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ASSIGNMENT 1

1. Water resources are [natural resources](https://en.wikipedia.org/wiki/Natural_resource) of [water](https://en.wikipedia.org/wiki/Water) that are potentially useful. Uses of water include [agricultural](https://en.wikipedia.org/wiki/Agricultural), [industrial](https://en.wikipedia.org/wiki/Industry), [household](https://en.wikipedia.org/wiki/Household), [recreational](https://en.wikipedia.org/wiki/Recreational) and [environmental](https://en.wikipedia.org/wiki/Natural_environment) activities. All living things require water to grow and reproduce.

97% of the water on the Earth is salt water and only three per cent is [fresh water](https://en.wikipedia.org/wiki/Fresh_water); slightly over two thirds of this is frozen in [glaciers](https://en.wikipedia.org/wiki/Glacier) and [polar](https://en.wikipedia.org/wiki/Polar_climate) [ice caps](https://en.wikipedia.org/wiki/Ice_cap). The remaining unfrozen fresh water is found mainly as groundwater, with only a small fraction present above ground or in the air.

Fresh water is a [renewable resource](https://en.wikipedia.org/wiki/Renewable_resource), yet the world's supply of [groundwater](https://en.wikipedia.org/wiki/Groundwater) is steadily decreasing, with depletion occurring most prominently in Asia, South America and North America, although it is still unclear how much natural renewal balances this usage, and whether [ecosystems](https://en.wikipedia.org/wiki/Ecosystem) are threatened. The framework for allocating water resources to water users (where such a framework exists) is known as [water rights](https://en.wikipedia.org/wiki/Water_rights).

SALT WATER

Saline water (also called salt water, salt-water or saltwater) is water with salt in it. It often means the water from the seas (sea water) and oceans. Almost all the water on Earth is saline. Salt water used for making or preserving food, is usually saltier than sea water and is called brine. Drinking sea water alone is dangerous. A summary of 163 life raft voyages showed the risk of death at 39% for those who drank seawater, compared to 3% for those who did not. Experiments on rats showed the danger. When scientists measure salt in water, they usually say they are testing the salinity of the water: salinity is measured in parts per thousand or ppt. Most sea water is about 35 ppt salt. Salt lakes can be up to ten times as salty. Above that level precipitation creates a salt plain. Brackish water, in contrast, is less salty than seawater. Salt water is more dense than fresh water. This means that it has more matter per its volume. Fresh water has a density of 1 g/ml, while salty seawater has an average density of about 1.025 g/ml.

FRESH WATER

Fresh water (or freshwater) is any naturally occurring water except seawater and brackish water. Fresh water includes water in ice sheets, ice caps, glaciers, icebergs, bogs, ponds, lakes, rivers, streams, and even underground water called groundwater. Fresh water is generally characterized by having low concentrations of dissolved salts and other total dissolved solids. Though the term specifically excludes seawater and brackish water, it does include mineral-rich waters such as chalybeate springs. Freshwater lakes contain about 87% of this fresh surface water, including 29% in the African Great Lakes, 22% in Lake Baikal in Russia, 21% in the North American Great lakes, and 14% in other lakes. Swamps have most of the balance with only a small amount in rivers, most notably the Amazon River. The atmosphere contains 0.04% water. In areas with no fresh water on the ground surface, fresh water derived from precipitation may, because of its lower density, overlie saline ground water in lenses or layers. Most of the world's fresh water is frozen in ice sheets. Many areas suffer from lack of distribution of fresh water, such as deserts

Fresh water is not the same as portable water (or drinking water). Much of the earth's fresh water (on the surface and groundwater) is unsuitable for drinking without some treatment. Fresh water can easily become polluted by human activities or due to naturally occurring processes, such as erosion. Water is critical to the survival of all living organisms. Some organisms can thrive on salt water, but the great majority of higher plants and most mammals need fresh water to live. The source of almost all fresh water is precipitation from the atmosphere, in the form of mist, rain and snow. Fresh water falling as mist, rain or snow contains materials dissolved from the atmosphere and material from the sea and land over which the rain bearing clouds have traveled. In industrialized areas rain is typically acidic because of dissolved oxides of sulfur and nitrogen formed from burning of fossil fuels in cars, factories, trains and aircraft and from the atmospheric emissions of industry. In some cases this acid rain results in pollution of lakes and rivers.

1. The current flood disaster in Nigeria and what are the causavative factors

Floods are known to be one of the most devastating natural disaster causing a threat to human existence, properties damages or lost just like any other natural disaster such as hurricanes and volcanoes. Floods are major disasters affecting many countries of the world annually especially in most flood plain areas. Floods do not only damage properties and endanger the lives of human and animals but also produce other secondary effects like outbreak of diseases such as cholera and malaria as well

Currently there has been a lot of flooding menace on Nigeria cities and communities.

Over the past few months, floods have ravaged many communities. Some of the affected states include Kogi, Niger, Anambra, Delta and Taraba. Others are Kebbi, Edo, Rivers, Benue, Bayelsa and Kwara states. Flooding in communities in these states prompted the National Emergency Management Agency to declare National Disaster in the states.

Apart from houses (built with mud brick, traditional building materials of the area and those not built with modern flood resistant structure) that collapse by flooding, schools, buildings and bridges sometimes collapse as well. Market places and farmlands are submerged for weeks and sometimes are washed away;

“These flood disasters have worsened the crises of internally displaced persons. These perennial floods have over the years caused widespread and irreparable damage to the various ecosystems along the impacted areas, with some flora and fauna lost forever, and also introduced several strange vegetation that not only choke native flora, but are usually difficult to control,” he said.

According to Nigeria’s National Emergency Management Agency (NEMA), nearly half a million people are currently affected by flooding in 8 states of the country. At least 108 people have died in the flooding, with a further 192 injured.

The affected states include Anambra (64,331 people affected), Benue (2,201), Delta (37,017), Edo (31,113), Kebbi (94,991), Kogi (118,199), Kwara (41,680) and Niger (51,719).

Earlier this month NEMA declared a state of emergency for [flooding in the four states of Niger, Kogi, Anambra and Delta](http://floodlist.com/africa/nigeria-floods-niger-benue-rivers-september-2018).

A total of 13,031 houses have been damaged or destroyed. As of 24 September, there were 141,369 people displaced by the floods. NEMA says there is an urgent need for food and non-food relief items.

Flooding also affected parts of Rivers and Beyelsa states over the last few days, and teams from NEMA and the military have started evacuating families trapped in their homes, relocating them to nearby relief camps.

As of 24 September, the Niger river at Lokoja had fallen slightly from previous levels and stood at 11.05 metres.

reported stated that communications and traffics are interrupted, electricity and telephone lines have been lost for many days, while many land areas were inundated, industrial plants and commercial establishment were paralyzed during floods in Nigeria. Additionally, untold hardship is experienced, especially by the most vulnerable groups (women and school children This revelation suggests that if all data of flood disasters in Nigeria were to be available, human would not be able to conceive the devastated effect of flooding that occurs in this Nigeria. The recent floods of 2018 in Nigeria devastated more than twenty-five States, with varying degrees of impact, in the upper reaches of our river system network. The floods swept away many homes, farmlands, schools, and sources of our livelihood, among others. However, on a comparative basis, Niger Delta (9 States) has a unique experience of such destructions

CAUSES OF FLOODING

These were attributed to climate change, rapid population growth, poor drainage facilities, poor practice of waste disposal, poor planning and inadequate preparedness. extraordinarily heavy rains and continued release of excess water from artificial reservoirs. While sometime the dams were accidently broken or overfilled. Others are the poor channel maintenance of drainage channels. Scenes of the flood show, settlements and infrastructure such as road at risk during inundation.

Conclusion and recommendations made are flood forecast and early warning of flood disaster in the country, prevention through effective urban planning, effective and proper waste disposal and flood disaster education should be included in the syllabus of all level of education.

FACTORS OF FLOOD

 These are:

(a)The level of predictability: This affects the timing, accuracy and communication of warnings given before a flood event.

(b)The rate of onset to which flood occurred: How quickly the water arrives and the speed at which it rises will govern the opportunity for people to prepare and respond effectively for a flood.

(c)The speed and depth of the water: This dictates the level of exposure of people and property to a flood. It is difficult to stand or wade through even relatively shallow water that is moving. Flood water often carries debris, including trees and water over 1m in depth can carry objects the size of cars. Fast flowing water can apply devastating force to property and other receptors.

(d)The duration of the flood: This is another important factor in determining the extent of its impact, particularly on individuals and affected communities.

 The effects of flooding from the sources

These include, people, buildings, infrastructure, agriculture, open recreational space and the entire

natural world. In extreme cases flooding may cause a loss of lives. Floodwater, resulting from heavy rains, damaged bridges and caused a dam to overflow, submerging buildings across the cities. The economy also be severely affected by flooding. Loss of stock, patronage, data and productivity and disruption to utilities and transport infrastructure can have knock-on effects to a wider area. Tourism, farming and livestock can equally be affected

The devastating effect of floods was not limited to houses and people. Many farmlands both arable and agro-forestry were swept away when schools were submerged, this therefore results to sudden food shortage resulting from loss of entire harvest, spoiling of grains when submerged in water along as well as loss of animal fodder. Some animals lost their lives to flooding when many bridges collapsed, and electric poles destroyed. The effects floods have also resulted to various destructions of dam’s embankments, drains, roads, railways etc. Other adverse effects of flooding are degradation of environment, spread infestations, chemical pollution of soil and water, freshwater resources and scarcity of drinking water. These Include contamination water supplies (water pollution). Clean drinking water therefore becomes scarce with consequent unhygienic conditions and Spread of water-borne diseases.

Effect and consequences of flood include spread of diseases, loss of lives and propertiess, socio-economic and psychological effects. causes of flooding

Recommendations

1. Efficient mapping, monitoring, and maintenance of all floodplains, sea coast, natural lakes and reservoirs (i.e. dams) in Nigeria.
2. Establishment of Efficient Monitoring Stations at each sea coast should be made.
3. There is a dire need for collaboration between hydrologists, remote sensing and GIS experts, environmental scientists, engineers, surveyors and other professional bodies, etc in monitoring the annual hydrological cycle and weather patterns as well as giving appropriate advice to the government.
4. As all prognoses available suggest that Nigeria will experience alterations in weather patterns throughout 21st century, with changes in temperature, rainfall, rise in sea level, therefore, data from NIMET should be obtained quarterly and measures should be implemented based on predicted future events.
5. Fast evacuation should always be carried out to minimize consequences of floods whenever they occur. This could only be achieved through supervision by serious minded personnel. Both rural and urban dwellers of riverine and sea coast areas should be educated on the risk and consequences of floods or even compensated with safe alternative land Procurement of cutting-edge flood modelling, prediction and mitigation should be highly motivated.

3. **LAGOS**: Benue, Kogi, Niger, Lagos, Rivers Lagos is an urban settlement located in the south-western part of Nigeria, between latitude 6020’00’’N to 6040’0’’N and longitude 2050’0’’E to 4020’0’’E. It is one of the 36 states of Nigeria. The state covers an area of approximately 3,496km2with a population of 9,113,605 (NPC 2010). Lagos urban area is the largest city in Nigeria, as well as in West Africa. The topography of Lagos can be divided into two main geographical areas: the Island and the Mainland. The Island areas of Lagos are land surfaces that are surrounded by water from creeks and Atlantic Ocean. These areas are collection of Islands that are separated from each other by lagoons and creeks and they are also separated from the rest of the state mainland. The Islands and the Mainland are connected by bridges. The two major urbanized areas of Lagos in Lagos islands are Victoria Island and Lagos Island (Soladeye, and Ajibade,2014). On the other hand, the areas of mainland Lagos are non island areas of the state, these areas are connected to each other and the rest of the country by land. It is where a huge population of Lagosians live, and most industries are located there. The topography of both the islands and the mainland areas are dominated by lagoons and sandbars, and the terrain is relatively flat on most of the land areas. The terrain is low-lying and the highest point on Lagos Islands 8 metres above sea level while on the mainland areas and other part of the state the highest point is 79 meters above sea level. The drainage system of Lagos State is characterized by a network of lagoons and waterways. The state also bordered with Atlantic Ocean in it southern part, so most of the waterways are flowing to the south toward the coastline. The major water bodies are the Yewa and Ogun Rivers, Lagos and Lekki Lagoons. Others are Ologe Lagoon, River Imede and River Omu (Soladeye, and Ajibade, 2014). These water bodies contributed in shaping the major topography of Lagos. The drainage system of the state and the terrain pattern which is relatively flat increases the risk of pluvial flooding: “that is flooding as a result of high intensity of rainfall” (Kaoje, 2016 PP: 137). Likewise, the state bordering the ocean in the South also increases the risk of tidal flood. Lagos is one of the states in Nigeria that experiences flooding almost every year during raining seasons. Using GIS techniques and RAS packages, research shows areas that have 1 % probability of flood occurrence in 100 years. These are areas where waters from rainfall and other forms of precipitation will run to and be accumulated thereby causing flood. It has been observed that most of water body areas are

less than 5 meters above sea level, for this reason all areas that are less than 5 meters above sea level are also included and depicted as flood vulnerability areas on the map. The flood vulnerability map clearly shows that flood vulnerable areas of Lagos are found around the major waterways (Lagos lagoons and creeks) this is because most of the streams and rivers in and around Lagos empty their waters in the lagoons and creeks then to the Atlantic Ocean. Lagos topography is one of the main factors that significantly influence flooding within the flood vulnerability areas. Conner, (2002) stated that “topography of an area strongly determines the characteristics and behaviours of surface water balance” (Kaoje, 2016 pp: 144).

**4. Profer modalities to prevent re-occurence of flooding in these states in Nigeria**

It’s clear Nigeria needs to take measures to cope with flooding. This will require both local and international interventions, and could include early warning and rapid response systems, flood data gathering and modeling, proper urban and spatial planning, flood emergency preparedness and political will.

The country can learn from others. For example, in Mumbai, India various measures have been implemented to reduce the impact of flooding. These have included an emergency control centre, automated weather stations, removal of solid waste from stormwater drains and the development of emergency response mechanisms. Nigeria must invest in these measures, and sustain them. According to analysts, incessant flooding in the State and other parts of the country can be addressed if  government, regulatory agencies and the citizens do what is expected of them and at the right time. They said providing material support to flood victims is appreciable, but the authorities should consider channeling such resources into preventing the menace as much as possible.

**5**. **WRITE ON RECENT FLOODING IN OTHER PARTS OF THE WORLD; USA, JAPAN, INDIA ETC CHOOSE ANY TWO COUTRIES OR REGIONS OF THE WORLD. PROVIDE CAUSATIVE FACTOR OF THE FLOOD. WRITE ALSO ON THE METHODS USED TO CHECK, AMELIORATE, OR PREVENT THE REOCCURENCE OF FLOODING IN THE LOACATIONS**

**FLOODING IN JAPAN**

Japan is no stranger to natural disasters, especially earthquakes. A series of quakes in Kumamoto in 2016 led to the deaths of more than 200 people, according to the Japanese Red Cross Society.

More than 20,000 people were killed or went missing during the 2011 disaster, when a 9.0-magnitude earthquake hit Japan, triggering a tsunami and nuclear meltdown at the Fukushima nuclear plant.

In late June through mid-July 2018, successive heavy downpours in southwestern Japan resulted in widespread, devastating floods and mudflows. The event is officially referred to as *Heisei san-jū-nen shichi-gatsu gōu* (平成30年7月豪雨, "Heavy rain of July, Hesei 30") by the Japan Meteorological Agency.

**VICTIMS**

 As of 20 July, 225 people were confirmed dead across 15 prefectures with a further 13 people reported missing, primarily due to mudlides, landslides and vehicles being swept away by the flood waters. More than 8 million people were advised or urged to evacuate across 23 prefectures. It is the deadliest freshwater flood-related disaster in the country since the 1982 Nagasaki flood when 299 people died. Many of the dead had ignored evacuation orders, and chose to stay in their homes despite repeated warnings. Police received numerous reports across the country of people trapped in homes buried by landslides, of people being swept away by swollen rivers, and from people trapped in cars. At least ten people were buried inside their homes in Higashihiroshima; rescuers were able to confirm seven survived but remained trapped as of 7 July.

**RESCUE EFFORT**

Approximately 54,000 members of the Japan Self- Defense Forces, police and firefighters, and have been searching for the people trapped or injured in landslides and flooding triggered by the heavy rain, while the Japanese government has set up a liaison unit at the crisis management center of the prime minister's office to gather information. Helicopters and boats were utilized by rescuers to retrieve individuals trapped on rooftops and balconies. Social media have been employed to let authorities and family and friends know about the individuals' conditions.

**INTERNATIONAL AID**

1. Taiwan announced that they will donate 20 million yen for disaster relief.
2. Thailand sent a donation of 17 million yen to assist relief efforts. Thai Red Cross Society donated an additional 7 million yen to support those affected.
3. The Phillipine Government offered Filipino soldiers, engineers, and doctors for the rehabilitation efforts, along with medical supplies.
4. Singapore -based non-governmental humanitarian organization Mercy Relief announced on 8 July that they were sending a team to assist in supplying meals to people displaced by the floods, and launched a fundraiser in Singapore on 12 July.
5. The Israeli humanitarian aid organization ISraAID sent an emergency response team to Western Japan on 9 July, to distribute urgent relief items, assessing the medical and post-trauma psycho-social needs. The team was equipped to provide psychological first aid and mental health support for evacuees.
6. The Malaysian government donated RM500,000 to the Japanese embassy in Malaysia for the flood and recent heat wave victim



A residential area is seen on July 9 in Kurashiki, Okayama Prefecture, submerged following torrential rains that hit a wide area of western Japan.

**CAUSATIVE FACTORS OF FLOOD IN JAPAN**

Torrential rains unleashed floods and set off landslides in western Japan, killing at least 176 people, forcing millions to evacuate and leaving dozens missing in the country's worst weather disaster in 36 years.

Below are some causes of the flood

1. **Extreme weather:** Remnants of Typhoon Prapiroon fed into a seasonal rainy weather front fuelled by warm air from the Pacific Ocean - a pattern similar to one that caused flooding in southwestern Japan exactly a year ago that killed dozens of people. The recent rainfall was unprecedented and disaster experts said torrential rains are becoming more frequent, possibly due to global warming.
2. **Risk awareness**: Municipalities in Japan have been required since 2005 to create and publicize "hazard maps" showing the risk of flooding and landslides. By 2013, 95 percent of municipalities had produced flood hazard maps and 81 percent for landslides, according to the land ministry. However, experts say many homes in Japan were built in risky areas before the 2001 requirement to distribute hazard maps. Kurashiki city in Okayama prefecture, where the Mabi district was especially hard hit by this week's floods, distributed a hazard map in 2016, the Yomiuri newspaper said. Despite orders and advisories to evacuate, which may have been issued too late, some residents appear to have ignored the warnings because they did not know where to go or how to get to safety. **Quakes not floods**: Japan, one of the most seismically-active places in the world, has stressed earthquake preparedness and regulations to make buildings quake-proof, but it has done less about potential flood disasters, said Okuma from Niigata University. After several smaller disasters in recent years, the Ministry of Land, Infrastructure, Transport and Tourism has drafted plans to improve flood control and evacuation planning.
3. **Land use**: The government monitors weather conditions and issues early warnings, but the nation remains vulnerable to disasters because much of the country outside major cities is mountainous and construction takes place on virtually every bit of usable land. Reforestation policies after World War Two saw many mountains logged and replanted with trees that have roots that are less able to retain water. That has contributed to the danger of landslides, which accounted for many of the deaths in this latest disaster. \

**METHODS TO AMELIORATE FLOOD IN THIS AREA**

The government should also take steps to mitigate the impact of global warming. It can be hard to measure the impact of a preventative measure, because, by its nature, it prevents a damaging event from happening. Two massive construction projects protect Japan's capital from the ever present threat of floods. The first project known as the Metropolitan Area Outer Underground Discharge Tunnel, or more simply as the " G-cans Project " was completed in 2009. A network of 3.3 kilometer tunnels called "The Furukawa reservoir" will be in place later this year.

1. Building Flood Protections: Starting in the 1920's, Japan began building water channels and an extensive set of levies. But storm after storm and flood after flood proved that the system was not enough. After a particularly deadly stream of six floods left ten of thousands of homes in the capital city damaged, national leaders decided Tokyo needed special attention.
2. The G-Cans Project: Commissioned in 1992, construction began on the "world largest drain" in 1993. The concept was relatively simple. The plan connected existing rivers and waterways to overflow pipes and drains. This allowed the above ground drainage system in central Tokyo to continue in operation, while its overall capacity was massively expanded underground. The underground system was composed of 5 giant cisterns that collected excess water from rivers and waterways. Each cylindrical shaft measures about 70 meters in height and 30m in diameter, spacious enough to park a space shuttle. These cisterns are connected by 6.5km of tunnels 10m wide buried 50m deep. The tunnels allowed the cisterns to provide capacity to support each other. The pipes take the water from the cisterns to an enormous pressure controlled tank. This tank measures 177m long, 78m wide and 18m tall. 59 pillars of 500 tons each support the ceiling and break up the power incoming water. The system is capable of discharging 200 cubic meters of water per second.

**FLOODING IN INDIA: A CASE STUDY OF KERALA**

Beginning on 15 August 2018, severe floods affected the [south Indian](https://en.wikipedia.org/wiki/South_India) state of Kerala, due to unusually high rainfall during the [monsoon season](https://en.wikipedia.org/wiki/Monsoon_season) It was the worst flooding in Kerala in nearly a century. Over 483 people died, and 15 are missing. At least a million people were evacuated, mainly from [Chengannur](https://en.wikipedia.org/wiki/Chengannur), [Pandanad](https://en.wikipedia.org/wiki/Pandanad), [Edanad](https://en.wikipedia.org/wiki/Edanad), [Aranmula](https://en.wikipedia.org/wiki/Aranmula), [Kozhencherry](https://en.wikipedia.org/wiki/Kozhencherry), [Ayiroor](https://en.wikipedia.org/wiki/Ayiroor%2C_Pathanamthitta), [Ranni](https://en.wikipedia.org/wiki/Ranni), [Pandalam](https://en.wikipedia.org/wiki/Pandalam), [Kuttanad](https://en.wikipedia.org/wiki/Kuttanad), [Aluva](https://en.wikipedia.org/wiki/Aluva), and [Chalakudy](https://en.wikipedia.org/wiki/Chalakudy), [N.Paravur](https://en.wikipedia.org/wiki/North_Paravur), [Chendamangalam](https://en.wikipedia.org/wiki/Chendamangalam), Eloor and few places in Vypin Island. All 14 districts of the state were placed on red alert. According to the Kerala government, one-sixth of the total population of Kerala had been directly affected by the floods and related incidents. The Indian  [government](https://en.wikipedia.org/wiki/Government_of_India) had declared it a Level 3 Calamity, or "calamity of a severe nature". It is the worst flood in Kerala after the [great flood of 99](https://en.wikipedia.org/wiki/Great_flood_of_99) that happened in 1924.

Thirty-five out of the fifty-four [dams within the state](https://en.wikipedia.org/wiki/List_of_dams_and_reservoirs_in_Kerala) were opened for the first time in history. All five overflow gates of the [Idukki Dam](https://en.wikipedia.org/wiki/Idukki_Dam) were opened at the same time, for the first time in 26 years. Heavy rains in [Wayanad](https://en.wikipedia.org/wiki/Wayanad_district) and Idukki have caused severe landslides and have left the hilly districts isolated. The situation was regularly monitored by the [Prime Minister](https://en.wikipedia.org/wiki/Prime_Minister_of_India), and the [National Crisis Management Committee](https://en.wikipedia.org/wiki/National_Crisis_Management_Committee) coordinated the rescue and relief operations.

**CAUASATIVE FACTORS**

Kerala received heavy [monsoon](https://en.wikipedia.org/wiki/Monsoon) rainfall, which was about 256% more than the usual rain fall in Kerala, on the mid-evening of August 8, resulting in [dams](https://en.wikipedia.org/wiki/Dam) filling to capacity; in the first 24 hours of rainfall the state received 310 mm (12 in) of rain. Almost all dams had been opened since the water level had risen close to overflow level due to heavy rainfall, flooding local low-lying areas. For the first time in the state's history, 35 of its 54dams had been opened.

The Government of Kerala argued in the [Supreme Court](https://en.wikipedia.org/wiki/Supreme_Court_of_India) that the sudden release of water from the [Mullaperiyar Dam](https://en.wikipedia.org/wiki/Mullaperiyar_Dam) by the [Tamil Nadu government](https://en.wikipedia.org/wiki/Tamil_Nadu_government) was one of the reasons for the devastating flood in Kerala. The Tamil Nadu government rejected the argument, saying that Kerala suffered the deluge due to the discharge of excess water from 80 reservoirs across Kerala, spurred by heavy rains from within the state; It also argued that the flood surplus from the [Idukki dam](https://en.wikipedia.org/wiki/Idukki_dam) is mainly due to the flows generated from its own independent catchment due to unprecedented heavy rainfall, while the discharge from Mullaperiyar dam was significantly less. Though it is difficult to attribute any single event to [climate change](https://en.wikipedia.org/wiki/Climate_change), it's possible role in causing the heavy rainfall event over Kerala cannot be ruled out.

**METHODS TO AMELIORATE FLOOD IN THIS AREA**

1. **Disaster proof housing**

But, the Kerala experience, must remind us that India has been increasingly prone to disasters in the last two decades. Take the 1999 Odisha Cyclone; the 2001 Gujarat Earthquake; the 2004 Indian Ocean Tsunami; the 2013 Uttarakhand Flash Floods; the 2014 Kashmir Floods; the 2014 Vishakhapatnam Cyclone; or the 2015 Chennai Floods.And it's time we looked seriously at disaster proof housing to secure our homes and property from shocks, mudslides and flooding.In 2011, Brian Vastag, wrote in [The Washington Post](http://www.washingtonpost.com/wp-dyn/content/article/2011/03/11/AR2011031104541.html?noredirect=on) of how 'huge shock absorbers, walls that slide and Teflon foundation pads that isolate buildings from the ground all help explain why medium- and high-rise structures in Japan remained standing in the wake of the country’s largest earthquake on record.'Japan learned lessons from its own past experiences. After the Kobe earthquake in 1995, Japan began engineering new structures and retrofitting old ones to withstand violent shaking from earthquakes.Similar engineering is being adopted in the United States too, especially in the San Francisco bay area, which is prone to earthquakes. Japan learned lessons from its own past experiences. After the Kobe earthquake in 1995, Japan began engineering new structures and retrofitting old ones to withstand violent shaking from earthquakes.

1. **Disaster insurance**

Insurance against disasters, is another area that requires attention. The Indian insurance companies have been providing cover to homes and property from burglary, theft and fire; terrorism and also acts of God, which covers floods, earthquakes, storms, etc. Yet, most Indians avoid taking a coverage for their homes or property.

For most of us, health insurance has become a must to guard against sudden and emergency hospital expenses; and vehicle insurance has been made mandatory by the Regional Transport Offices. Similarly, home and property insurance against disasters must also become mandatory.

In San Francisco, when families buy new homes, they have to perforce insure their homes against floods and earthquakes. This insurance is tied in to their mortgages.

On 18 March, 2015, the UN Member States at the Third UN World Conference on Disaster Risk Reduction (DRR) in Sendai City, Japan, adopted the Sendai Framework. [The Sendai framework](http://www.unisdr.org/we/coordinate/sendai-framework) "aims at substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries". The Sendai framework is the principle upon which countries, including India, build their disaster management planning. India has a comprehensive Disaster Management Act of 2005 and a nodal agency, the National Disaster Management Authority (NDMA), whose vision is "to build a safer and disaster resilient India by a holistic, pro-active, technology driven and sustainable development strategy that involves all stakeholders and fosters a culture of prevention, preparedness and mitigation".

**6. PROVIDE NAMES OF WATER AND WEATHER RESOURCES AGENCIES AND ORGANIZATIONS AT :**

1. Local/state

* Lagos State Environmental Protection Agency (LASEPA)
* Lagos State Water Management Board (LSWMB)
* Imo River Basin Development Authority

2. National

* Nigeria Integrated Water Resources Management Commission
* Nigeria Metrological Agency (NiMET)
* National Water Resources Institute

3. International

* National Disaster Management Authority (NDMA)
* Japan Water Agency
* National Water Development Agency (NWDA)