

= 2008 Yemen cyclone =

In October 2008 , the remnants of a tropical cyclone caused extensive damage in Yemen , a poor country on the southern tip of the Arabian Peninsula . The storm , officially known as Deep Depression ARB 02 , was the sixth tropical cyclone of the 2008 North Indian Ocean cyclone season , and the second tropical cyclone in the Arabian Sea that year . It formed on October 19 off the west coast of India from the same broader system that spawned a storm in the southern Indian Ocean . Moving generally westward , the depression failed to intensify much , reaching maximum sustained winds of only 55 km / h ( 35 mph ) . It was no longer classifiable as a tropical depression by October 23 , and later that day , its remnants struck near Ash Shihr in eastern Yemen .

The storm sent a plume of moisture throughout the Arabian Peninsula , contributing to dust storms as far north as Iraq . However , the effects were most severe in Yemen , becoming the second @-@ worst natural disaster in the country after deadly floods in 1996 . The storm dropped heavy rainfall in a normally arid region , reaching around 91 mm ( 3 @. @ 6 in ) , which caused flash flooding in valleys after waterways were unable to contain the approximately 2 billion km<sup>3</sup> ( 528 billion gallons ) of water that fell . Poor drainage practices and an invasive species of weed contributed to the floods , which damaged or destroyed 6 @, @ 505 houses , leaving about 25 @, @ 000 people homeless . The floods killed 180 people and severely disrupted the livelihoods of about 700 @, @ 000 residents of Hadhramaut and Al Mahrah governorates , mostly farmers whose fields were washed away . Some of the buildings at the Shibam UNESCO World Heritage Site collapsed due to the floods . Overall damage was estimated at US \$ 874 @. @ 8 million , although residual losses from damaged infrastructure were estimated to cost an additional US \$ 726 @. @ 9 million . The overall economic impact of the storm was therefore estimated at US \$ 1 @. @ 638 billion , equating to roughly 6 % of the country 's gross domestic product .

After the scale of the damage became clear , the government of Yemen requested for assistance from the international community . The hardest hit areas had poor infrastructure , which caused difficulties in communications as relief goods were distributed . Nations in the region , including Saudi Arabia and the United Arab Emirates , sent money and supplies to help rebuild the damaged infrastructure and houses . Agencies under the United Nations provided food and logistical support . Relief efforts continued to make progress until 2011 due to a political uprising in Yemen .

= = Meteorological history = =

On October 11 , an active phase of the Madden ? Julian oscillation , in conjunction with an equatorial wind burst , produced twin areas of convection in the central Indian Ocean on both sides of the equator . The system in the southern hemisphere would become Moderate Tropical Storm Asma in the south @-@ west Indian Ocean , and the system in the northern hemisphere would ultimately strike Yemen . The northern hemisphere system originated in the Bay of Bengal , and moved westward for much of its duration , steered by a ridge to the north along 15° N. On October 16 , a low pressure area developed over southern India near Kanyakumari . With low wind shear and warm waters of 27 to 28 ° C ( 81 to 82 ° F ) , the system slowly organized . On October 19 , the India Meteorological Department ( IMD ) classified the low as a depression about 725 km ( 450 mi ) southeast of the Yemeni island of Socotra . By that time , the convection had organized more , although it was displaced slightly from the center due to stronger wind shear .

The convection persisted along the western periphery of an elongated center , organizing enough for the American @-@ based Joint Typhoon Warning Center ( JTWC ) to issue warnings on the depression on October 20 , designating it Tropical Cyclone 03A . With marginally favorable conditions , the depression intensified slightly , and the IMD upgraded it to a 55 km / h ( 35 mph ) deep depression on October 21 , the same peak as the JTWC . That day , the system moved over Socotra as it reached an area of cooler water temperatures . Land interaction and dry air weakened the convection around the system as it approached the Gulf of Aden . The IMD downgraded the cyclone to depression status on October 22 . On the next day , the JTWC discontinued advisories , and the IMD downgraded the system further to a remnant low to the northeast of Cape Guardafui ,

Somalia . The JTWC continued tracking the system as it moved northwestward , and the circulation made landfall near Ash Shihr in southeastern Yemen late on October 23 , losing its identity shortly thereafter .

= = Impact = =

Moving ashore southeastern Yemen , the storm dropped heavy rainfall in the typically arid region , reaching 91 mm ( 3 @. @ 6 in ) in some areas , and possibly as high as 200 mm ( 8 in ) , over a 20 @, @ 000 km<sup>2</sup> ( 7 @, @ 700 mi<sup>2</sup> ) area . This equated to about 2 billion m<sup>3</sup> ( 528 billion gallons ) of water , more than twice the capacity of most waterways . The thunderstorms and rainfall occurred over a 30 ? hour period , severely disrupting life in eastern Yemen . The precipitation coalesced into valleys , resulting in flash flooding that swelled water levels to 18 m ( 59 ft ) . Hundreds of residents became trapped in their homes , while businesses and schools were shut down . The storm sent a plume of moisture that spread into Saudi Arabia , reaching 74 mm ( 2 @. @ 9 in ) in Najran , and was drawn northward into Iraq by a trough over Syria , triggering dust storms .

A representative of UNICEF estimated that the magnitude of the flooding was the worst in 600 years , attributing the scope to climate change . The areas effected ? primarily Hadhramaut and Al Mahrah governorates ? are usually dry and unsuited for such flooding . This resulted in the second worst natural disaster on record in Yemen , following deadly floods in 1996 . Overall , the floods killed around 180 people in Yemen , with many corpses carried away by the deluge . Illegal alterations in canal and drainage systems caused the floods to impact many houses and buildings , and the governor of Hadhramaut credited the invasive *Prosopis juliflora* weed as exasperating floods after blocking waterways . Throughout the country , the floods destroyed 2 @, @ 826 houses and damaged another 3 @, @ 679 , leaving about 25 @, @ 000 people homeless ; many of these houses were made of mud , washed away by the floodwaters . The displaced utilized temporary shelters in mosques and schools , or stayed with family and friends . Damage to housing , hospitals , and education was estimated at \$ 200 million . The UNESCO World Heritage Site at Shibam ? dating back to the 3rd century and housing tall mud buildings from the 17th century ? was surrounded by floodwaters , causing some of the dwellings to collapse . Businesses and other infrastructure projects were also destroyed .

Infrastructure damage was estimated at \$ 113 million ( 2008 USD ) , most of which related to damaged roads , after thoroughfares were washed away . At the Sayun Airport , floods damaged runways and other facilities . 359 dams were damaged , alongside 65 reservoirs . Widespread irrigation systems were also damaged , including 117 @, @ 875 m ( 386 @, @ 729 ft ) of pipelines , 1 @, @ 241 wells , and 1 @, @ 229 water pumps . Electricity and telephone lines were disrupted in the region . The floods damaged 170 schools , as well as many health facilities . Along the coast , the storm damaged many fishing boats and equipment . In Al Mahrah Governorate , the storm washed a cargo ship ashore , although the 17 person crew was rescued .

Agriculture impacts were significant , estimated at \$ 550 million , which affected 75 % of the farmers in Hadhramaut . Soil erosion from the floods damaged 22 @, @ 902 acres ( 9 @, @ 268 ha ) of farmlands , as well as 51 @, @ 455 acres ( 20 @, @ 823 ha ) of uncultivated lands . This mostly affected cereals , vegetables , and forage crops . Floods killed about 58 @, @ 500 livestock and wrecked 309 @, @ 103 beehives . The storm also knocked down 547 @, @ 185 palm trees , 16 @, @ 587 citrus trees , and another 161 @, @ 449 fruit trees . Despite the heavy agriculture damage , the floods did not disrupt the national food supply .

The effects of the flooding disrupted the livelihoods of about 700 @, @ 000 residents ; most of the storm 's damage affected people 's jobs , including farming , industry , and commerce , totaling \$ 557 @. @ 3 million in damages . About 76 % of the overall effects of the flooding were the result of disruption of people 's jobs . Overall damage was estimated at \$ 874 @. @ 8 million , although residual losses from damaged infrastructure were estimated to cost an additional \$ 726 @. @ 9 million . The overall economic impact of the storm was therefore estimated at \$ 1 @. @ 638 billion , equating to roughly 6 % of the country 's gross domestic product . Damage was heaviest in Hadhramaut Governorate , accounting for 67 @. @ 5 % of the material damages , and occurred

mostly along the coast ; 16 of the 19 districts in the governorate reported damage . Also in Hadramaut , there were 57 people injured due to the storm . The government sent search and rescue teams into the flooded areas to help stranded residents , although strong winds in the region disrupted these efforts in the immediate aftermath . In Seiyun , six soldiers died while attempting to rescue trapped residents . Lightning strikes killed six people .

= = Aftermath = =

On October 27 , the Yemen government requested assistance from the international community , unable to provide disaster assessments or cope with the rebuilding . The storm affected areas of Yemen that already had poor infrastructure and lack of food , and were generally under a state of political unrest , which made recovery difficult . In some areas , relief distribution was duplicated due to lack of coordination while some areas did not receive help . Yemen 's Deputy Prime Minister for Internal Affairs coordinated the relief efforts , in conjunction with the governors of the most affected areas . The government focused on streamlining disaster activities and toward future mitigation . However , there was no coordinated disaster plan as of September 2009 , and the scale of the disaster proved too great for ministries to handle . The Ministry of Public Works helped reopen roads , which allowed for the transport of relief goods , and the damaged Sayun Airport was repaired to withstand future floods . By December 2008 , most roads , power systems , hospitals , and communication services were restored . The government also enacted the Fund for Hadramout and Al @-@ Mahara Reconstruction , which failed to promptly distribute aid assistance .

In addition to requesting international aid , the Yemen government declared Hadhramaut and Al Mahrah governorates as disaster areas , after then @-@ president Ali Abdullah Saleh surveyed the affected areas . The president also utilized the nation 's military to assist storm victims , and sent aircraft with tents , food , and medicine to the worst hit areas . To raise money for the disaster recovery , the Yemeni government cut one day of salary for all workers , equating to \$ 4 @.@ 25 million , and the government provided another \$ 100 million from its annual budget . Local charities and residents collectively raised \$ 8 @.@ 5 million . Yemen 's Red Cross provided meals and water to about 21 @,@ 000 people . The agency also provided school kits for 4 @,@ 500 students whose facilities were damaged . Ultimately , the Red Cross assisted over 70 @,@ 000 storm victims through health programs , and also helped residents cope with stress , hygiene promotion , and other ongoing vulnerabilities to their livelihoods .

Various agencies under the United Nations assisted in the recovery ; the World Health Organization provided medical kits to the worst hit areas , capable of helping 10 @,@ 000 residents each for three months . The United Nations Development Programme helped house displaced storm victims , and many of the mud @-@ built houses were repaired with the same construction materials as before . The World Bank led the assessment efforts , estimating the cost of recovery at \$ 1 @.@ 046 billion , mostly toward rebuilding houses , regrowing crops , and restoring social services . The World Bank also provided \$ 41 million toward the Yemen Flood Protection and Emergency Reconstruction , which rebuilt vital infrastructure and ensured they were flood @-@ proof . The World Food Programme assisted 43 @,@ 000 people with food and other emergency supplies . The Organisation of the Islamic Conference declared the situation a " national catastrophe " and started a drive to collect funds for the relief of flood victims . At an international donor conference , various individuals and countries pledged \$ 301 million to help with the reconstruction in the country . Arab nations in the region also donated cash and supplies to Yemen ; Saudi Arabia pledged \$ 100 million in assistance . The United Arab Emirates Red Crescent assisted in the reconstruction work , sending \$ 27 @.@ 3 million to rebuild 1 @,@ 000 houses ; 750 of these were completed by December 2009 . The Arab Fund sent \$ 135 million , including \$ 35 million for road reconstruction . The Japanese government provided funding toward building shelter for 700 displaced Al @-@ Akhdam people , designed to be away from the flood plain . Access to clean drinking water and proper shelter for the displaced helped mitigate the spread of disease . For many families , the effects of the disaster lasted several years due to insufficient assistance or disrupted jobs . By 2010 , about 40 % of the overall recovery cost was met by international donations , although funding was

halted after political uprising in 2011 .

Over the long term , residents lost significant amounts of income in the storm @-@ affected areas , particularly farms in the year after the storm . Higher food prices also resulted in less income for other residents . The area 's economy largely recovered to pre @-@ flood levels by 2010 .