surface, it often results in a volcanic eruption. These eruptions sometimes occur via slow and steady flows, but often show themselves in huge bursts of activity.

When this latter case happens, a large amount of ash, dust, rock, volatile gases, and lava all are expelled in a very short period of time. While we might think of these as the major features of a volcano, there's often a magnificent visual sight that accompanies these: volcanic lightning. Although not every eruption will produce this stunning light show, it's been observed and recorded by humans for countless generations. The phenomena of lightning has been exquisitely recorded around a number of recent volcanic eruptions, including Iceland's Eyjafjallajökull,

Japan's Sakurajima, Italy's Mt. Etna, Chile's Puyehue, Calbuco and Chaiten volcanoes, Alaska's Mount Augustine volcano and Taal Volcano in the Philippines.



History

Throughout the past 2000 years humans have witnessed lightning bolts flashing in and around erupted ash plumes. The earliest known written account of volcanic lightning was from Pliny the Elder. An ill-fated resident of Pompeii wrote; "there was a most intense darkness rendered more appalling by the fitful gleam of torches at intervals obscured by the transient blaze of lightning."

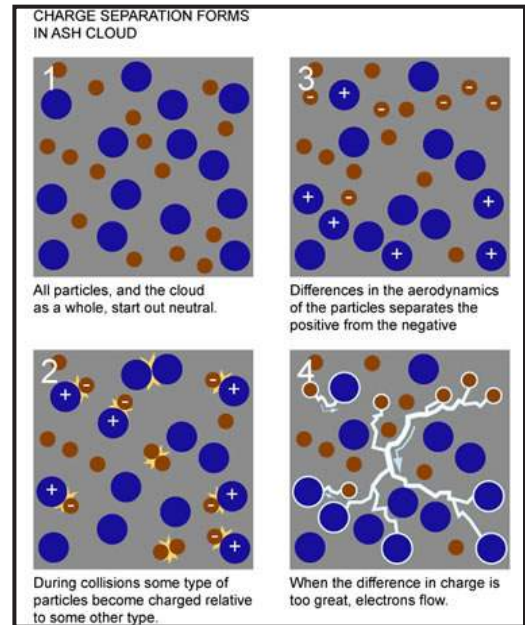
Vesuvius would also be the sight of the first volcanic lightning studies conducted by Mr. Palmieri who manned the Vesuvius observatory during the eruptions of 1858, 1861, 1868, and 1872. Mt Vesuvius eruptions have been relatively frequent and have always included an array of lightning activity within their plumes and ash clouds. The 1944 eruption is among the earliest to have its volcanic lightning captured in photographs.

Science Behind Volcanic Lightnings

- Whether sparked by a springtime shower or an eruption of volcanic fury, all lightning requires what is known as a charge separation, which develops as positively and negatively charged particles accumulated in different parts of a cloud. As the opposing charges build up, they generate an imbalance that nature resolves by releasing a bolt of electricity-lightning.
- In volcanic eruptions, ash particles play a critical role. These tiny fragments form as the rapid

expansion of gases in magma shatter the molten rock into glassy shards, which gain a charge in the process. The ashier the plume, the higher the chance these particles collide and fracture within the billowing clouds, producing even more charge that might spark lightning.

- Researchers have long suspected that ice also plays an important role in driving volcanic light. Eruption plumes, even from volcanoes not surrounded by the ocean, are laden with water that was previously entrained in the magma. When these plumes rise high enough in the atmosphere for ice to form, the lightning rates and intensity often skyrocket.



Conclusion

There are always a number of details to be filled in as far as improving our understanding of exactly how this occurs in each individual volcanic eruption. Volcanic lightning events can be a one-time thing, or the strikes can last for minutes, hours, or even multiple days.

Using the photographic techniques of either stacking or time-lapse, we can often see multiple strikes in a single composite photograph, with many containing dozens or even hundreds of individual lightning bolts. As the charges move around, every single strike is different, but the physics is universal. All it takes is heat, ionization, a diversity of molecules, and transport, and when enough charge separates over the right distance, electrical discharges occur. That's how volcanic lightning are created, and the spectacular result is unlike anything else in the world.

Bibliography :

- <https://www.forbes.com>
- <https://en.wikipedia.org>
- <https://www.nationalgeographic.org>



OCEAN ACIDIFICATION AND IT'S EFFECT

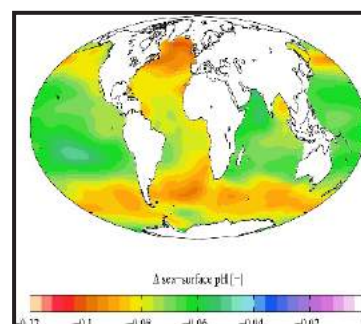
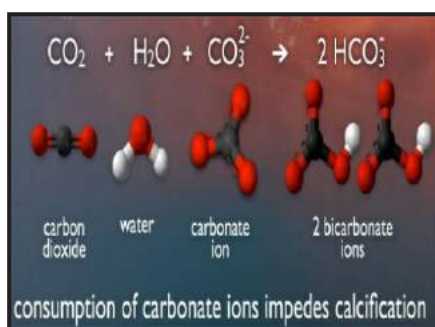
Koyena Das, Class of 2022

Introduction :

Ocean acidification means the worldwide reduction in the pH of seawater as a consequence of the absorption of large amounts of carbon dioxide (CO²) by the oceans. Ocean acidification is largely the result of loading Earth's atmosphere with large quantities of CO², produced by vehicles and industrial and agricultural processes. Since the beginning of the Industrial Revolution about 1750, roughly one-third to one-half of the CO² released into Earth's atmosphere by human activities has been absorbed by the oceans. During that time period, scientists have estimated, the average pH of seawater declined from 8.19 to 8.05, which corresponds to a 30 percent increase in acidity.

What Causes This Acidification :

Ocean acidification is mainly caused by carbon dioxide gas in the atmosphere dissolving into the ocean. This leads to a lowering of the water's pH, making the ocean more acidic. Currently, the burning of fossil fuels such as coal, oil and gas for human industry is one of the major causes. Deforestation results in fewer trees to absorb the gas. Also, when plants are cut down and burnt or left to rot, the carbon that makes up their organic tissue is released as carbon dioxide.



Effects Of Ocean Acidification On Ecosystem :

The effects of ocean acidification can be divided in several subparts, as the effect on environment is related to one another. But here, we will only discuss its effect on marine life and humankind.

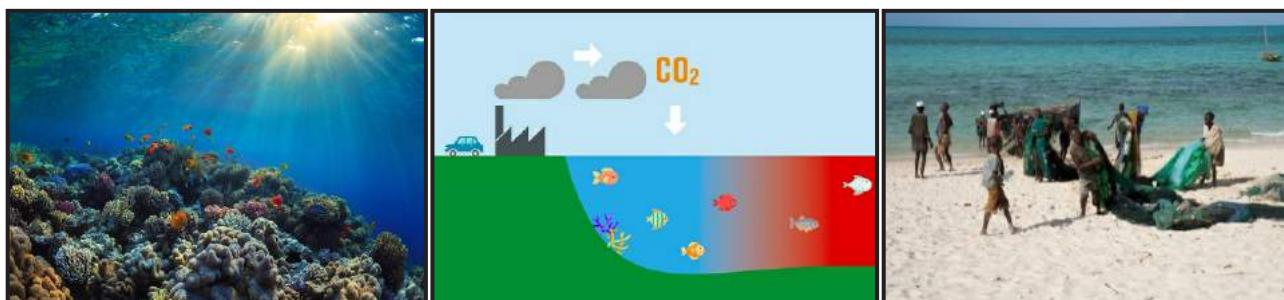
- **Effects On Marine Life :** One of the most devastating impacts of rising ocean acidity could be the collapse of food webs. Marine animals interact in complex food webs that may be disrupted by ocean acidification due to losses in key species that will have trouble creating calcium carbonate shells in acidified waters. Tiny swimming sea snails called pteropods are considered the 'potato chips of the sea' as they serve as a critical part of the arctic marine food web, ultimately feeding whales and other top predators. Pteropod shells are expected to dissolve in acidity levels predicted by the end of this century and may not be able to survive.

- **Effects On Human Life :** We examine the ways in which ocean acidification could have impacts on human health in terms of four pathways : (1) malnutrition and poisoning via altered food quantity and

quality, (2) respiratory issues via impaired air quality, (3) mental health impacts via modification of natural spaces, and (4) decreased opportunity to develop and obtain medical resources via loss of biodiversity. These contaminants, such as heavy metals, pharmaceuticals, etc. in personal care products, mainly enter the environment via municipal effluent discharges, animal husbandry, horticulture runoff and waste disposal.

Measures To Combat Ocean Acidification :

The burning of fossil fuels is the major contributor to ocean acidification. Fossil fuels are burned to produce energy, and to make vehicles run. But fossil fuels are also burned in factories to make products that we use every day. The saying "reduce, re-use, recycle" also applies to the ocean acidification crisis. Protecting wildlife has many benefits, but most people don't know that it's an important factor in how the Earth responds to climate change. It is important to preserve existing habitats and to identify more areas that need protection. Monitoring pollution and nutrient run-off helps protect coral reefs, so they can be healthy enough to withstand global warming and ocean acidification.



Bibliography :

- <https://coastadapt.com.au/ocean-acidification-and-its-effects>
- <http://therevolutionmovie.com/index.php/open-your-eyes/ocean-acidification/solutions/>
- <https://www.epa.gov/ocean-acidification/effects-ocean-and-coastal-acidification-marine-life>
- <https://academic.oup.com/icesjms/article/65/3/414/789605>



BLACK SUMMER AUSTRALIAN BUSHFIRE (2019-2020)

Rajeshwari Chakraborty, *Class of 2022*

Introduction :

Australia had recently been in the middle of a grave catastrophe as the mainland has confronted the worst possible bushfires recorded in the history of the nation. The out-of-control fires sprung up at the beginning of September 2019. Heat and drought created more tinder to fuel fires. The heightened intensity and frequency of wildfires fall in line with scientists' predictions for a warming world. Many animals, as well as people, have died along with the destruction of about 2000 homes. Wildfires are not new to Australia, but the intensity was higher in 2019. The devastation only adds to existing pressures on Australia's unique ecosystems. The relief came after torrential rains marked the wettest week in the region in three decades. Record-breaking temperatures and months of severe drought have fuelled the series of massive bushfires across Australia. The fires in New South Wales, the state most affected, were finally declared contained on February 13th. It has taken a lot of work by firefighters, emergency services and communities to reduce the fire.



The fires in New South Wales, the state most affected, were finally declared contained on February 13th. It has taken a lot of work by firefighters, emergency services and communities to reduce the fire.

Each year there is a fire season during the Australian summer, with hot, dry weather making it easy for blazes to start and spread. Natural causes are to blame most of the time, like lightning strikes in drought-affected forests. Dry lightning was responsible for starting a number of fires in Victoria's East Gippsland region in late December, which then travelled more than 20 kms in just five hours. Humans are sometimes to blame for starting the fires, but they are also often sparked by natural causes, such as lightning striking dry vegetation. Once fires have started, other areas are at risk, with embers blown by the wind causing blazes to spread to new areas. Scientists have long warned that a hotter, drier climate will contribute to fires becoming more frequent and more intense. There have been two other meteorological patterns that helped generate the extreme conditions Australia has been experiencing, and both these phases made conditions worse.

Cause :

Each year there is a fire season during the Australian summer, with hot, dry weather making it easy for blazes to start and spread. Natural causes are to blame most of the time, like lightning strikes in drought-affected forests. Dry lightning was responsible for starting a number of fires in Victoria's East Gippsland region in late December, which then travelled more than 20 kms in just five hours. Humans are sometimes to blame for starting the fires, but they are also often sparked by natural causes, such as lightning striking dry vegetation. Once fires have started, other areas are at risk, with embers blown by the wind causing blazes to spread to new areas. Scientists have long warned that a hotter, drier climate will contribute to fires becoming more frequent and more intense. There have been two other meteorological patterns that helped generate the extreme conditions Australia has been experiencing, and both these phases made conditions worse.



Scientists have long warned that a hotter, drier climate will contribute to fires becoming more frequent and more intense. There have been two other meteorological patterns that helped generate the extreme conditions Australia has been experiencing, and both these phases made conditions worse.

The Indian Ocean dipole was in a “positive phase”, meaning the Indian Ocean off Australia's north-west was cooler than normal and the west of the ocean was warmer. Positive dipole events draw moisture away from Australia and tend to deliver less rainfall. The southern annular mode was in a “negative phase” as the bushfires took hold in November and December. This phase was generated by a sudden warming event in the stratosphere above Antarctica and caused westerly winds to track further north, blowing hot air across the continent into fire-prone areas, further fanning flames.

Damage :

Over 18 million hectares have burned in the Australian bushfire. After initial devastation of the fires, impacts are ongoing. An estimated billion animals, and many more bats and insects, are likely to die in total over the coming weeks and months as a result of lost habitat and food sources. As a result of intense smoke and air pollution stemming from the fires, in January 2020 reports indicated that Canberra measured the worst air quality index of any major city in the world.



Conclusion :



Perhaps the Australian bushfires create an alarming impact on the global audience. And, people tend to retrospect on the effects of climate change. People are also thinking about disaster management and its intricacies. The continuing negligence of governments towards the issue of global sustainable development has become evident this time. Data shows that Australia has warmed overall by slightly more than one degree Celsius since 1910, with most of the heating occurring since 1950, the Bureau of Meteorology says. By the end of the month every state had measured temperatures above 40C - including Tasmania, which is usually much cooler than the mainland.

Bibliography :

- https://www.researchgate.net/publication/340930739_Case_Study_on_2019_Australian_Bushfire
- <https://disasterphilanthropy.org/disaster/2019-australian-wildfires/>
- <https://www.unenvironment.org/news-and-stories/story/ten-impacts-australian-bushfires>



ONE DAY TOUR TO A CLANDESTINE ISLAND-MOUSUNI

Shreya Das, *Class of 2022*

The wintry days were preparing for an adieu, rolling out the carpets for the spring. Having been occupied in the chores of research for quite a phase, it was time to recharge the fried circuits! And unapologetically, I turned to my best buddies. That we must go on a trip, if not a long one, a weekend jaunt at the least.

Location :



Mousuni Island is located at the southern end of West Bengal. This is basically a river island. Mousuni Island formed at the sea mouth of Muri Ganga River and river Chinai separates Mousuni Island from the main land. If you look at the map you will see this place Mousuni Island is located in between Gangasagar Island and Bakkhali. Bakkhali is situated south-east corner of Mousuni island and Gangasagar Island is located at

South-west corner of the island. Jambu Dwip is situated at the south of Mousuni and it can be seen on a clear day.

How To Reach ?

Mousuni can be reached in several ways, but we chose to travel by car. At 8 a.m. we started our journey from Jadavpur, Kolkata. Then we travelled for 2 ½ hours to reach Diamond Harbour, where we completed our breakfast. From there we had to travel for another 1 ½ hours to reach the bank of the river Hatania- Dotania. It took around 15 minutes to cross the river by the boat. Thereafter we took a toto to reach our destination spot – Moonlight Canvas.



All along the way, apart from enjoying the rugged and rustic village sights, we were also mesmerized by the scenic beauty. Interestingly, even though mobile internets do not work in such remote places, there are still certain connections which helped us to make calls and keep in touch with our family back home. The tents are located only about 50 meters far from the sea, which provided us with ample opportunities for boating and enjoying the sea view.

Manoeuvre :

Mousuni island is a heavenly abode for all the bird watchers. Sunset at the beach was mesmerizing. We took a stroll around the beach and took the pleasure of viewing the setting sun rays. There were plenty of fisherman's colonies all over the beaches. We also explored the fisherman's life through interaction and exchanging of ideas. We relished the mud walk through Mangrove forests and provided food to our adventurous soul. In evening we also enjoyed tasting the local seafood. Later as per our call, Bonfire and barbeque was arranged. Bonfire played a very important role to keep ourselves warm at such chilled evening by the sea.



Mousuni Island : Best Time To Visit

The place can be visited all through the year but because of the proximity to the sea, the summers are highly humid. The rainy season is a bit risky near the sea, so most of the camps stay closed. Therefore, December to mid-April is the ideal time to visit Mousuni.



Cessation :

Being a remote island, MOUSUNI offers a lot of greenery with less pollution and a different flavor altogether. If you are tired of your regular hustle-bustle and want a very quick relaxation, then you must visit this virgin beach. Although this island is getting popular day by day, so many tourists are visiting, but unfortunately they are leaving trashes on the sea beach, thus MOUSUNI is losing its natural beauty.



THE MIRROR WORLD OF MANIPUR

Soumi Kayari, *Class of 2022*

To escape the muggy climate of June in Kolkata and to escape the chaotic city life, we decided to head to the lesser-known part of northeastern India for a short weekend trip. The state of Manipur which is situated in the northeastern part of the Indian subcontinent, with Imphal as its capital-located at the center of the state, is largely isolated from the rest of India. The name Manipur means “land of gems”. One such “gem” of the state is north-east India's largest freshwater lake known as the Loktak Lake. We took a drive of 48kms from the capital city to reach there. Situated in the district of Bishnupur, this large water body covers an area of 287km square. The very first sight of this lake gave us the feeling of entering into a mirror world. As clear as glass, the transparent water reflected the sky above and it seemed like the clouds have descended into the lake.



“Mirror world”The floating islands over the lake

One of the most striking features are the phumdis floating over the lake. These are a series of floating islands, exclusive to this lake of Manipur. They cover a substantial part of the lake area and are heterogeneous masses of vegetation, soil and organic matter. As we took our boat far away from the shore, many more such phumdis or circular floating islands-larger in size were seen floating over the lake. They almost looked like green colored rings floating over the clouds, as the bright sunlight made a clear reflection of the sky on the water surface. To know about the locality, I asked our guide about the lifestyle of the natives and as said by him, Loktak is “the lifeline” of the state and also many fishermen live on the phumdis. Besides tourism, thousands of fishermen gain their livelihood from this water body and also it is vital for irrigation. Except for a few local fishermen, there were no other tourists at that time. The weather was quite pleasant and cool enough unlike the heat of summer, with light breeze which swayed our boat and the environment slowly transformed into a beautiful and serene one, as we rowed through the middle of the transparent lake.

While returning we crossed through a small village in Moirang. It was time for sunset, and this small village on the foothills, with the sunset in the background, made it totally picturesque. The village has sparse population and the villagers depend on mostly agriculture and small cottage-based industries. We visited one of the handicraft shops of the villager inside their hut. They warmly greeted us and



Fishermen and locals of Bishnupur

showed that they generally use jute or wood as raw material for craft work. The Sangai or the brow-antlered deer which is found only in Manipur, the Manipuri dancing girl and idols of Lord Radha and Krishna are the most famous craft work of the place.



Village in Moirang



Handicrafts by villagers

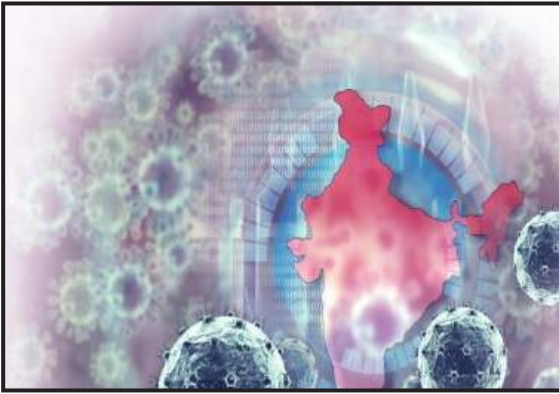
Just like this, the state of Manipur has many other hidden gems, starting from green landscapes to historical places like the Kangla Fort. But, as stated by the locals, because of frequent political turmoil it doesn't attract many tourists and its beauty has not gained much attention. This beautiful land still remains isolated and less developed in terms of tourism.



THE CATASTROPHIC YEAR -2020

Vartika Banerjee, *Class of 2022*

Introduction :



Other than cool movie names, what really comes to your mind when you hear words like 'apocalypse', 'annihilation' or 'Armageddon'? "End of the World" right? Now the question arises, 'When?' While the Mayans would tell you it's supposed to be 2012, for us who breathed past the end of 2019, 2020 did manage to make a really strong case in this regard. A deadly pandemic, fatal disasters, unexpected deaths, menacing accidents, recurring civil disobediences, declining economy- it would only be an understatement

to say that the year 2020 was full of nightmares. With the fiascos of COVID-19, economic depression, loss of celebrity lives, petty politics by China capturing most of the coverage, I'd like to reflect some light on some of the most catastrophic disasters that hit our country in 2020.

Cyclone Amphan - It was probably the beginning of May 2020. Just when the common people were getting accustomed to terms like 'Quarantine' and 'Lockdown', India Meteorological Department started warning us of a super fatal cyclone build-up over the Bay of Bengal. It finally hit the shores of West Bengal, Odisha and Bangladesh in mid May, causing widespread damage to life and property. Amphan took 40 hours after its formation to become a super cyclone. The main reason behind this was the high sea surface temperatures



of 32-34 degrees celsius in the Bay of Bengal. General long-term warming of the Bay of Bengal was the leading cause of rapid intensification, according to experts. Amphan, with a top wind speed of 260 km/h



(compared to cyclone Aila's peak of 120) is the fourth super cyclone to have hit West Bengal in the last five centuries. The damages caused have been estimated to be worth \$13.7 Billion, making Amphan the costliest cyclone in the North Indian Ocean and the fourth most expensive disaster of 2020. But thanks to the measures taken by the Government

and concerned authorities, the number of fatalities was contained at 128. The countries affected include India, Bangladesh, Sri Lanka and Bhutan.

Assam Floods - Heavy rainfall and flooding of the Brahmaputra river in May came at a heavy cost for Assam with casualties and widespread destruction of property and agriculture. It immediately displaced 30000 people across 5 districts. Decimating 270,000 hectares of agricultural land, it ended

up affecting over 5 Million human lives in 5474 villages with total damages estimated to cost 3.46 Billion. As many as 123 people lost their lives in the floods, while 26 died due to landslides. It further forced 150 thousand people to take refuge in relief camps. The flora and fauna in the region too sustained substantial damage, and 45000 domesticated animal went accounted for Locust Infestation- The locust attacks, also known as Swarmageddon, were a surprise, even for the standards of 2020. The locusts entered India from Iran and Pakistan. In 2020, the first swarms



were spotted in January in Gujarat's Banaskantha district. In May, Rajasthan and Madhya Pradesh were severely affected by locust swarms measuring a kilometer wide, the worst locust attack in 27 years. In June, millions of locusts swarmed on a massive scale in Gurgaon making it look like a sand storm. The locust plague originated in East Africa in 2019 and affected as many as 23 countries through April 2020.

Over 200 thousand hectares of crop lands were impacted with 33% crop damage.

Oil and Gas Leak in Assam - Well, this never gets old. As deadly and expensive these leaks are, humans have failed to avoid them every now and then. In May, one of the wells at Oil India Limited's (OIL) Baghjan Oilfield Assam started leaking, ultimately resulting in a blowout. The subsequent fire that started middle of 2020 was reported to be still burning till November. The oil and gas leak resulted in two deaths, large-scale local evacuations, and environmental damage to the nearby Dibru-Saikhowa National Park. Since most accidents in the upstream sector are a resultant of human error, lack of safety measures or negligence in proper Blowout Preventer installation can be held accountable. As a result, Centre had exempted all oil and gas firms conducting exploratory drilling from legal requirements for environmental clearances. The National Green Tribunal imposed a fine of 250 Million on OIL to compensate the affected people.



Conclusion : A number of floods and cyclones apart from the ones mentioned above had hit different parts of India in 2020. But the dreadful year is over and it's time to get back on our feet. The disasters have given us a reminder of how cataclysmic nature's fury can be. Though we can't prevent most natural disasters yet, we can certainly minimize their impacts through necessary measures through the means of conservation of

natural resources and sustainable development. As quoted by Antonio Guterre - Humanitarian response, sustainable development, and sustaining peace are three sides of a same triangle. Norway stands as a lead example for us to practice and succeed in sustainable energy development. 2021 will pose various challenges, most of them to undo the damages caused last year, and we need to face them with our chins up. Think, plan and act before it's too late. Sustainable developments remains a beacon of hope for our safer future.

Bibliography :

- <https://timesofindia.indiatimes.com/india/disasters-that-struck-india-in-2020/articleshow/79954339.cms>
- https://en.wikipedia.org/wiki/Cyclone_Amphan
- <https://timesofindia.indiatimes.com/readersblog/letsbereal/assam-floods-2020-23481/>
- [https://www.drishtias.com/daily-updates/daily-news-analysis/assam-gasleak#:~:text=Recently%2C%20a%20gas%20leak%20has,Limited%20\(OIL\)%20since%202006.](https://www.drishtias.com/daily-updates/daily-news-analysis/assam-gasleak#:~:text=Recently%2C%20a%20gas%20leak%20has,Limited%20(OIL)%20since%202006.)
- <https://www.thehindu.com/sci-tech/agriculture/locust-attack-in-india/article31729025.ece>
- https://en.wikipedia.org/wiki/2019%E2%80%932021_locust_infestatio



CYCLONE AMPHAN AND IT'S EFFECTS IN WESTBENGAL

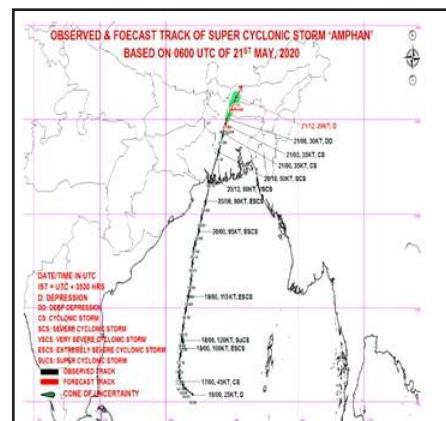
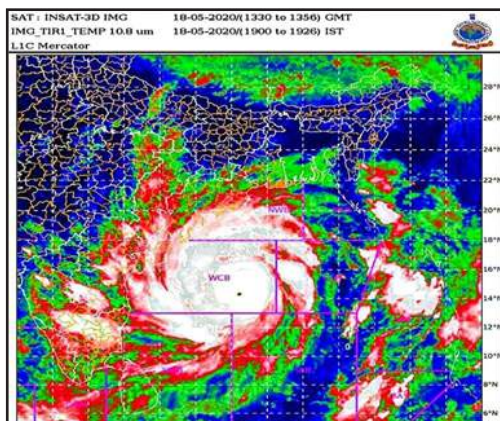
Udita Bhattacharyya, *Class of 2023*

Introduction :

Supercyclonic storm Amphan was a powerful and catastrophic tropical cyclone,that originated from low-pressure area persisting a couple hundred miles east of Colombo in Sri Lanka, had caused widespread damage in eastern India, especially in West Bengal on 20thMay 2020.Cyclone Amphan made its landfall in West Bengal between Bakhkhali and Digha on afternoon of May 20, as a very severe cyclonic storm with sustained wind speeds of 155-165 kilometers per hour spiralling up to 185 kilometers per hour. Coastal areas in West Bengal comprising east Midnapore,north 24 parganas, south 24 parganas,Kolkata,Hooghly and Howrah were devastated by the cyclone.

Preparations :

Alerts had been sounded in 5 districts in West Bengal including Kolkata,South 24 Parganas, North 24 Parganas, East and West Midnapore. All fishing expeditions were stalled until further orders. Operations at Haldia docks, including floating cargo handling in the sea, were also suspended. The Indian coast guard had initiated a series of pre-emptive measures to tackle the approaching cyclone.



CYCLONE AMPHAN IN BAY OF BENGAL INDIA METEOROLOGICAL DEPARTMENT'S TRACK ON AMPHAN

Various help line numbers were also set by different organisations and also the government for providing 24/7 assistance to the people. Amateur radio(ham) had taken their actions immediately and reached Bakhkhali in south 24 parganas in order to help the people,taking various precautions. At most part of the alert zone in West Bengal the fishermen,farmers and other unsafe villagers were shifted to proper evacuation centres along with their cattles so that they remain safe during after the cyclone hit the coast. Announcements were made throughout so that people stay inside their house or under some safe places during the storm.

Impact Of The Storm :

Millions of people left homeless after the storm hit on coasts. West Bengal government estimates that 21,560 sq km(appx) of area has been affected in the cyclone impacting the lives of millions of people.



CATTLES AND VILLAGERS KEPT IN EVACUATION CENTRE

Apart from human and livestock casualties, the cyclone also caused severe losses to farmers by destroying their standing crops of paddy, mangoes, lychee when it was a time for harvest. Several parts of Kolkata was left without power, internet and water. Soon after the fury of the storm subsided, the snapped electrical wires and damage to water pipes led to power outages and water shortages in pockets across the state. The absence of internet further compounded the woes as the official work came to a complete halt and also due to lockdown people were working from home. The city airport was flooded in rainwater. Thousands of trees uprooted destroyed the environment and livelihood. Protests broke out in several parts of Kolkata for the delay in restoring normalcy. The uprooted trees led to many important roads remain closed for people, many houses were also affected by the uprooted big trees.



POST AMPHAN EFFECTS IN CITIES AND VILLAGES

Control Taken By Government And Amateur Organisations To Restore Normalcy :

On 22 may, Prime Minister Narendra Modi conducted on aerial survey over Kolkata, along with Chief Minister Mamata Banerjee. Our Honourable PM announced a rs.10 billion immediate relief package for West Bengal. Twenty disaster relief teams were sent to West Bengal to aid recovery, in addition to NDRF team pre-positioned there before Amphan. Approximately 1000 ground teams worked to restore infrastructure and services in West Bengal after Amphan. At a time when internet and power connectivity had died down, radio proved to be of great help for the administration and those trapped in

the affected area across the state. HAM radio stations with the help of 42 volunteers spreaded in various districts managed to save around 8000 people and sent them to safer locations.



HAM MEMBEMBERS ANDNDRF IN ACTION TO RESTORE NORMALCY AFTER THE CYCLONE

Bibliography :

- <https://india.mongabay.com/2020/05/west-bengal-faces-the-brunt-of-cyclone-amphan/#:~:text=Cyclone%20Amphan%2C%20hit%20West%20Bengal,in%20the%20eastern%20I ndian%20state.&text=The%20storm%20in%20West%20Bengal,in%20the%20state%20capital%20 Kolkata>
- https://en.wikipedia.org/wiki/Cyclone_Amphan

Image Courtesy :

- https://en.wikipedia.org/wiki/Cyclone_Amphan,<https://www.indiatoday.in/india/story/cyclone-amphan-landfall-damage-west-bengal-odisha-kolkata-rains-heavy-winds-1680224-2020-05-21>, with observation and with help of HAM radio's youngest member, Saborni Nag Biswas.



INFLUENCE OF THE PHYSICAL SETTING ON THE SOCIO-ECONOMIC LIFE OF MAN IN CHORDA, PURULIYA DISTRICT

Enakshi Mukherjee, *Class of 2020*

Introduction :

The students of the Geography Department had visited the Chorda village in Baghmundi block of Puruliya on 20th November, 2018, as a part of their excursion. Chorda, is a village of skilled mask makers. It is famous for Chau mask making. This tradition of mask making is 150 years old, starting from the time of King Madan Mohan Singh Deo and is continued thereafter till now.

Objective :

To present a comprehensive study of the physical and economic environment of the study area, their interdependence and its overall impact on the village.

Methodology :

Three aspects of field study had been studied for preparing this report. They are the following –

- Pre-field study: includes the collection of information from various books and government offices before visiting the study area.
- Field study: includes both primary and secondary data collection. Primary data collection includes the household survey and dumpy level while the secondary data collection includes the collection of information from various government offices in the study area.
- Post-field study: includes the analysis of the data collected and representation of that data through various maps and diagrams so that the inter-relationship between the physical and economic factors can be clearly established.

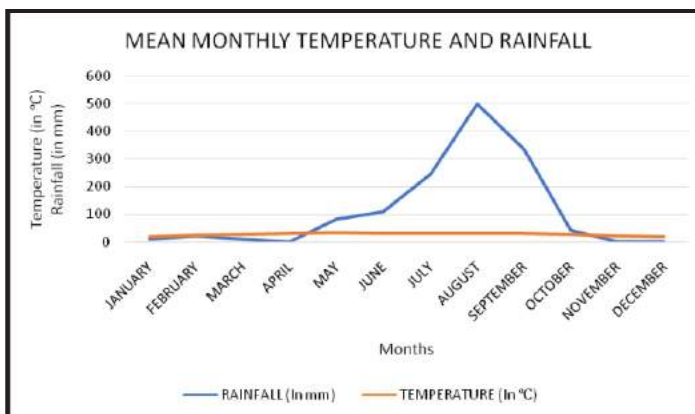
Physical Setting :

The physical factors of relief and geology, drainage and soil, natural vegetation etc. has immense influence on the socio-economic factors.

Relief : Formed in the Pre-Cambrian era, the geological history of Puruliya reveals that Archean rocks are overlain by Gondwana rocks and is covered by alluvium. Denudation for a long period has given rise to various topographic conditions. The study area is formed primarily by gneiss, schist, sandstone and alluvium. It is located at the foothills of the Baghmundi hills and has an average height of 250m.

Drainage : The main rivers flowing through the district are Damodar, Dwarekeshwar, Kumari and Kasai etc. The Panchet and Baranti dams, were visited which are important irrigation projects, water supplies and fish farms. There are a few non-perennial rivers flowing through the study area in a south-westerly direction running from the Ajodhya Hills. A few scattered tanks are present in the village.

Climate : Characterized by tropical sub humid continental type of climate, Puruliya has a prolonged dry season. Mid-November to February covers the cold season while the hot summers extends till May. Monsoons start thereafter and continues till September and the months of October and half of November are post-monsoon months. Dry seasons often result in drought conditions. Monthly range of temperature ranges



between 18.50C, being the lowest in the month of January to 28.50C being the highest in July or August. The daily temperature is often pushed up to 40°C because of dry land winds.

Soil : Covered mostly of residual soils, the soil of Puruliya has high iron content, which makes it reddish. The soil of the study area falls in the pediment area and the soil type is classified as Shalgadumaumi.

Natural Vegetation : The main species that are dominating the area are Sal, Simul, Palash, Kadam etc. Kendu leaves are a source of income generation as they are used to prepare biris. The Ramkrishna Mission Lok Siksha Parishad, has set up a Joint Forest Management that often sets up camps and awareness programs for forest conservation.

Socio-Economic Setting :

Chorda village comes under the Baghmundi block and is the fifth biggest village of the district. With 546 households, the density of population of the village is 263 persons/sq.km. The sex wise composition shows a male-female balance with the males outnumbering the females marginally.

Household survey :

Primary data has been collected by household surveys wherein only 109 households out of 546, randomly selected, were surveyed.

Population Features : In the sample population, it is seen that the greatest number of people occur in the age group of 15-35 years with marginally more females than males. The above sixty population is not much indicating a comparatively low life expectancy. The dependency ratio is high and it works out to be 38 per 100 workers. The surveyed population is Hindu by religion and speaks Bengali language.

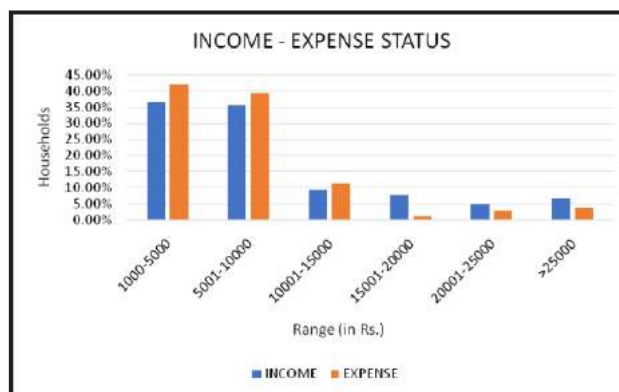
Literacy and education : Analysing the literacy rates of our study area, it is seen that literacy rate is higher among males than female. Overall literacy is 67.66% which is higher than the general block and district level literacy. Only a small population has received higher education.

Work Participation and Occupation : The percentage of the non-working population (51.59%) outnumbers that of the working population (48.41%) marginally. Non workers are higher among the females compared to men. Majority of the people in the sample population are engaged in the business of selling masks while some are also engaged in agriculture and service sector.

Economic Base : Agriculture is practiced by many. Single cropping is prevalent due to absence of irrigation facility. Rice is the main crop while potato is cultivated during winter. Mask making is dominant in the village.

As far as the average cost of mask making is concerned, it ranges from Rs. 1000 (most common) to Rs. 2500. This variation is because of the variety of raw materials that is used.

Standard of living : It is seen that the majority of households has six members. The income ranges from Rs. 1000 to Rs. 5000 for majority of the people and that rises up to Rs. 20000 for an insignificant proportion. On an average income levels were low which indicated a low standard of living. Monthly expense ranged from Rs. 1000 to Rs. 5000 on an average, much similar to the income. No significant responses were received when asked about savings as whatever is earned is also spent simultaneously. A study of the assets gave a broader idea of the standard of living of the people.



There is wide disparity in living standards, as some well off households own cycles, land, cattle and poultry while others having none except their homes and some utensils. Almost all households (98%) own the house they live in.

Quality of life : This is measured based on several parameters, the first one being the type of house. About 52.29% houses are kutchha and 47.71% houses are pucca. Mud and cement are the popular flooring and wall material and asbestos is mostly used for roofing alongside tiles, bamboo and straw. Electricity is available in 86% of the households. But there is a huge problem in water and sewerage supply. Tubewells are used for collecting drinking water and water for cooking, while ponds are used for bathing and washing clothes. Sanitation facility is almost absent in most households, although there are common toilets. Due to the nearness of forests, fuelwood becomes the most important source of fuel.

Village Amenities : Talking about amenities, it is seen that while some amenities are within the village, some are at a distant. There are three primary schools within the village, and four secondary schools within 5 km from the village. Post office, grocery shops, bus stops, health center, banks etc. are all within 2-4 kms from the village. The railway station is 10 kms from the village.

Transport and communication : The SH4 from Jhalda to Junput is the major means of connectivity to Baghmundi block. Due to Chorda's importance as a craft centre, the village has good road connectivity. Jhalda is the nearest town to the village. Cycles and walking are the most common modes of transport. Van-rickshaws and jeeps are less popular. Buses are also accessible due to the nearness of the bus-stops.

Market survey : There are 50 shops at the entrance, out of which 20 shops were surveyed. Majority of the shops out of the sample, sell masks and some sell decorative items, garments and idols of gods. These masks, idols or gifts cater to both local markets and also at markets of Kolkata or Shanti Niketan. The Puruliya Mela is a favoured destination for the products of Chorda. The peak sale is from November to March. Bank loans and credit facilities are available for mask makers.

Dumpy Level Survey :

Analysing the land use of the study area, it is seen that the southern area is covered by agriculture. The northern part is hilly and forested. With the help of prismatic compass and dumpy level survey, a long profile has been generated. It shows that the settlements are located between the agricultural fields and the forests. This indicates that the people are dependent on agriculture and forest products.

Conclusion :

It can be said that Chorda is a moderately developed village which has gained considerable fame due to its rich cultural heritage. Its unique livelihood of mask making distinguishes it from other villages. Although there is moderate development, the households engaged in mask making are much well off compared to those engaged in agriculture. There is definitely scope for further improvement if irrigation facilities are developed in agriculture, wage rates are increased for labourers working in agriculture, credit and marketing facilities for the mask-makers are improved and health and education facilities are made more widely available. Chorda has access to multiple natural resources in the form of cultivable lands, forest and ample water bodies, a unique livelihood activity in the form of mask-making and thus has bright prospects for further development.

Bibliography :

- Soils of Purulia District, West Bengal (NBSS and LUP)
- Topographical Sheet No. F45C4
- Prathamik Manchitrabali
- District Planning Map Series, Puruliya, NATMO
- District Statistical Handbook of Puruliya, 2008
- Census of West Bengal (CD), 2011
- District Statistical Handbook of Puruliya (CD), 2010 and 2011 (combined)
- Primary Census Abstract of Puruliya (CD), 2011
- www.censusindia.gov.in
- www.censusindia.net
- www.Indiamaps.com



PHOTO ALBUM OF DEPARTMENTAL ACTIVITIES : 2020

ANNUAL EXCURSION TO GARHBETA



'WILD ROOTS' PROGRAMME

