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IMPACT OF NATURAL DISASTERS ON SOCIAL - ECOLOGICAL BALANCE AND SUSTAINABLE DEVELOPMENT OF BANGLADESH

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Abstract:

In current decades, natural disasters have lead to substantial forfeiture and havoc to human, social development, ecology, economy, and society. Natural disasters like floods, earth quake, cyclone, hurricane, additionally river back erosion, sea level rise and changes in the atmosphere, is already affecting ecological and social development. Accordingly, there is a swiftly rising frame of research describing on the impacts of natural disasters on social change and on the estimation of environmental change impacts on social- ecological development In particular, this paper suggests the impact of natural disasters on ecological and social development of Bangladesh.

Key Words: Natural Disasters, Environment, Ecology, Child- Development, Economy, Bangladesh, Social Development.

Introduction:

All humans rely on the eco system and natural resource to execute necessity and endure good physical and mental condition. The people have accustomed their means of living and deportment to persevere in their unique environment. The natural world paramountcy people's values, behaviors, attitudes, and ambitions and culture and social value. Different environments have had differing influence on their human cultures. Natural disasters can have a catastrophic affect on inhabitants and society. The acuteness based on various components, incorporating the type of disaster and the preparedness of the community, knowledge of the community about how to minimize the loss due to natural disasters, disasters responsiveness of the community.

Natural disasters have numerous influences on social ecological development such as loss of life, assets, diseases or other health related problem, crops and resource damage, loss of livelihood and source of income, social and economic turmoil, occupation loss etc. Every year various capital assets and infrastructure such as housing, schools, factories and equipment, roads, dams and bridges are destroyed by natural disasters in Bangladesh .Human capital is evacuate due to the loss of valuable life , the of loss of skilled manpower and the destruction of education infrastructure that disrupts schooling.

Disasters may slow economic and social development of a country. In Bangladesh social ecological development is greatly affected by natural disasters each year. The data used this paper is collected from; Bangladesh Disaster related Statistics 2015 & 2021.

This research reveals that natural disasters not only make economic loss but also hamper social ecological balance of Bangladesh. Natural disasters also influence demographic attributes and habitual facts of the inhabitants of Bangladesh.

Objective of the Research:

- To evaluate how natural disasters affect social life of the people of Bangladesh.
- To inspect how natural disasters change the social -ecological balance in Bangladesh.
- To assess how natural disasters affect the economy of Bangladesh.

Research Questions:

- To what extent natural disasters influence the demographic factors of Bangladesh like education system, occupation, marital status, longevity?
- To what extent natural disasters had connected various demographic factors such as age and marital status, education and occupation, age and education?
- To what extent natural disasters influence the habitual fact of the people in the disaster prone area of Bangladesh?

Scope of the Research:

- The research scope is defined in relation to the ecology scope, population scope,(population of interest), geographical scope and time scope.

Ecological Scope:

- The all disasters prone area of Bangladesh and their inhabitants are the ecological purview of this research.

Population Scope:

- A large number of village and regions in Bangladesh were devastated by various natural calamities in every year. The affected households in that village and regions were defined as the target population of this survey.

Geographical Scope:

- The whole disaster prone area of Bangladesh was under the scope and purview of this research.

Time Scope:

The time scope/ reference period of the research was last six years, beginning with the calendar year 2015. (2015-2021).

Mission and Vision of the Research:

The prime goal of the research is to develop a social ecological frame work on disaster risk and impacts, such as people killed, injured, homeless, as well as economic losses. All these data can be used to analyze the severity of disaster risk, impact of natural disasters on ecological cycle of Bangladesh, and reduce the country's socioeconomic effects from disasters. However the specific missions of the research are:

- To evaluate the socioeconomic characteristics of households and populations living in disaster-prone areas of Bangladesh.
- To estimate how the damage and loss of cultivable and usable land in disaster prone areas of Bangladesh affect social-ecological balance.
- To evaluate how the loss of agricultural production (Crops, Livestock, Poultry, Fisheries, and private forestry Forestry) due to natural disasters in BD affect economy.
- To inspect the extent of damage and loss to residences, cowsheds, and kitchens in disaster-prone areas of Bangladesh affect the social-ecological cycle.
- To gather data on the state of health and sanitation in disaster-prone areas in BD.
- To check out the vulnerability of women, children, the elderly, and people with disabilities; and
- To collect data on people's perceptions and knowledge of disasters, in addition the effects of disasters in Bangladesh.

Literature Review:

Ecology was originally defined in the mid-19th century, when biology was a vastly different discipline than it is today. The original definition is from Ernst Haeckel, who defined ecology as the study of the relationship of organisms with their environment. Ecology is the natural science of the relationships among living organisms, including humans, and their physical environment. Ecology considers organisms at the individual, population, community, ecosystem, and biosphere level.

Social ecology is the study of how individuals interact with respond to the environment around them, and how these interactions affect society and the environment as a whole. The social-ecological cycle conceptual model explain the impact that human have an natural resources and subsequent feedback to human well-being and how people respond to those changes through management dimensions. The socio ecological framework is a multilevel conceptualization of health that includes intrapersonal, interpersonal, organizational, environmental and public policy factors.

Social ecology deals with energy and society, land use and food production, the metabolism of societies and the environmental impact of human activities. Social ecology offers a conceptual approach to society-nature coevolution that integrates historical and current development processes and future sustainability transitions. The factors of socio ecological models consists of individual behaviors, socio demographic factors (race, education, socioeconomic status), interpersonal factors(romantic, family and coworker relationship), community factors(physical and social environment), and societal factors(local, state and federal policies).

The social ecological persepective is useful for understanding relationship between children or young people, and for understanding the different systems listed above, includind friendship networks, families, community organizations and services, cultures, national policies and even globalization.

Components of Social-Ecology& It's Relation with Natural Calamity:

Sociology can be defined as all the ways of life including arts, beliefs and institutions of a population that are passed down from generation to generation. Socio ecology has been called "the way of life for an entire society."The major elements of the sociology are material culture, language, aesthetics, education, religion, attitudes and values and social organization are material element of sociology

The people have adapted their ways of life and behaviors to survive in their unique environment. Explain that different cultures develop different characteristics primarily because of adaptations to environments. Traditions often begin as people find rituals and routines that help them survive.

The major elements of social-ecology are symbols, language, norms, values, and artifacts. Language makes effective social interaction possible and influences how people conceive of concepts and objects.

- Social Organization.
- Language.
- Customs and Traditions.
- Religion.
- Arts and Literature.
- Forms of Government.
- Economic Systems.

Ecology and Environment is a provocative analysis of the complex relationship between people and their environments from a cross-cultural perspective. A social's perception of its natural environment often reflects the qualities of that environment. People living in a harsh climate tend to see nature as somewhat threatening, while society that live in mild, resource-rich environments tend to see nature in more benevolent terms. The environment or nature influences people's values, behaviors, attitudes, and ambitions. Components influencing a given set of people's behavior or ideas are impacted by elements influencing their culture. One of the fundamental aspects of culture is the relationship it prescribes between individuals and nature.

Social - ecology also is influenced by the natural environment. The art, literature and modes of living of a country bear the impression of its natural environment. The natural conditions affect the outlook on life, traditions, folk's lore, marriage, institutions, form of government etc. Disasters can both destroy development initiatives and create development opportunities. Development schemes can both increase and decrease vulnerability.

The poor are more likely to live in vulnerable areas (slopes prone to landslides, flood plains, marginal agricultural land), have difficulty accessing education and information, have fewer assets to invest in resources to reduce vulnerability, and are more prone to become malnourished and have chronic illnesses that Influenja, Jondice, Diarrehia, Hepatities. Natural disasters causes coping capacity, cultural impacts, loss absorption, loss acceptance, loss of livelihood, psychological impacts, psychological support, social vulnerability.

Environmental Influences on Child Development:

The family, school, or general environment a child lives and interacts with generally affects their growth and development In the early formative years, children pick up things from their environment, learn how to solve problems, habits, and behaviors, socialize, and general functioning. Consequently, studying the main environmental factors affecting the growth and development of a child is necessary. These include the social, emotional, economic, and physical environment.

Social Environment:

The social environment influences on child development are those that affect the social relationships that children will form throughout their lives and the quality of said relationships, whether with their families, or the neighborhood where they reside. Some examples of a child's social environment include educational facilities, housing, recreational facilities, and the places they spend most of their interactive social time.

Emotional Environment:

The emotional environment in child development refers to how well their interpersonal and relational needs are being met at home. This factor may include learning what emotions are, understanding and communicating their feelings, learning empathy, and developing appropriate ways to manage and handle their feelings and those of others. Natural disasters hampered children's emotional development. Children who grow up in less than ideal emotional environments tend to struggle in the future and are unable to form meaningful relationships as they grow up and, in extreme cases, get involved in crime. Studies have also linked poor emotional environments to later mental health issues such as anxiety.

Economic Environment:

The economic environment in child development essentially refers to the financial situation in which a child grows up. Economic factors primarily affect child development since child rearing is an expensive endeavor. Research asserts that the most preventable negative impact on a child's development is a direct result of the economic environment. There are claims that children from low-income families have poorer health, and are more likely to perform poorly in school than their wealthier counterparts. Natural disasters causes economic losses of small income family, which affect child development.

Nurture in the Development of Children:

The nature vs nature debate is one of the oldest concepts in child-rearing psychology. Nature defines the hereditary aspects such as genes, which will determine the physical traits, and help build a child's personality traits. Nurture, on the other hand, points to the environmental factors and how they may affect experiences while growing up, social relationships, and behavioral characteristics. Nature explains how genetics can provide a possible predisposition for a developmental issue, affecting how the child turns out. Nurture, however, can mitigate the effects of the developmental problems caused by nature since nurturing helps children learn, or unlearn undesirable traits they might have inherited.

Type of Natural Disasters & Its Impact on Ecology:

A natural disaster is a sudden and dreadful event that happens as a result of a natural process (such as a hurricane, tornado, or flood) .Every year in the world natural disasters causes remarkable loss of economy and create loss of millions of life. A natural disasters damage property, spread out diseases, loss of valuable life along with economic loss and destruction, the acuteness of a particular disaster is determined by the resilience, or ability to retrieve, of the affected people. Natural disasters have caused extensive loss of life, as well as damages to physical facilities such as buildings and infrastructure, and have as a result had a detrimental impact upon the socio-economic conditions of affected communities. Climate change may also influence the frequency and intensity of hazardous events such as droughts, floods and landslides with inevitable widespread impacts, also on cultural heritage. Changes in temperature, precipitation, and atmospheric moisture, and wind intensity, in addition to SLR, desertification, and the interaction between climatic changes and air pollution have been identified by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as threats to culture and social development of a country.

Flooding:

Flooding is one of the most important consequences of climate change for cultural heritage in Europe (Historic England, 2015). The need for reducing and managing the risks of flooding on cultural heritage was thus included in Directive 2007/60/EC of the European Parliament and of the Council of 23 October 2007 on the assessment and management of flood risks.

SLR and Associated Coastal Impacts:

Sea Level Rise:

Rising sea level poses a significant threat to cultural heritage (Perez-Alvaro, 2016) situated in coastal areas, and Marzeion and Levermann (2014) have estimated that 19% of UNESCO WHS globally could be lost to inundation in a 3°C warming scenario. Studies in Europe on this topic have to date focused on the Mediterranean region.

Coastal Erosion and Coastal Flooding:

Rising sea level together with a higher frequency of storm surges will increase coastal erosion, causing re-shaping of the coast, and a further increase in the frequency of coastal flooding, impacting coastal heritage sites.

Income:

Income and environmental stability are often directly related to each other, especially when higher income samples are contrasted with lower income samples. Also, environmental quality is accepted to be inversely related to various physical (and psychological) health problems. In other words, income of the individuals in a society is generally accepted to be highly associated with exposure to a wide variety of environmental quality indicators in the surrounding environment, at home, on the job, in school, as well as in one's neighborhood, which in turn cause negative health effects on individuals (Evans and Kantrowitz 2002; Cakmak et al.2006; Evans et al.2008).

Life Expectancy:

Natural hazards have caused extensive loss of life as well as damage to both tangible cultural heritage such as buildings and infrastructure and intangible cultural heritage such as social values, traditions, and attachment to a location. Employment, Marital Status, Occupation, Education level, Child education rate are some intangible cultural factors which are mostly affected by natural disasters.

Causes of Natural Disaster:

Natural disasters are caused on account of various reasons like soil erosion, seismic activity, tectonic movements, industrialization, urbanization, air pressure, ocean currents, and deforestation, etc. Natural exertion taking place in the earth's crust, besides surface, are the main reasons for these disasters.

Disaster Onset Phase:

Disaster onset phase is a period during which the direct impact of a natural disaster is felt. Naturally the slow on-set disasters (drought, normal monsoon, floods) have the long onset phase. And the rapid on-set disasters (flash floods, cyclones, earthquakes, fires, industrial accidents, landslides, etc.) have short on-set phase.

Drought and Desertification:

Mainly deficiency in precipitation is the cause drought .Drought has a major impact on ecological balance. The prime risks constitutes by drought is mentioned below:

- Drought increase temperature,
- On account of drought drying up rivers, lakes, and ponds and other source of water like water fall, canals etc.
- Drought drying out or loss of crops, plants.
- Drought drying out of soils and an increase in salinity level.

Besides the long term and acute effect of drought (both in intensity and in duration) is called desertification. It induces to the situations developing landscape almost identical to that of a desert. Desertification causes an adverse impact on environment which degrades the vegetation cover and soil.

Flood:

When land and localities are submerged by the over flow of water is called flood. Usually flood occurs alongside the river banks, lakes, canals and sea coasts. Generally river flooding is the most occurred flooding all over the world. In Bangladesh floods are the prime and serious natural disasters. The reason of flooding in Bangladesh is given below:

- Prolonged rain fall over several days.
- Poor drainage system.
- The failure of a water control structure such as levee or dam.
- Ice or debris jam causes a river or stream to overflow onto the surrounding area.
- Collapsed dams.
- Coastal storms.

Water Logging:

The saturation of land with water either temporarily or permanently is called water logging. When there is too much water in an area, the soil is unable to absorb the water and land is water logged. Bangladesh is extremely vulnerable to natural disasters. Water logging, however a minor occurrence, so far it has been disturbing and damaging people's livelihoods for the past 20 years in Bangladesh.

Cyclone:

Cyclone is a type of storm or a system of winds that rotates about a center of low atmospheric pressure and moves at a speed of about 30 to 50 mph (about 40 to 80 kilometers/h).Cyclone cause heavy rain and powerful winds .Cyclonic storms cause economic loss, in addition loss of life and property.

Tornado:

Tornadoes are violently destructive whirling winds accompanied by a funnel shaped cloud that moves in a narrow path across the land. Bangladesh faces the majority of its tornadoes in the transition to the wet monsoon of spring in every year. The country's peak tornado month is April, though its tornado season runs from March to May.

Storm Surge:

The unusual rise in sea water level during a storm is called storm surge. The surge is caused primarily by a storm’s winds pushing water onshore. In Bangladesh every year storm surge causes much death in the sea shore area.

River/coastal Erosion:

The loss or displacement of land along the coastal line or river line is called river/coastal erosion. The socioeconomic system of any locality is badly destroyed by the river and coastal erosion. It is more devastate than any other natural disasters in Bangladesh. In spite of the fact that river or coastal erosion not create loss of life, it does cause people to become undone.

Landslide:

A landslide is the movement of rock, earth, or debris down a sloped section of land. Landslides are caused by rain, earthquakes, volcanoes, or other factors that make the slope unstable. In Bangladesh, landslides are mostly triggered by heavy rainfall.

Saline Water Intrusion:

Saline water intrusion is the movement of saline water into freshwater aquifers. Saline water is gradually degrading the quality of ground water. It also hampered the purity of drinking water. In Bangladesh the coastal districts such as Satkhira, Khulna, Bagerhat, Barguna, Patuakhali, and Barisal are greatly affected by salinity intrusion. Higher salinity has an adverse impact on agricultural production, fisheries, livestock, and mangrove forests during the dry season.

Hailstorm:

Any thunderstorm which produces hail that reaches the ground is known as a hailstorm. In Bangladesh every year hailstorm caused extensive damage and loss to plants, agricultural crops, infrastructure and equipment stored outdoors. Animals and human are often killed by strong hailstorm.

Other Disasters:

In Bangladesh there are some other disasters such as fog, severe cold, epidemic diseases, locusts or pest infestations, human-wildlife confrontations, and other natural disasters that may cause a large number of death or destruction, loss of crops, livestock, poultry, plants, or fisheries.

Post-Disaster Phase:

The post disaster phase is more serious. In this phase various diseases are spread out, famine break out, scarcity of pure drinking water, many people are become homeless; many people don’t get proper treatment. During this phase actions are to be

taken to enable victims to resume normal lives and means of livelihood, and to restore infrastructure, services and the economy in a manner appropriate to long-term needs and defined development objectives.

Early Warning System:

Early warning systems are systems that provide individuals with timely and relevant information in a systematic manner before to a disaster so that they can make informed decisions and take appropriate action. Disaster risks are effectively reduced by early warning system. It prevents loss of life and reduces the economic loss of disasters.

Adaptation:

Adjustment in a new ecological, social, or economic systems in response to an actual or expected climatic stimuli and their effects or impacts is called adaptation. Adaptation indicates changes in processes, practices, and structures to moderate potential damages.

Vulnerability:

Vulnerability indicate to any existing socioeconomic, geographical, or environmental condition in a community that may render it vulnerable, weak, unskilled, or limited in its ability to adapt to the effects of a natural or man-made hazard or any adverse reaction.

Sustainable Development:

Sustainable development, according to the Brundt and Commission, is "development that meets current demands without jeopardizing future generations' ability to satisfy their own needs."It also implies concerns about social equity between generations, a concern that must logically be extended to equity within each generation." Sustainable development ensures "a harmonious process of social and economic betterment that satisfies the needs and values of all stakeholders while maintaining future opportunities and conserving natural resources and biological diversity."

Water Borne Diseases:

Water-borne diseases are any illnesses caused by drinking water contaminated by natural disasters which contains pathogenic microorganisms. In Bangladesh the common water-borne diseases are cholera, diarrhea, typhoid, amebiasis, hepatitis, scabies, and worm infections.

Vector-Borne Disease:

Disease that results from an infection transmitted to humans and other animals by blood-feeding anthropoids, such as mosquitoes, ticks, and fleas. Examples of vector-borne diseases include Dengue fever, West Nile Virus, Lyme disease, and malaria.

Emphasis on Sustainable Development Goals (SDGs):

This research paper focus on sustainable development goals also. This paper relating with the below mentioned SDG:

- SDG 1 -- No Poverty
- SDG 3 -- Good Health and Well-being.
- SDG 13 -- Climate Action.

This research also keep pace with these three SDGs. Natural disasters hamper economic development, which increased poverty of BD. Natural disasters also influenced good health, well-being and climate action of BD. Various disasters cause illness, physical disability, climatic change of BD.

Global Relevance and Comparative Analysis:

Today natural disasters very common in very common in whole world. The eight most common events are earthquakes, volcanic eruptions, landslides, floods, droughts, wildfires, storms, and extreme temperatures. This research is intended to equip us with knowledge and skills in analyzing disaster from the different perspectives like physical, psychological, socio-cultural economic, political and biological from BD and other countries also. Because most of the countries hampered by natural disasters at same direction. Research found that Philippines, Indonesia, India, Bangladesh, Japan are the most disasters prone countries in the world.

Research Design:

At the starting of every purposeful research, a researcher must select a framework of methods and techniques to be used and applied in the research process. This framework is usually referred to as the research design. In this research the author used the correlation research design and explanatory research design. Because the correlational design allows the researcher to establish some kind of a relation between two closely related topics or variables. It's a non-experimental research design type that requires at least two groups of data such as age and education, age and marital status, occupation and marital status, education and occupational status etc. Correlation research design can be applied to case-control studies and observational studies.

Here the author used explanatory research design because it is used to further expand, explore, and explain the researcher's ideas and theories. Again this type of research design is used to elaborate on the unexplored aspects of natural disasters and try to explain the impacts of natural disasters. Here the researcher used quantitative research because the results of quantitative surveys can easily be transformed into numbers, stats, graphs, and charts. The is also a qualitative research .This paper revolves around open ended survey questions and highly descriptive answers that are hard to quantify and express through numbers. This paper collect more complex information and explore people's thoughts and behavior about the impact of natural disasters. This paper used to find tradition, formulate prediction and explain in numbers.

It is a probability based research design. Here the researcher chooses a samples from a larger population using a method based on probability theory. Here the author chooses only some disaster prone area of Bangladesh. The selection process is based on random sample. Here the author used stratified random sampling. Here the main population is divided into smaller groups based on specific characteristics that don't overlap but represent the entire population when put together. With stratified random sampling, the author draws a sample from each of these groups (or strata) separately such as income group, education status, marital status, occupation status etc. This allow the author draw a sample from each of these group or strata separately. This allows the researcher to make sure that every subgroup is properly represented, which leads to more accurate results than other sampling technique.

Here the researcher stratifies the whole population (disaster affected people of Bangladesh) by characteristics like sex, age, income bracket and ethnicity. The strata must be specific and mutually exclusive; meaning every individual in the population should only be assigned to one group. The respondents of the disasters prone area of Bangladesh are maximum illiterate or having low education level, so they could not provide correct information sometime. This is a major limitation for data collection.

Sampling Design:

A sampling design act as a framework or road map of a research. It serves as the basis for the selection of samples of a research. Many important aspects of a research are affected by sampling design. Selecting sample of a research is done by sampling design. Sampling design is a methodology of selecting the target sample of a population. It is a basic plan of selecting sample. The prime action of a research is to identify the study population and design sampling frame through a pre survey census. In this research a complete census is conducted in Bangladesh to identify the disastrous village and disaster prone area. This census produced comprehensive data on the disastrous status of the village and disaster prone area of BD. All of those disastrous village and disaster prone area were treated as the survey's primary sampling unit (PSU). The respondents of these research have various classes, they are belongs to different occupation, different education level, different financial condition etc.

Research Methodology:

Here the author used Chi square test, independent T test, correlation R test for data analysis purpose. Here the author used Chi-square test because, the Chi-Square test is a statistical procedure used by researchers to examine the differences between categorical variables in the same population. In this research the population is the people of disaster prone area in Bangladesh and the categorical variables are main source of income, diseases, type of disasters, sickness etc. The independent samples t test is commonly used to test the following:

- Statistical difference between the mean of two group.
- Statistical differences between the means of two interventions.
- Statistical differences between the means of two change scores.

Here the author used independent t test because it is an inferential statistical test that determines whether there is a statistically significant difference between the means in two unrelated groups such as age and marital status, education and occupation status etc. Another reason the author used the independent t test because to test difference the means (averages) of two groups, or the difference between one group's mean and standard value. Here the author also used correlation r test. Because the Pearson correlation coefficient is also an inferential statistic, meaning that it can be used to test statistical hypotheses. Specifically, we can test whether there is a significant relationship between two variables.

Data Analysis:

In this research the author used both ordinal and cardinal data. The author used independent t test, regression analysis, Variance Inflation Factor formula for data analysis purposes. The author tries to find an impact of natural disaster on cultural factor like education, marital status, occupation rate of Bangladesh. Here the author used categorical data sets (marital status, age group), ordinal data sets (education status, employment status), The source of the data used in this research is, Bangladesh Disaster related Statistics 2015 & 2021.

Data Analysis:

Table 1

Main Source of Annual Income of Household	2021		2015	
	Number	Percentage	Number	Percentage
Agriculture	2663092	35.43	1568629	35.97
Industry	51324	0.68	15049	0.35
Service	947217	12.60	615785	14.12
Business	1324426	17.62	644428	14.78
Day Labour	2362408	31.43	1422285	32.61
Others	167510	2.23	95084	2.18

Null Hypothesis:

There is no significant association exists between type of household and annual income in the disaster prone area of Bangladesh.

Table 2

Income by Year	Main Source of Annual Income of Household						Total
	Agriculture	Industry	Service	Business	Day Labour	Others	
Income of Year 2015	1568629	15049	615785	644428	1422285	95084	4361260
Income of Year 2021	2663092	51324	947217	1324426	2362408	167510	7515977
Total	4231721	66373	1563002	1968854	3784693	262594	11877237

Here the author used Chi Square test,
The calculated Chi-square value is = 25395.28
Degrees of Freedom = (2-1) * (6-1) = 5
At 0.05 level of significance and 5 degrees of freedom the table value of Chi square value is = 11.070
So chi square cal > chi square table.

If our chi-square calculated value is greater than the chi-square critical value, then we reject our null hypothesis. So the null hypothesis, there is no significant association exists between type of household and annual income in the disaster prone area of Bangladesh is reject or not true.

Table 3

Sector Wise Damage and Loss (in Million TK)	2021		2015	
	Number	Percentage	Number	Percentage
Crops	517961	28.90	66703.42	36.20
Livestock	71373	3.98	8772.16	4.76
Poultry	26976	1.51	2224.88	1.21
Fishery	66460	3.71	10713.99	5.82
Land Degradation Induding Reduced Valuation	941843	52.56	49229.73	26.72
Dwelling & Others Infrastructure	132315	7.38	31676.89	17.19
Homestead Forestry	35061	1.96	14926.27	8.10

Null Hypothesis:

There is no significant association exists between amount of loss and type of sector wise loss in the disaster prone area of Bangladesh.

Table 4

Loss by Year	Sector wise damage and loss(in million TK)							Total
	Crops	Livestock	Poultry	Fishery	Land Degradation Induding Reduced Valuation	Dwelling & Others Infrastructure	Homestead Forestry	
Year 2015	66703.42	8772.16	2224.88	10713.99	49229.73	31676.89	14926.27	184247.34
Year 2021	517961	71373	26976	66460	941843	132315	35061	1791989
Total	584664.42	80145.16	29200.88	77173.99	991072.73	163991.89	49987.27	1976236.34

Here the author used Chi Square test,
The calculated Chi - square value is = 71742.56
Degrees of Freedom = (2-1) * (7-1) = 6
At 0.05 level of significance and 6 degrees of freedom the table value of Chi square value is = 12.592
So chi square cal > chi square table.

If our chi-square calculated value is greater than the chi-square critical value, then we reject our null hypothesis. So the null hypothesis, there is no significant association exists between amount of loss and type of sector wise loss in the disaster prone area of Bangladesh, is rejected or not true.

Table 5

Damage of Land by Disasters (in Acres)	2021		2015	
	Number	Percentage	Number	Percentage
Drought	28548	3.29	1250	0.81
Flood	404501	46.59	21704	13.99
Water Logging	92120	10.61	4098	2.64
Storm/Tidal Surge	7192	0.83	5456	3.52
River/Coastal Erosion	317186	36.53	105928	68.26
Landslide	6295	0.73	541	0.35
Salinity	12363	1.42	16196	10.44

Null Hypothesis:

There is no significant association exists between type of disaster and damage of land by disasters.

Table 6

Damage by Year	Damage of land by Disasters(In Acres)							Total
	Drought	Flood	Water Logging	Storm / Tidal Surge	River / Coastal Erosion	Landslide	Salinity	
Year 2015	1250	21704	4098	5456	105928	541	16196	155173
Year 2021	28548	404501	92120	7192	317186	6295	12363	868205
Total	29798	426205	96218	12648	423114	6836	28559	1023378

Here the author used Chi Square test,
The calculated Chi- square value is = 123695.7692
Degrees of Freedom = (2-1) * (7-1) = 6
At 0.05 level of significance and 6 degrees of freedom the table value of Chi square value is = 12.592
So chi square cal > chi square table.
If our chi-square calculated value is greater than the chi-square critical value, then we reject our null hypothesis, there is no significant association exists between type of disaster and damage of land by disasters is rejected or not true.

Sickness by Disasters:

Table 7

Sickness by Disasters	2021		2015	
	Number / Value	(%) / Average	Number / Value	(%) / Average
Drought	291859	11.27	133610	7.07
Flood	1412684	54.57	905781	47.91
Water Logging	383057	14.80	235009	12.43
Cyclone	327221	12.64	228215	12.07

Tornado	13774	0.53	22613	1.20
Storm/Tidal Surge	11879	0.46	86347	4.57
Thunderstorm/Lightening	71174	2.75	89675	4.74
River/Coastal Erosion	11065	0.43	16139	0.85
Landslide	1506	0.06	785	0.04
Salinity	131975	5.10	15073	0.80
Hailstorm	27508	1.06	65887	3.48
Others	63598	2.46	91600	4.84

Null Hypothesis:

There is no significant association exists between type of disaster and sickness by disasters.

Table 8

Disease by Year	Sickness by Disasters												Total
	Drought	Flood	Water Logging	Cyclone	Tornado	Storm / Tidal Surge	Thunderstorm / Lightening	River / Coastal Erosion	Landslide	Salinity	Hailstorm	Others	
Year 2015	133610	905781	235009	228215	22613	86347	89675	16139	785	15073	65887	91600	1890734
Year 2021	291859	1412684	383057	327221	13774	11879	71174	11065	1506	131975	27508	63598	2747300
Total	425469	2318465	618066	555436	36387	98226	160849	27204	2291	147048	93395	155198	4638034

Here the author used Chi Square test,
The calculated Chi- square value is = 358172.0788
Degrees of Freedom = (2-1) * (12-1) = 1 1
At 0.05 level of significance and 11 degrees of freedom the table value of Chi square value is = 19.675
So chi square cal > chi square table.
If our chi-square calculated value is greater than the chi-square critical value, and then we reject our null hypothesis, there is no significant association exists between type of disaster and sickness by disasters is rejected or not true.

Injured By Disasters:

Table 9

Injured By Disasters	2021		2015	
	Number / Value	(%) / Average	Number / Value	(%) / Average
Flood	94394	54.74	13786	41.89
Water Logging	15446	8.96	2526	7.68
Cyclone	40982	23.77	5006	15.21
Tornado	6575	3.81	2770	8.42
Storm / Tidal Surge	3327	1.93	1272	3.87
Thunderstorm / Lightening	16270	9.44	2200	6.69
River / Coastal Erosion	3323	1.93	1370	4.16
Landslide	278	0.16	3	0.01
Hailstorm	4959	2.88	2989	9.08
Others	4214	2.44	988	3.00

Null Hypothesis:

There is no significant association exists between type of disaster and rate of injured by disasters.

Table 10

Injured by year	Injured By Disasters										Total
	Flood	Water Logging	Cyclone	Tornado	Storm / Tidal Surge	Thunderstorm / Lightening	River / Coastal Erosion	Landslide	Hailstorm	Others	
Year 2015	13786	2526	5006	2770	1272	2200	1370	3	2989	988	32910
Year 2021	94394	15446	40982	6575	3327	16270	3323	278	4959	4214	189768
Total	108180	17972	45988	9345	4599	18470	4693	281	7948	5202	222678

Here the author used Chi Square test,
The calculated Chi- square value is = 14605.44
Degrees of Freedom = (2-1) * (10-1) = 9
At 0.05 level of significance and 9 degrees of freedom the table value of Chi square value is = 16.919
So chi square cal > chi square table.

If our chi-square calculated value is greater than the chi-square critical value, then we reject our null hypothesis, the null hypothesis there is no significant association exists between type of disaster and rate of injured by disasters is rejected or not true.

Table 11

Disability by Disasters	2021	
	Number / Value	Percentage (%) / Average
Flood	4314	43.36
Water Logging	19	0.19
Cyclone	2591	26.04
Tornado	561	5.64
Thunder storm/Lightening	1560	15.68
River/ Coastal Erosion	314	3.16
Landslide	193	1.94
Hailstorm	69	0.69
Others	329	3.31

The table 11 show that flood cause highest number of disability every year in Bangladesh. Then cyclone, thunder storm/lightening cause large number of disable people every year in BD.

Table12

Source	Source of Drinking water during disasters		Source of Drinking water before disasters	
	Number / Value	Percentage (%) / Average	Number / Value	Percentage (%) / Average
Pipe / Tap supply	95394	1.27	96709	1.29
Shallow Tube well (up to 199 feet)	4586379	61.02	4590059	61.07
Deep tube well (200feet or more)	2155151	28.67	1483585	19.74
Pond	624168	8.30	1687969	22.46
Others (Canal / River / Rainfall / Waterfall / Well / Bottled Water)	664435	8.84	1144645	15.23

Null Hypothesis:

There is no significant association exists between source of water and disaster period.

Table 13

Disasters Period	Available Source of Water					Total
	Pipe / Tap Supply	Shallow Tube Well (Up to 199 Feet)	Deep Tube Well (200 Feet or More)	Pond	Others (Canal / River / Rainfall / Waterfall / Well / Bottled Water	
Source of Drinking Water During Disasters	95394	4586379	2155151	624168	664435	8125527
Source of Drinking Water Before Disasters	96709	4590059	1483585	1687969	1144645	9002967
Total	192103	9176438	3638736	2312137	1809080	17128494

Here the author used Chi Square test,

The calculated Chi- square value is = 697779.5801

Degrees of Freedom = (2-1) * (5-1) = 4

At 0.05 level of significance and 4 degrees of freedom the table value of Chi square value is = 9.488

So chi square cal > chi square table.

If our chi-square calculated value is greater than the chi-square critical value, then we reject our null hypothesis, the null hypothesis there is no significant association exists between source of water and disaster period is rejected or not true.

Main Diseases Due to Scarcity of Water:

Table 14

Main Diseases Due to Scarcity of Water	2021		2015	
	Number / Value	(%) / Average	Number / Value	(%) / Average
Diarrhoea	188963	44.14	224869	36.66
Dysentery	86563	20.22	129204	21.06
Skin Disease	134723	31.47	61160	9.97
Cold/Cough	172818	40.37	93034	15.17
Fever	101434	23.70	56877	9.27
Jaundice	47507	11.10	16774	2.73
Others:	23843	5.57	31556	5.14

Null Hypothesis:

There is no significant association exists between type of diseases and scarcity of water by year.

Table 15

Diseases by Year	Main Diseases due to Scarcity of Water							Total
	Diarrhoea	Dysentery	Skin Disease	Cold / Cough	Fever	Jaundice	Others	
Year 2015	224869	129204	61160	93034	56877	16774	31556	613474
Year 2021	188963	86563	134723	172818	101434	47507	23843	755851
Total	413832	215767	195883	265852	158311	64281	55399	1369325

Here the author used Chi Square test,

The calculated Chi- square value is = 77453.46
Degrees of Freedom = (2-1) * (7-1) = 5
At 0.05 level of significance and 5 degrees of freedom the table value of Chi square value is=11.070
So chi square cal > chi square table.

If our chi-square calculated value is greater than the chi-square critical value, and then we reject our null hypothesis, the null hypothesis there is no significant association exists between type of diseases and scarcity of water by year is reject.

Table 16

Year 2021	Cause of Diseases Before Disasters		Cause of Diseases During Disasters	
	Number / Value	(%) / Average	Number / Value	(%) / Average
Temperature variation (too hot or too cold)	2755945	36.67	2219731	29.53
Variation in rain (Too much rain or no rain)	1795074	23.88	1883134	25.06
Water Pollution	1692352	22.52	2440647	32.47
Air Pollution	975560	12.98	1072110	14.26
Unplanned Sanitation	789531	10.50	896259	11.92
During Period	814743	10.84	1319943	17.56
Unknown	1054965	14.04	876011	11.66
Others	486910	6.48	305444	4.06

Null Hypothesis:

There is no significant association exists between cause of diseases and disasters period.

Table 17

Disaster Period	Cause of Diseases:								Total
	Temperature Variation (Too Hot or Too Cold)	Variation In Rain (Too Much Rain or No Rain)	Water Pollution	Air Pollution	Unplanned Sanitation	During Period	Unknown	Others	
Cause of Diseases before disasters	2755945	1795074	1692352	975560	789531	814743	1054965	486910	10365080
Cause of Diseases during disasters	2219731	1883134	2440647	1072110	896259	1319943	876011	305444	11013279
Total	4975676	3678208	4132999	2047670	1685790	2134686	1930976	792354	21378359

Here the author used Chi Square test,
The calculated Chi- square value is = 366233.14
Degrees of Freedom = (2-1) * (8-1) = 7
At 0.05 level of significance and 7 degrees of freedom the table value of Chi square value is = 14.067
So chi square cal > chi square table.

If our chi-square calculated value is greater than the chi-square critical value, then we reject our null hypothesis, the null hypothesis there is no significant association exists between cause of diseases and disasters period is rejected or not true.

Table 18

Year 2015	Cause of Diseases Before Disasters		Cause of Diseases During Disasters	
	Number / Value	(%) / Average	Number / Value	(%) / Average
Temperature variation (too hot or too cold)	2158424	49.49	2158424	49.49
Variation in rain (Too much rain or no rain)	835893	19.17	835893	19.17
Water Pollution	668556	15.33	668556	15.33
Air Pollution	--	--	--	--
Unplanned Sanitation	60954	1.40	60954	1.40
During Period	268219	6.15	268219	6.15
Unknown	356316	8.17	356316	8.17
Others	12899	0.30	12899	0.30

Table 19

Cause of Diseases Post Disasters	2021		2015	
	Number / Value	(%) / Average	Number / Value	(%) / Average
Temperature variation (too hot or too cold)	2543303	33.84	2158424	49.49
Variation in rain (Too much rain or no rain)	1918350	25.52	835893	19.17
Water Pollution	2272267	30.23	668556	15.33
Air Pollution	1105847	14.71	--	-
Unplanned Sanitation	915933	12.79	60954	1.40

Here the author used Chi Square test,
Null Hypothesis: There is no significant association exists between cause of diseases and Post disasters period by year.

Table 20

Disaster Period by Year	Cause of Diseases					Total
	Temperature Variation (Too Hot or Too Cold)	Variation in Rain (Too Much Rain or No Rain)	Water Pollution	Air Pollution	Unplanned Sanitation	
Year 2015	2158424	835893	668556	---	60954	3723827
Year 2021	2543303	1918350	2272267	1105847	915933	8755700
Total	4701727	2754243	2940823	1105847	976887	12479527

Here the author used Chi Square test,

The calculated Chi- square value is = 1381267.138
Degrees of Freedom = (2-1) * (5-1) = 4
At 0.05 level of significance and 4 degrees of freedom the table value of Chi square value is = 9.488.
So chi square cal > chi square table.

If our chi-square calculated value is greater than the chi-square critical value, then we reject our null hypothesis, the null hypothesis There is no significant association exists between cause of diseases and Post disasters period by year is rejected or not true.

Table 21

Type of Knowledge About Disasters	2021		2015	
	Number / Value	(%) / Average	Number / Value	(%) / Average
Knowledge & Perception about climate change	7515977	100	4361261	100
Long-term changes of climatic conditions due to variation in natural process or due to human activities	4537411	60.37	2410668	55.27
Regional variation in temperature and rainfall	1401991	18.65	591286	13.56
Extreme events that cause colossal and sudden loss of human life and infrastructure	1255153	16.70	700456	16.06
Others	155606	2.07	55498	1.27
Do not know	165817	2.21	603354	13.83

The table 21 show that highest number of people have knowledge about Long-term changes of climatic conditions due to variation in natural process or due to human activities. But people have low knowledge and perception about other impact of disasters.

Hypothesis 1:

There is no significant impact of age on education status in Disaster Prone Areas of Bangladesh.
Here the author used independent t test, Year 2021

Table 22

Population by Age Group		Education Rate	
(0 - 4) Year	2942338	No Education	7326439
(05 - 17) Year	8771919	Primary(Class I to V & Equivalent)	10653360
(18 - 36) Year	11200355	Secondary (Class VI to IX &Equivalent)	7376813
(37 - 60) Year	8573295	SSC/HSC/Equivalent/Diploma	4514914
61 +Year	2625003	Graduate/ Masters	1015868
Total		Others	283179

(Source: Bangladesh Disaster related Statistics2015, 2021)
Here the author used independent t test, Year 2015

Table 23

Population by Age group:	Number	Education Rate:	Number
(0 - 4) Year	1919995	No Education	6656371
(05 - 17) Year	6097562	Primary(Class It oV& Equivalent)	5656437
(18 - 36) Year	6490279	Secondary (Class VI to IX & Equivalent)	3223284
(37 - 60) Year	4559610	SSC/HSC/Equivalent/Diploma	1602116
61 +Year	1136921	Graduate/ Masters	224366

(Source: Bangladesh Disaster related Statistics2015, 2021)
For year 2021, t test, t = 0.780588489
For year 2015, t test t = 0.310580318
Here t table value is = 0.00000

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, There is no significant impact of age on education status in Disaster Prone Areas of Bangladesh, is reject or not true. So the alternative hypothesis there is a significant impact of age on education status in Disaster Prone Areas of Bangladesh is true.

Here the Author Used Chi Square Test:

Null Hypothesis: There is no significant association exists between age group and education rate.
Hypothesis 2: There is no significant impact of age on marital status in Disaster Prone Areas of Bangladesh.
Here the author used independent T test: Year 2021

Table 24

Population by Age group	Number	Marital Status	Number
(0 - 4) Year	2942338	Unmarried	8617864
(05 - 17) Year	8771919	Married	17844610
(18 - 36) Year	11200355	Divorced	126276
(37 - 60) Year	8573295	Separated	64013
61 +Year	2625003	Widow/ Widowed	1358158

(Source: Bangladesh Disaster related Statistics 2015, 2021)
Here the author used independent t test
Year 2015

Table 25

Population by Age group	Number	Marital Status	Number
(0 - 4) Year	2942338	Unmarried	5087415
(05 - 17) Year	8771919	Married	10033305
(18 - 36) Year	11200355	Divorced	41686
(37 - 60) Year	8573295	Separated	35900
61 +Year	2625003	Widow/ Widowed	633842

(Source: Bangladesh Disaster related Statistics 2015, 2021)

For year 2021 t test, t = 0.796238444

For year 2015 t test, t = 0.436671802

t table value= 0.0000

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, There is no significant impact of age on marital status in Disaster Prone Areas of Bangladesh is reject or not true. There is a significant impact of age on marital status in disaster prone area in Bangladesh is true.

Here the Author Used Chi Square Test,

Null Hypothesis:

There is no significant association exists between age group and marital status.

Hypothesis 3:

There is no significant impact of education status on marital status in Disaster Prone Areas of Bangladesh.

Here the author used independent T test

Year 2021

Table 26

Education Rate:	Number	Marital Status:	Number:
No Education	7326439	Unmarried	8617864
Primary(Class I to V& Equivalent)	10653360	Married	17844610
Secondary (Class VI to IX & Equivalent)	7376813	Divorced	126276
SSC/HSC/Equivalent/Diploma	4514914	Separated	64013
Graduate/ Masters	1015868	Widow / Widowed	1358158
Others	**28317**		

(Source: Bangladesh Disaster related Statistics2015, 2021)

Here the author used independent t test

Year 2015

Table 27

Education Rate:	Number:	Marital Status:	Number
No Education	6656371	Unmarried	5087415
Primary(Class I toV& Equivalent)	5656437	Married	10033305
Secondary (Class VI to IX & Equivalent)	3223284	Divorced	41686
SSC/HSC/Equivalent/Diploma	1602116	Separated	35900
Graduate/ Masters	1015868	Widow/ Widowed	633842

(Source: Bangladesh Disaster related Statistics 2015, 2021)

For year 2021, t = 0.132471374,

For year 2015, t = 1.533889748

Here, t table value = 0.0000

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, There is no significant impact of education status on marital status in Disaster Prone Areas of Bangladesh is reject or not true. There is a significant impact of education status on marital status in disaster prone area in Bangladesh is true.

Here the Author Used Chi Square Test,

Null Hypothesis:

There is no significant association exists between education rate and marital status.

Hypothesis 4:

There is no significant impact of affected household on reason of not attending school in Disaster Prone Areas of Bangladesh: Year 2021

Table 28

Affected Household:	Number:	Reason of not attending school:	Number
Drought	354739	School infrastructure affected	28733
Flood	4110532	Income loss of Household	14596
Water Logging	763676	Communication disrupted	207347
Cyclone	2555137	School destroyed	10875
Tornado	396614	Books spoiled	6235
Storm/Tidal Surge	169759	Sick/ injured	735309
Thunderstorm/Lightening	1068659	Transfer/ Migration	2187
River/Coastal Erosion	754979	Other reasons	10495
Land Slide	30379		

(Source: Bangladesh Disaster related Statistics 2015, 2021)
For year 2021, t = 2.336590638
Here, t table value = 0.0000

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis there is no significant impact of affected household on not attending school in Disaster Prone Areas of Bangladesh is reject or not true. There is a significant impact of affected household on reason of not attending school in Disaster Prone Areas of Bangladesh.

Hypothesis 5:

There is no significant relationship exists between completion rate of education and participation rate of youth and adult in formal education in Disaster Prone Areas of Bangladesh:

Year 2021

Table 29

Completion Rate of Education:	**Percentage:**	**Participation Rate of Youth and Adults in Formal Education: Percentage:**	
Primary (Class I to V & E q uivalent)	34.18	Secondary	23.67
Secondary(Class VI to IX & Equivalent)	23.67	Higher Secondary	14.48
SSC / HSC / Equivalent / Diploma	14.48	Tertiary:	3.26

Year 2015:

Table 30

Completion Rate of Education:	**Percentage:**	**Participation Rate of Youth and Adults in Formal Education: Percentage:**	
Primary (ClassI to V & E q uivalent)	32.58	Secondary	18.56
Secondary(ClassVItoIX& Equivalent)	18.56	Higher Secondary	9.23
SSC/ HSC/ Equivalent/ Diploma	9.23	Tertiary:	1.29

For year 2021, r = 0.99539295
For year 2015, r = 0.997619515
VIF=1/(1-R^2) for year 2021, VIF = 108.7798964
VIF=1/(1-R^2) for year 2015, VIF = 210.291529

Variance inflation factor measures how much the behavior (variance) of an independent variable is influenced, or inflated, by its interaction/correlation with the other independent variables. Variance inflation factors allow a quick measure of how much a variable is contributing to the standard error in the regression. So there is a positive and strong correlation exists between Completion rate of Education and Participation Rate of Youth and Adults in Formal Education of year 2015 and 2021 in Disaster Prone Areas of Bangladesh. While VIF values larger than 10 are a sign for high, not tolerable correlation of model predictors.

Hypothesis 6:

There is no significant impact of education level on occupation in Disaster Prone Areas of Bangladesh:

Year 2021:

Table 31

Education Rate:	**Number**	**Employment:**	**Number:**
No Education	7326439	Agriculture	2663092
Primary(Class I to V& Equivalent)	10653360	Industry	51324
Secondary (Class VI to IX & Equivalent)	7376813	Service	947217
SSC/HSC/Equivalent/Diploma	4514914	Business	1324426
Graduate/ Masters	1015868	Day Labour	2362408
Others	28317	Other	167510

Year 2015:

Table 32

Education Rate	**Number**	**Employment**	**Number**
No Education	6656371	Agriculture	1568629
Primary(Class I toV& Equivalent)	5656437	Industry	15049
Secondary (Class VI to IX & Equivalent)	3223284	Service	615785
SSC/HSC/Equivalent/Diploma	1602116	Business	644428
Graduate/ Masters	1015868	Day labour	1422285
Total		Other	95084

Here the author used independent t test
For year 2021, t = 2.471378004
For year 2015, t = 2.85596046
Here, t table value = 0.0000

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. So the null hypothesis, There is no significant impact of education level on occupation in Disaster Prone Areas of Bangladesh is reject or not true. There is a significant impact of education level on occupation/employment in Disaster Prone Areas of Bangladesh.

Here the author used Chi Square test,

Null Hypothesis:

There is no significant association exists between education rate and employment status in disaster prone area of BD.

Hypothesis 7:

There is no significant impact of main source of lighting of year 2021 on main source of lighting of year 2015 in Disaster Prone Areas of Bangladesh:

Hypothesis 8:

There is no significant impact of main source of cooking fuel of year 2021 on main source of cooking of year 2015 in Disaster Prone Areas of Bangladesh.

Year 2021

Table 33

Main source of Lighting:	**Number**	**Main source of cooking Fuel:**	**Number**
Electricity	7069741	Wood / Fuel wood / Bamboo	3943597
Solar Energy	301723	Cow dung / Leaves / Straw	2611802
Kerosine	130321	Gas / LPG / Biogas / Kerosine / Electricity	947958
Others	14193	Others	12621

Year 2015:

Table 34

Main source of Lighting:	**Number**	**Main source of cooking Fuel:**	**Number**
Electricity	2172901	Wood / Fuel wood / Bamboo	1790532
Solar Energy	443201	Cow dung / Leaves / Straw	2492363
Kerosine	1726708	Gas / LPG / Biogas / Kerosine / Electricity	75426
Others	18451	Others	2941

Here the author used t test,

For Hypothesis (7), Lighting, t = 0.52119693

For Hypothesis (8), Cooking, t = 0.848661759

Here, t table value = 0.0000

If the absolute value of the t-value is greater than the critical value, for hypothesis (7) we reject the null hypothesis. There is no significant impact of main source of lighting of year 2021 on main source of lighting of year 2015 in Disaster Prone Areas of Bangladesh is reject or not true. There is a significant impact of main source of lighting of year 2021 on main source of lighting of year 2015 in Disaster Prone Areas of Bangladesh.

For hypothesis (8) we reject the null hypothesis, there is no significant impact of main source of cooking fuel of year 2021 on main source of cooking of year 2015 in Disaster Prone Areas of Bangladeshis reject or not true. So There is a significant impact of main source of cooking fuel of year 2021 on main source of cooking fuel of year 2015in Disaster Prone Areas of Bangladesh.

Hypothesis 9:

There is no significant relationship exists between proportion of population with access to electricity of year 2015 and year 2021 in Disaster Prone Areas of Bangladesh:

Table 35

Criteria	**Year 2015**	**Percentage 2015**	**Year 2021**	**Percentage 2021**
During Disaster	268219	6.15	1027058	13.66
Unknown	356316	8.17	962663	12.81
Others	12899	0.30	500123	6.65

Here the author use Correlation test r, r = 2.25126102/10^13 = 0.0000225126102

VIF=1/(1-R^2)= 1.000000001

The Variance Inflation Factor (VIF) measures the severity of multicollinearity in regression analysis. It is a statistical concept that indicates the increase in the variance of a regression coefficient as a result of collinearity. VIF between 1 and 5 = variables are moderately correlated; so the variables access to electricity during disasters, unknown are moderately correlated with each other. So there is a positive and weak correlation exists between proportion of population with access to electricity of year 2015 and 2021 in Disaster Prone Areas of Bangladesh.

Hypothesis 10:

There is no significant impact of main source of lighting on proportion of population with access to electricity in Disaster Prone Areas of Bangladesh: Year 2021

Table 36

Main source of Lighting:	**Number**	**Proportion of population with access to electricity**	**Number**
Electricity	7069741	During Disaster	1027058
Solar Energy	301723	Unknown	962663
Kerosine	130321	Others	500123
Others	14193		

Year 2015

Table 37

Main source of Lighting:	**Number**	**Proportion of population with access to electricity**	**Number**
Electricity	2172901	During Disaster	268219
Solar Energy	443201	Unknown	356316
Kerosine	1726708	Others	12899
Others	18451		

For year 2021, t = 0.696845181

For year 2015, t = 1.945426536
Here, t table value = 0.0000

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. There is no significant impact of main source of lighting on proportion of population with access to electricity in Disaster Prone Areas of Bangladesh is reject or not true. There is a significant impact of main source of lighting on proportion of population with access to electricity in Disaster Prone Areas of Bangladesh.

Hypothesis 11:

There is no significant relationship between Sick Children Received Treatment (Age 0 - 17 Years) of year 2015 and 2021 in Disaster Prone Areas of Bangladesh:

Table 38

Sick Children Received Treatment (Age 0 - 17)	Sick Children Received Treatment (Age 0 - 17) Years of year 2015	Sick Children Received Treatment (Age 0 - 17) Years of year 2021
MBBS	259052	421395
Paramedics Doctor / Medical Assistant / Nurse	342326	520496
Pharmacy	313603	260913
Village Doctor	308168	190465
Others (Kabiraj / Homeo- Doctor / Ojha / Aiurbedic / Unani	83064	55553
No Treatment	8484	85652
Total	1314697	1534474

Here the author used Correlation Coefficient r test:
Here, r= 0.755245179
So there is a positive correlation exists between sick children received treatment between year 2015 and 2021.
VIF=1/(1-R^2)= 4.085721359
VIF between 1 and 5 = variables are moderately correlated;
Here the variables by which sick children received treatment like MBBS doctor, Paramedics Doctor, Medical Assistant, Nurse, Pharmacy, Village doctor, Kabiraj, Unani, Aiurbedic are moderately correlated to each other.

Hypothesis 12:

There is no significant impact of marital status on employment in Disaster Prone Areas of Bangladesh.
Here the author used independent t test.
Here for year 2021 t = 1.398668306
Here for year 2015 t = 1.3785541321
Here, t table value = 0.0000

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. There is no significant impact of marital status on employment in Disaster Prone Areas of Bangladesh is reject or not true. There is a significant impact of marital status on employment in Disaster Prone Areas of Bangladesh.
Here the author used Chi Square test,
Null Hypothesis: There is no significant association exists between marital status and employment.
Vulnerability Assessment based on quintile income group:

Table 39

Household Group	Average Annual Income (Tk)	Average Annual Damage and Loss (Tk.)								Proportion of Damage and Loss to Total Income
		Crops	Livestock	Poultry	Fishery	Land	House	Homestead Forestry	Total	
1	2	3	4	5	6	7	8	9	10	11
Q1	34957	2038	279	75	268	1351	1066	394	5471	15.7
Q2	74590	1776	270	77	220	1397	1231	382	5353	7.2
Q3	105986	1987	331	87	300	1888	1255	529	6377	6.0
Q4	152092	2566	353	92	395	2026	1260	743	7435	4.9
Q5	357897	4665	460	95	934	2877	1244	846	11121	3.1
Total	139357	2549	335	85	409	1881	1211	570	7040	5.1

Source: Bangladesh Disaster related Statistics-2015

As high as 16% of income goes for damage and loss in bottom quintile. While it is only 3% for the top quintile. Bottom quintile is more vulnerable (5 times) than top quintile in exposure to damage and loss. Proportion of damage and loss decrease as income goes up. Percentage distribution of causes of children not attending school due to disaster by type and division, 2009-14:

Table 40

Division	Causes of Not Attending School					Others
	Not Attended School	Damaged / Ruined School Building	Communication Failure	Sickness	Reduced Household Income / Damaged Books	
1	2	3	4	5	6	7
Bangladesh	100.00	8.41	73.00	10.46	4.33	3.80
Barisal	24.56	4.47	15.09	2.46	1.54	1.00
Chittagong	10.77	0.96	8.10	0.82	0.55	0.34
Dhaka	18.58	0.73	13.83	2.55	0.68	0.80
Khulna	7.15	0.57	5.35	0.30	0.40	0.59
Rajshahi	8.56	0.41	6.61	0.97	0.38	0.18
Rangpur	12.03	0.44	9.12	1.57	0.35	0.56
Sylhet	18.34	0.89	14.87	1.81	0.44	0.35

The above table shows that communication failure is the main reason of not attending school. Barisal, Dhaka, Rangpur and Sylhet area's children are most affected by communication failure. Sickness of children is second main reason of not attending school in Disaster prone area in Bangladesh. School building damaged is another main of not attending school of children. Affected household received early warning and took preparedness by disaster, 2009-2014:

Table 41

Disaster	Households (%)	
	Got Early Warning	Preparedness
Drought	4.80	-
Flood	17.84	18.86
Cyclone	66.73	88.48
Tornado	9.80	23.67
Storm / Tidal Surge	61.03	75.85
Thunderstorm	5.88	62.78
River / Coastal Erosion	5.09	47.80
Landslides	3.18	-
Halistorm	1.35	-
Others	19.89	66.55

Hypothesis 13:

There is no significant impact of got early warning of disaster on preparedness of disaster in Disaster Prone Areas of Bangladesh. Here the author used independent t test= -3.026656

T table value = 0.0000

Although a negative t-value shows a reversal in the directionality of the effect being studied, it has no impact on the significance of the difference between groups of data. If the absolute value of the t-value is smaller than the critical value, we accept the null hypothesis. There is no significant impact of got early warning of disaster on preparedness of people in Disaster Prone Areas of Bangladesh is true.

Table 42

Disasters	Number of Non Working Days (%)					Average Nonworking Days Per Household (%)
	Total	1 to 7	8 to 15	16 to 30	31+	
Drought	8.17	3.61	2.69	1.47	0.39	12.09
Flood	26.93	4.98	10.62	9.39	1.94	17.63
Water logging	11.11	4.88	3.23	2.05	0.96	14.85
Cyclone	19.17	12.05	4.51	1.95	0.66	9.33
Tornado	3.26	2.65	0.45	0.14	0.03	5.72
Storm / Tidal Surge	7.95	4.92	1.50	1.06	0.47	10.80
Thunderstorm	6.37	3.73	2.14	0.46	0.04	7.60
River /Coastal Erosion	3.62	1.23	1.13	0.92	0.34	16.86
Landslides	0.05	0.04	0.01	0.00	0.00	5.67
Salinity	1.51	1.18	0.24	0.08	0.01	6.80
Halistorm	7.50	6.29	0.76	0.34	0.12	5.30
Others (Fog, Cold wave etc)	4.37	2.91	1.16	0.26	0.04	7.15
Total	100	48.46	28.44	18.12	4.98	12.13

Hypothesis 13:

There is no significant impact of Average nonworking day per household (%) on Total Number of non working days (%) in Disaster Prone Areas of Bangladesh.

Here the author used independent t- test. Here t value = 1.6723

Here, t table value = 0.0000

If the absolute value of the t-value is greater than the critical value, we reject the null hypothesis. There is no significant impact of Average nonworking day per household (%) on Total Number of non working days (%) in Disaster Prone Areas of Bangladesh is reject or not true. There is a significant impact of Average nonworking day per household (%) on Total Number of non working days (%) in Disaster Prone Areas of Bangladesh.

Discussion & Analysis:

The eastern parts of Bangladesh, comprising the Sylhet and Chattogram divisions, are prone to earthquakes, landslides, and flash floods.

In this research the author found that there is a significant association exists between type of household and annual income per house hold in the disaster prone area of BD. In disaster prone area in BD people earn highest income by agriculture and then day labour. Earning through industry is very low in disaster prone area in BD, because the environment it not suitable for cotton, spinning, readymade garments, and any food industry. Service holder and business men have moderate income.

The paper also show that sector wise loss is closely related with the type of disasters in BD. Crops, Livestock and land degradation are mostly affected by disasters. Fishery, homestead forestry, dwelling are moderately hampered by natural disasters. Poultry are less affected by disasters.

The research show that various type of disasters are closely associated with the damaged of land in the disasters prone area in BD. Land are damaged highly by flood, coastal erosion, tidal surge, water logging and salinity. Land slide, drought is less damaged the land in disaster prone area.

In this research the author also find that type of disasters has a significant association with the sickness by disasters. Flood , water logging, drought cause maximum diseases in the disaster prone area in BD. Tornado, tidal , storm cause less diseases.

The paper also show that various type of disaster cause various type of disability in Bangladesh. In the disaster prone area flood, cyclone, hailstorm, thunderstorm, lightening make many people become disable every year. Land slide, coastal erosion, water logging cause less disability. People are mostly injured by flood, cyclone, thunder storm in the disaater prone area in BD.

The research found that in Bangladesh source of pure water are closely associated with disasters period. In disaster period the main source of water is shallow and deep tube well. Supply water is very rare to get in the disaster period. Pond, canal, rivers are dried up by drought. Water fall, pond water are become polluted in the flood and other natural disasters.

The research also found that scarcity of water is closely associated with various types of diseases in the disaster prone area in BD. Diarrhoea, cold, cough, skin diseases are cause on account of scarcity of pure drinking water. Scarcity of water also cause fever, dysentery, jaundice in the disaster prone area in BD.

The paper also found that disaster period closely associated with the cause of various types of diseases in BD. During disaster and post disaster period the people are mostly affected by diseases than the period of before disasters.

In this study the author find that, There is a significant relationship exists between age and education rate in Disaster Prone Areas of Bangladesh is true.

Currently, Bangladeshi adults over the age of 64 are less likely than adults aged 35 to 64 years to possess a high school diploma; however, given cohort trends in postsecondary education, future cohorts of elderly will have increasing levels of education.

In this study the author also found that, there is a significant relationship exists between age and marital status in disaster prone area in Bangladesh is true. Different age's people are affected differently by natural disaster. Natural disaster like Post-hurricane conditions may pose an increased risk for the spread of common infectious diseases, like influenza and less common illnesses, like leptospirosis, hepatitis A, and vibriosis etc. Child. Old and weak people are severely affected by these diseases. These affect marital status of people. Disabled people get separation and divorce from their active or healthy partners.

The number of widower and widow are very high in year 2015 and 2021, it's because natural disaster causes many death of people both male and female in disaster prone area in Bangladesh. Again child marriage rate is also high in Disaster prone area in Bangladesh.

Adults who are in the age range of 40-60 are likely to be more distressed after disasters. The thinking is that if they are in that age range, they have more demands from job and family. Research show that how children react to natural disasters is limited. Natural hazards, such as floods, droughts and earthquakes, are gender neutral- but their impacts are not. Men and women, boys and girls are affected differently from disaster, even if they live in the same households.

The research identifies crucial policy actions that can be taken before, during and after a disaster to mitigate gender-differentiated impacts of disasters.

Here the author also find that, There is a significant relationship exists between education rate and marital status in disaster prone area in Bangladesh is true. Married people and couple are less interested to get education, while single, widower, widow, divorced people are more interested to get proper education in Bangladesh.

One of the essential findings of this research is that couples with different education levels have a higher probability of separation and divorce. Highly educated and illiterate people are easily get separation or divorce, while people with higher secondary or graduate degree are less affected by separation.

There are several reasons to explain this phenomenon. First of all, People with different education levels do different kinds of work with different incomes. Highly educated people have a greater opportunity to obtain a high-income job, but a high-income work needs a longer working time.

In this study firstly investigates the influence of couples with different education levels on marriage. The author find that couples with different education levels have a higher probability to experience divorce or separation. Then according to the second model the author notice that when wife has a higher education level than her husband, there is a higher probability of leading to divorce or separation.

In this research the author find that there is a significant relationship exists between affected household and reason of not attending school in Disaster Prone Areas of Bangladesh. Family which are affected by disasters their children are not attending school regularly in disaster prone area in Bangladesh.

Schools that are often hit by typhoons miss school days, disrupting the flow of teaching and learning. Strong winds damage infrastructure, incurring additional costs and distracting attention of the teaching staff, which also disrupts classes and education.

The research show that so there is a positive correlation exists between Completion rate of Education and Participation Rate of Youth and Adults in Formal Education of year 2015 and 2021 in Disaster Prone Areas of Bangladesh. The research show that for year 2021, r = 0.99539295 and for year 2015, r=0.997619515. It is a positive sign that students participation rate are highly positively correlated completion rate of education. So natural disasters couldn't hamper students participation and completion rate of education in Bangladesh. Dropout rate from education is very low in the disaster prone area in Bangladesh.

The research show that there is a significant relationship exists between education level and occupation/employment in Disaster Prone Areas of Bangladesh. In disaster prone area most people are engaged with agricultural work, day labour. Service holders and industry workers are low in these areas. Though graduate/masters qualified many people live in this area but not get honorable job. Number of no education people is very high in these area most of them depend on agriculture.

The author show that there is a significant relationship exists between main source of lighting of year 2021 and main source of lighting of year 2015 in Disaster Prone Areas of Bangladesh. So from year 2015 to year 2021 main source of lighting in this disaster prone area in Bangladesh is not improved.

The research show that there is a significant relationship exists between main source of cooking fuel of year 2021 and main source of cooking fuel of year 2015in Disaster Prone Areas of Bangladesh. Which indicate that from year 2015 to 2021 main source of cooking is not much improved.

The research also find that there is a significant impact of main source of lighting on main source on cooking in disaster prone area in Bangladesh. There are four main source of lighting such as electricity, kerosine, solar energy and others, the main source of cooking are wood/fuel wood/bamboo, cow dung, leaves, straw, gas, LPG, biogas, kerosine, electricity and others .Main source of lighting has a great impact on main source on cooking, Because these two types of source are interrelated and substitute each other. So if lighting source is available , cooking source is also available, but if lighting source is very much used cooking source is saved and vice versa.

The research show that there is a positive and weak correlation exists between proportion of population with access to electricity of year 2015 and 2021 in Disaster Prone Areas of Bangladesh which indicate that from year 2015 to year 2021proportion of population with access to electricity is not very much improved.

The research shows that there is a significant impact of main source of lighting on proportion of population with access to electricity in Disaster Prone Areas of Bangladesh. There are four types of main source lighting such as electricity, kerosine, solar energy and others. Electricy is the main source of lighting here. But during disasters people are depends on other source of lighting because electricity system is hampered.

The research show that there is a positive correlation exists sick children received treatment between year 2015 and 2021.The sample correlation coefficient (r) is a measure of the closeness of association of the points, Here the value of correlation coefficient r is, r = 0.755245179, which indicate there is strong positive correlation exists sick children received treatment between year 2015 and 2021.

The higher the value, the greater the correlation of the variable with other variables. Values of more than 4 or 5 are sometimes regarded as being moderate to high, So the variables such as MBBS doctor, Paramedics Doctor, Medical Assistant, Nurse, Pharmacy, Village doctor, Kabiraj , Unani, Aiurbedic are moderately correlated to each other.

So sick children received treatment from MBBS doctor are rarely received treatment from Medical Assistant, Kabiraj, Unani etc. Again sick children who received treatment from Kabiraj are rarely received treatment from MBBS doctor and vice versa.

Natural disasters cause loss of property and income .In this research the author find that , low income people are most affected by disasters ; proportion of damage and loss decrease as income goes up.

In this research the author show that there is no significant impact of got early warning of disaster on preparedness in Disaster Prone Areas of Bangladesh is true. People of disaster prone area are not so much prepared after getting early warning of disasters, because of their ignorance and illiteracy. So not taking preparedness they are affected mostly by the natural disasters like storm, typhoon, cyclone, hurricane, earth quake etc.

In this research the author also find that marital status has a significant impact on employment status in disaster prone area in Bangladesh. There are five marital status in Bangladesh disaster prone area such as unmarried, married, divorced, separated, widow/widower. The employment status of Bangladesh disaster prone area are Agriculture, Industry, Service, Business, day labour, other, in this regards employment status has influenced by marital status. This research show that single people get work easily than couples in disaster prone area in Bangladesh. Because the employer thought single people have less demands and they are satisfied with low wage or salary.

In this research the author also find that, there is a significant impact of Average nonworking day per household(%) on Total Number of non working days(%) in Disaster Prone Areas of Bangladesh. Which means all types of workers are affected by disasters more or less. Mostly day laborer, farmer, fisherman have no work in disasters. Maximum households in disasters prone area are earning their livelihood through agriculture, fishing, day labour .Most of them have no work in disasters.

In this study, the author examined the impact of environmental issues/disasters on culture framework and Human Development Index of Bangladesh, The research show that natural disasters have a great impact on culture and social development of the country.

Recommendations:

The following steps are taken to minimize impact of natural disasters;

- Understanding the particular effect of a specific natural disaster ;
- To minimize effect of disasters strengthening the disasters risk governance.
- Provide proper training to the people who live in the disaster prone area to minimize disaster risk.
- Creating disaster preparedness among the people in order to effective response and to “Built Back Better” in recovery, rehabilitation and reconstruction.

Conclusion:

Social scientific research on natural disasters and social change stems directly from previous generations of research about the relationship between natural disasters and social ecological development. A natural disaster affects the lives of survivors socially, economically and psychologically, and can change their etiquette regarding the disasters.

In Bangladesh, the natural disaster causes significant impact on the ecological development. For that reason, disaster becomes a reason, and environmental degradation becomes the impact.

Ecology and disasters have a close relationship. Disasters cause change in ecology which influence the social ecological development of a country. The disasters and social ecology are inherently linked. Natural disasters affects ecological processes, change humanity’s resource base and increases vulnerability. It exacerbates the impact of natural hazards, lessens overall resilience and challenges traditional coping strategies.

In Bangladesh natural disaster, cause danger of death or physical injury. People may also lose their home, properties, possessions and community. Such stressors place us at risk for emotional and physical health problems. Stress reactions after a natural disaster in Bangladesh look very much like the common reactions seen after any type of trauma.

In Bangladesh disaster- resilient communities, especially in coastal areas, rural areas are based on healthy ecosystems and diverse livelihood. The ecosystem of Bangladesh such as wetland, forests, coastal systems can provide cost- effective natural buffers against natural disasters and the impact of environmental change.

In Bangladesh natural disasters greatly affect some demographic factors like income, health, education system. This paper try to discuss that disasters link up various social ecological factor like age and education level, education level and occupation, education level and marital status, marital status and occupation status etc. This paper also analysis how natural disasters hampered education system of Bangladesh. This paper showed that natural disasters losses property, losses income of people, cause diseases these also affect social ecological cycle of Bangladesh.

Future Research & Implication:

From the results of the discussion portion, the author has suggestions for the application of this study:

- For companies: The author expects that this research can be used as a reference in order to examine relation between natural disasters and social- ecology and bring with it many benefits for the world.
- For the Academic field: The study can be used for reference for any students that will conduct research about natural disasters and human characteristics.
- For future studies: Any future study should focus on new areas of research so that information about different type of natural disasters can be gained, and the impact of natural disasters on the social- ecology can be examined further. Future researcher also study about the recovery policy of disasters.

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