*IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*
*e-ISSN: 2319-2402, p- ISSN: 2319-2399.Volume 20, Issue 6 Ser. 2 (June 2026), PP 01-06*
*www.iosrjournals.org*

# Hailstorm, Rain, Dust -The Effect Of Climate Change In Bangladesh

Author

***Abstract:***
*Presently climate change becomes the most anxious matter in the earth. From 1880 the earth average temperature has been risen by approximately 1.3°C leading to rising sea level. According to NASA the current warming is happening at a rate not seen in past 10000 years.*
*Hailstorm size also increases due to climate change. Rain reduces & Dust increases in the weather.*
*Hailstorm, Rain, Dust are another way to measure of climate change. Here i tried to find out due to climate change what effect made in hailstorm, rainfall and dust and what would be the size and quantity of hailstorm, rain, dust if there are no change of climate. Also discussed about causes, effects and way of climate change with some new view.*
***Keywords:*** *Climate Change, Hailstorm, Rain, Dust*

---

Date of Submission: 21-06-2026 Date of Acceptance: 01-07-2026

---

## I. Introduction:

The earth will be destroyed as per science and religion. But we have to keep it cool as we can. Due to climate change about 8,32,000/-people dead and about $4.5 trillion losses recorded between 1995 to 2024 in the world. To keep losses minimum we have to made more analysis on climate change. Compensation is not a way to stop climate change. The world must have to reduce the carbon from the air. In this regard awareness is more efficient way about climate change. Due to climate change hailstorm size has been increased, rainfall decreased and dust increased. Climate change does not effects not only death of people and losses of crops it is also has an effect on peoples patience, mental health. Research shows 3.6 billion people already live in areas highly susceptible to climate change.

**Causes of Climate change:**

A) Greenhouse gases: The main and actual cause of climate change is greenhouse gases,(Carbon dioxide, nitrous oxide, methane, chlorofluoro carbons, water vapor) overflow. It causes due to industrial smoke, Transport, destroy green forest, filling the river, pond.
B) War: War is another cause of climate change. Due to war a huge amount of bomb, missile is busted. A huge amount of air polluted and a huge amount of gas outflows.
C) Higher quantity of Electric product use: Electrical goods outflows gases. Previous it was used limitedly.
D) Increase of dust in the air: increase of dust in the is another cause of climate change. Dust increases due to lacking of rain.
E) Sound: since sound can't be deleted so it might be another cause of climate change.
F) Dust in the Sea: Due to high dust specially plastic the sea could not absorb full sunlight . As such water vapour could not create properly. For this rain decreases carbon increases.

**Effects:**

Hailstorm: Hailstorm is the most common effect of climate change.
Patience and Mental health: Due to climate change (heat) people are losing their patience and mental health.
Several diseases: Due to high carbon, dust and no rain several pandemic diseases found in the world like Corona by accumulating carbon, dust in a specific area and spread it through air. Climate Change also liable for diseases.
Earthquake: Mostly earthquake occurs due to climate change. Suppose due to climate change one area has less rainfall and the adjacent area is full of rainfall. Due to low rainfall the sea level must be reduced and to increase the sea level the nature automatically collect water from adjacent area. This may cause to move the plates under land.
Reduces lifespan: Climate change reduces life span. In ancient year people were living for 1000 years but now it came to average 60-70 years. It is observed by Wikipedia in the ancient time the weather was mostly cool and comfortable.
Rain at non seasonal monsoon: Due to climate change rain falls at non seasonal monsoon.

Temperature increase: Temperature increase is the one of the most common effect of climate change. It effects through higher carbon in the weather.
Increase of height of sea level: Due to climate change the height of sea level increases and water level decreases. Global sea level has risen about 8 inches from 1880. It occurs through short rainfall, glaciers retreating, ice sheets shrinking, subsidence.
Snow cover is decreasing: Decreasing of snow cover also causes of climate change.
Artic Sea Ice is declining: Both the extent and thickness Artic sea ice has declined rapidly over the last several decades.
Ocean acidification is increasing: Since the beginning of the revolution the acidity of surface ocean waters has been increased by about 30%. The ocean has absorbed between 20% & 30%of total anthropogenic carbon dioxide emissions in recent decades
Disappearing of Rainbows: Due to climate change we lost the rainbows.

**Losses: Due to climate change**
1. Many people die by thunderstorm,
2. Million hector land flooded and crops are losses,
3. Fire occurs in jungle, fire occurs in cities,
4. Green world becomes wide,
5. Animal, bird, fishes dies.
6. The natural life destroyed by climate change.
7. People losses their mental health and patience.
8. Ices of the world deceasing.

**Prevention:**
1. Tree planting: A matured tree absorbs 130 gram carbon in a day. Other hand Bangladesh emits 700 Kg carbon i.e. 1.9 kg i.e. 1900 gram per day. It means if Bangladesh plants1900/130= 15 tree for pee person the climate must be favourable.
2. Use filter when carbon emerged from factories, vehicles and other sources. The filter will store the carbon which might be used another positive purpose.
3. Carbon separator machine: To invent a carbon separator machine from weather.
4. War control: The world should control war i.e. bombing.
5. Water distribution: As per Bangladesh previously water Inflows from several countries was 5590m3/s now it is 3370m3/s. It means the neighbour countries is not passing proper water to Bangladesh. For this dust increases and climate changes

**Hailstorm Creation & Methodology:**
Hailstorm: As per National Weather Service to create a cloud and hailstorm the following process have to maintain:

**Key Processes in Cloud Formation**
- **Evaporation & Transpiration:** The sun heats water on Earth's surface (oceans, lakes) and plants, turning it into water vapor (gas) that rises into the atmosphere.
- **Rising & Cooling:** As air rises, it moves into lower pressure, causing it to expand and cool.
- **Condensation:** When the air cools below its dew point (saturation), the water vapor condenses into liquid water droplets.
- **Condensation Nuclei:** The water vapor needs a surface to condense on, such as dust, smoke, salt, or pollution particles in the air.

**Temperature Conditions for Cloud Formation**
Clouds form when air is cooled to its saturation point, where relative humidity reaches 100%.
- **Cooling Process:** As warm, moist air rises, it expands and cools at an average rate of 5.5°F per 1,000 feet (9.8°C per kilometre) in dry air, or lower in moist air.
- **Dew Point:** Clouds form when the air temperature falls to the dew point temperature, allowing water vapor to condense onto aerosols such as dust, smoke, or sea salt.
- **Freezing Temperatures:** Water droplets can exist in a "supercooled" state at temperatures between 32°F and -32.8°F (0°C to -36°C) before turning into ice crystals.

**Weight and Density of Air in Clouds**

Although clouds contain immense amounts of water, they float because the air within them is less dense than the surrounding atmosphere.

- **Air Weight:** A moderate-sized cumulus cloud is estimated to have a mass equivalent to a B-747 jumbo jet, or roughly 500 tonnes.
- **Density:** The density of water droplets within a cloud is very low—approximately 0.5 grams per 1,000 litters—allowing it to remain suspended.
- **Buoyancy:** When condensation occurs, heat is released, which causes the air in the cloud to expand and become warmer (and thus lighter/more buoyant) than the dry air surrounding it.

**Key Components of Hail Formation**

- **Strong Updrafts:** Updrafts are necessary to carry water droplets well above the freezing level.
- **Supercooled Water:** Droplets colder than but still liquid collide with ice pellets, freezing instantly and creating layers of ice.
- **Freezing Level:** Hail forms in the middle-upper part of cumulonimbus clouds, often where temperatures are between

**How Hail Grows**

1. **Embryo Formation:** Raindrops freeze into tiny ice balls.
2. **Accumulation:** The ice balls are pushed up and down, accumulating layers of water that freeze, similar to onion layers.
3. **Falling:** Once the hailstone is too heavy for the updraft to support, or the updraft weakens, it falls to the ground.

**Factors Affecting Hail Size**

- **Updraft Intensity:** Faster updrafts produce larger hail.
- **Atmospheric Instability:** High instability, low-level moisture, and strong winds contribute to larger, more destructive hail.
- **Temperature Variations:** Large variations, such as cold air aloft paired with warm, humid surface air, encourage strong convective activity.

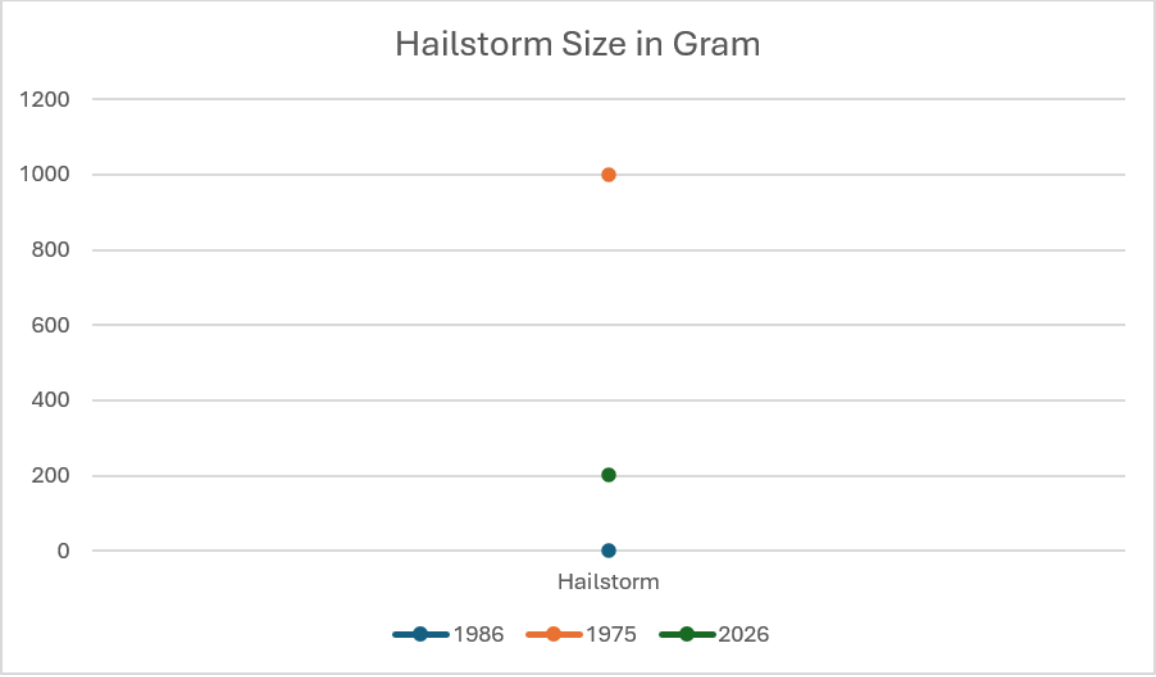
**Methodology**: Hail grows when air temperature falls below -30°C (-22°F)

As per Bangladesh history:

- Minimum hail size: 5 millimetre equal to 1.5 gram

Maximum hail size: 1 kg in1986

- Latest hail size: 203-gram April 2026



**It means:**

To grow minimum size hail i.e. 1.5 gram -30° Celsius temperature needed Then 203-gram hail needs (-30X1.5/203) -0.22. ° C

It means climate change effect -30—0.22=-29.68° C.

It means this -29.68° C heat increases in the atmosphere.

Present highest temperature recorded at summer season in Bangladesh 43° C.

**That means temperature should be 43°+-29.68°=14°C.**

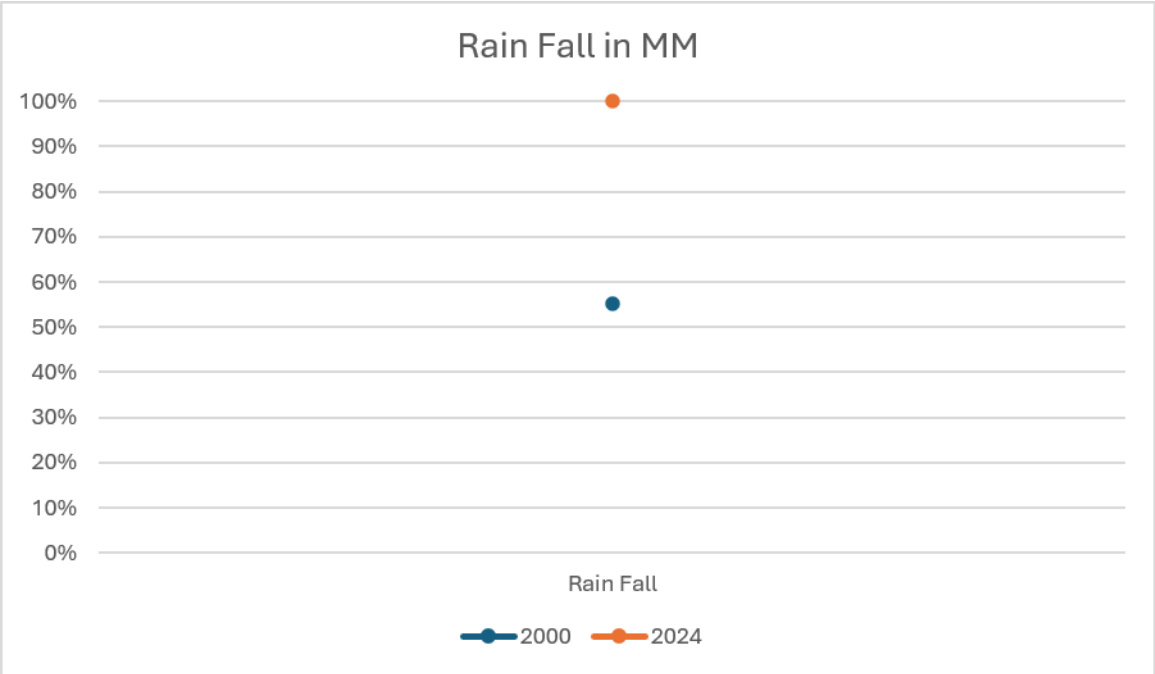
**The percentage of climate change is 14/43X100=32.55%**

**Rain & Methodology:**

In Bangladesh average rainfall in the year 2024 was 2021 mm and in the year 2000 it was 2488 mm

It means rainfall decreases=2488 mm-2021mm=467mm.

The percentage of rain decreases is 467/2488X100=18.77%.




**Water resources position in Bangladesh:**

Table shows Water resources in Bangladesh.

| Water Inflow | 1983 | 1990 | 2005 | 2018 |
|---|---|---|---|---|
| Border Inflows (m3/s): | | | | |
| Brahmaputra | 3990 | 3900 | 3900 | 3800 |
| Ganges | 870 | 770 | 836 | 836 |
| Tributary Inflows (m3/s): | | | | |
| Measured | 450 | 370 | 284 | 284 |
| Unmeasured (net) | 480 | 790 | 480 | 480 |
| Total Inflows (m3/s) | 5790 | 5830 | 5500 | 5400 |
| Diversions (m3/s): | | | | |
| Normal Diversions | 200 | 200 | 200 | 130 |

| | | | | |
|---|---|---|---|---|
| New pumps and improved offtakes | - | - | 600 | 370 |
| Possible diversions by barrage: | | | | |
| from Brahmaputra | - | - | - | 1000 |
| from Ganges | - | - | - | 830 |
| Total diversions (m3/s) | 200 | 200 | 800 | 2330 |
| Outflows to the Bay of Bengal (m3/s) | 5590 | 5630 | 4700 | 3070 |

It shows that water inflow has been reduced by (5590-3070) =2520 m3/s.

If inflow of water at 2005, 4700 m3/s and rain fall 2488mm then in 2024 inflow was (assumed on the basis of table) 2430 or 2192 m3/s then rainfall should be(2488/4700X2430) 1287 mm but rainfall was 2021 mm. Excess rainfall due to climate change was 2021-1287=734 mm. It causes flood.

Since in 1983 inflow was 5590 m3/s and diversion were only 200 m3/s

And

2018 inflow was 3070 m3/s and division were 2330m3/s.

It means inflow has been reduced by 3070/5590X100=55%

And diversion increased by 2330/200X100=1165%.

Due to higher diversion water level has gone down by 1165% this makes high impact on climate change.

**On the other hand**

If inflow of water at 2005 4700 m3/s and rain falls 2488mm then in 2024 inflow should be 3817 m3/s but inflow was (assumed on the basis of table) 2430 or 2192 m3/s.

Inflow is reduced by 3817-2430=1387m3/s.

The percentage is 36%. It means if inflow is less then this is the shortage of water and the shortage of water increases carbon and dust in the weather.

**Assumption through table:**

1990=5630

2005=4700

2018=3070

(5630-4700) =930 for 15 years

(4700-3070) =1630 for 13 years

Average= (1630+930)/28=91

Then 91X7=640m3/s

I.e. 3070-640=2430m3/s

If only last 13 years average, we count

Then 1630/13=125 m3/s per year reduces

125X7=877m3/s

i.e. 3070-877=2192m3/s

**Air pollution & Methodology:**

According to Begum and Hopke, Aerosol and Air Quality Research, 18: 1910–1920, 2018

Table 2. Average air particulate matter mass concentration (µg m–3) and PM2.5/PM10 and BC/PM2.5 ratio during the collection period in semi-residential area in Dhaka.

| Year | PM10 | PM2.5 | BC | PM2.5/PM10 | BC/PM2.5 |
|---|---|---|---|---|---|
| 1996–97 | 92.5 ± 54.2 | 44.9 ± 26.4 | 15.8 ± 8.88 | 0.51 ± 0.13 | 0.37 ± 0.10 |
| 1997–98 | 98.5 ± 62.7 | 49.2 ± 28.9 | 21.0 ± 13.1 | 0.54 ± 0.15 | 0.45 ± 0.18 |
| 1998–99 | 132 ± 88.0 | 67.2 ± 40.8 | 25.3 ± 22.0 | 0.56 ± 0.13 | 0.37 ± 0.18 |
| 1999–00 | 94.1 ± 64.1 | 46.3 ± 25.8 | 15.1 ± 9.93 | 0.56 ± 0.13 | 0.34 ± 0.13 |
| 2000–01 | 93.2 ± 82.7 | 35.1 ± 28.3 | 11.8 ± 8.77 | 0.42 ± 0.14 | 0.39 ± 0.15 |
| 2001–02 | 73.4 ± 48.1 | 25.7 ± 16.9 | 8.48 ± 4.74 | 0.39 ± 0.14 | 0.35 ± 0.09 |
| 2002–03 | 81.7 ± 45.7 | 32.9 ± 19.5 | 9.10 ± 6.88 | 0.42 ± 0.12 | 0.28 ± 0.11 |
| 2003–04 | 71.7 ± 48.6 | 23.9 ± 14. | 8 7.89 ± 5.82 | 0.36 ± 0.12 | 0.33 ± 0.12 |
| 2004–05 | 67.1 ± 37.4 | 26.7 ± 12.5 | 8.45 ± 6.43 | 0.44 ± 0.15 | 0.33 ± 0.20 |

| | | | | | |
|---|---|---|---|---|---|
| 2005–06 | 112 ± 85.1 | 36.4 ± 30.5 | 10.3 ± 8.12 | 0.35 ± 0.11 | 0.30 ± 0.10 |
| 2006–07 | 90.8 ± 46.9 | 31.5 ± 13.5 | 9.60 ± 4.81 | 0.38 ± 0.12 | 0.32 ± 0.11 |
| 2007–08 | 102 ± 51.9 | 35.4 ± 17.8 | 8.30 ± 4.08 | 0.37 ± 0.10 | 0.25 ± 0.08 |
| 2008–09 | 123 ± 81.8 | 41.2 ± 23.4 | 9.24 ± 5.77 | 0.38 ± 0.12 | 0.27 ± 0.15 |
| 2009–10 | 113 ± 82.7 | 33.5 ± 19.1 | 10.5 ± 4.94 | 0.34 ± 0.13 | 0.36 ± 0.14 |
| 2010–11 | 121 ± 70.2 | 38.2 ± 20.1 | 8.39 ± 4.59 | 0.35 ± 0.10 | 0.23 ± 0.08 |
| 2011–12 | 82.7 ± 54.0 | 17.0 ± 13.2 | 3.90 ± 2.55 | 0.23 ± 0.09 | 0.25 ± 0.09 |
| 2012–13 | 109 ± 78.3 | 33.8 ± 26.2 | 6.11 ± 4.02 | 0.33 ± 0.11 | 0.20 ± 0.08 |
| 2013–14 | 82.5 ± 43.7 | 30.2 ± 19.6 | 6.43 ± 3.90 | 0.38 ± 0.13 | 0.23 ± 0.08 |
| 2014–15 | 100 ± 58.7 | 32.7 ± 21.3 | 6.85 ± 4.69 | 0.35 ± 0.12 | 0.21 ± 0.09 |

PM10, PM2.5 and BC (Black Carbon) are measure of air pollution based on particle size and composition, posing significant respiratory health risks. They are primarily generated by combustion and industrial activity. Ratios like PM2.4/PM10 and BC/PM2.5 indicate pollution sources with high ratios linking to heavy combustion (traffic/biomass burning) and low ratios suggesting dust.

As per table Pollution was mostly at 2012-13.

In the year 2024-2025 dust position in Bangladesh was recorded 158 AQI+ and PM 2.5 was 66.1 µg m–3.

In the year it was average 73.35AQI+and PM 2.5 was 35.65 µg m–3.

The climate change effect:

It means dust increases as per AQI 158/73.35X100=215%

And PM 2.5 increases 66.1/35.65X100=185%.

In this regard :

Bangladesh has an overall population of approximately 178 million people in 2025. While there is no singular count for all "active patients" at any given time, the Directorate General of Health Services (DGHS) records over **34.7 million outpatient (OPD) visits** annually at public health facilities.

34.7/178X100=20%people are ill. Which was average 10%in 1995.

## II. Conclusion:

To live in a better world we have to save our climate. Scientist have to discover new product to reduce climate change. Every person should be aware about the affect of climate change and follow the step to reduce climate change.

## Reference:


[1]. (Wolf, Pete (2003-01-16). "Meso-Analyst Severe Weather Guide". University Corporation For Atmospheric Research. Archived From The Original On 2003-03-20. Retrieved 2009-07-16.)

[2]. Https://En.Somoynews.Tv/News/2024-04-20/Are-Hailstorms-In-Bangladesh-Linked-To-Global-Warming

[3]. Https://En.Wikipedia.Org/Wiki/Hail

[4]. Https://Tradingeconomics.Com/Bangladesh/Precipitation#:~:Text=Precipitation%20in%20Bangladesh%20decreased%20to%202020.96%20mm,Record%20low%20of%201678.22%20mm%20in%201972.

[5]. Https://Www.Atlas.Impact2c.Eu/En/Non-European-Hotspot/Bangladesh/Rainfall-In-Bangladesh/?Parent_Id=33

[6]. Https://En.Banglapedia.Org/Index.Php/Water_Resources

[7]. Https://Wwww.Mdpi.Com

[8]. Https://Www.Iqair.Com/Bangladesh

[9]. Https://Www.Worldometers.Info/World-Population/Bangladesh-Population/

[10]. Sealevel.Nasa.Gov

[11]. Who.Int