Abstract

Environmental Policy Towards Climate Changes And Tropical Storm Disasters in Yemen

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Yemen exposed to ongoing environmental disasters lately especially an in the coastal areas of the Gulf of Aden and Arabian Sea including Socotra Island which are more vulnerable and subjected to sever causalities. In Aug. 2015, two tropical cyclones hit Yemen within one week. It was described as an extraordinary happening in contemporary records. Similarly, in May 2018, SAGAR and MEKUNU cyclones hit back-to-back the same areas described as extremely severe storms. The unusual natural happenings bring attention of climatologist and geographers who linked unpredictability sever tropical storms in Yemen to the world's climate changes.

The aim here is to study and analyses the Yemeni institutions related to environmental issues and to reveal how the government response towards natural disasters, mainly the Tropical Storms happened lately. Yemen was the first country in Arabia who recognized the Metrology establishment seven decades ago, but recently is behind and secluded from world's climatology development.

Remote sensing, satellite imagery, semi-interview used including climatology data of TSR, OCHA, Relief and web networks. The study showed that the Yemen Government responded toward natural disasters for tropical storm events was catastrophic, although early warning of natural disaster technology is highly developed lately. Furthermore, Yemen does not have appropriately developed disaster management plan nor has a vision yet. Suggesting that founding co-ordination among government, NGOs and international originations is vital to help the country cope with such casualties, and tackling the failure of environmental management that Yemen Government in chaos for long time.

Introduction

Recently, Yemen subjected to constant environmental disasters lately especially in the Southern Coast of Gulf of Aden and Arabian Sea areas, which are more vulnerable and lay opened to sever causalities than others. However, climate change researchers indicated that these severe and unpredictable storms are linked generally speaking to climate change due to human induced. In order to understand these sever events, the paper will analyze the response and structure of Yemeni environmental institutions and agencies related who should share responsibility where fragmentation and a lack of coordination among government departments and global institutions are obvious.

Climate change and recent severe cyclonic storms over Yemen

Recently the Arabian Sea has experienced unprecedented storms, and a new study reveals that climate change has made such events more likely to strike. In 2011, James Kossin at the National Oceanic and Atmospheric Administration linked the tropical cyclone behavior to human activities. However, the Arabian Sea cyclones are rare there, yet in 2015, two cyclones hit back-to-back for the first time. Chapala and Megh both made landfall in Yemen as exceptionally severe cyclonic storms (Woodward, A 2015).

These storms are the strongest Yemen has seen, according to the India Meteorological Department and Journal of Climate study who measured the chronological record there. Yemen who usually perceives received only one or two storms a year observed exceptional high-end hurricane known as strongest on record in the Arabia (Time 2015) "As Chapala and Megh, not as many reach the intensities of those in more active basins, like the Pacific, even though the area has very warm waters, usually favorable to storm development"

Climate change scientists indicated that these unpredictable storms link to climate change due to human impacts such as Air pollution. They explained the unusual storm as a result of incredibly warm waters and a lack of strong winds (Time 2015). This is because dry air from the Arabian Peninsula and monsoon winds tends to make the region unfriendly to storm formation and intensification. This allowed tropical storms to take advantage of the very warm ocean waters of the region and send its convection into overdrive according to the Weather Channel.

Murakami and his colleague's studies found that, in 2015, 64 per cent of the increased hurricane risk in the Arabian Sea was down to climate change. They used complicated climate model to compare conditions in 2015 to conditions in 1860, when humanity's carbon footprint was much smaller. Furthermore, Murakami, H, et al 2017 used a suite of numerical climate model experiments due to a lack of observational record to address the plausibility and causes of the recent increase in post-monsoon cyclones in Arabia.

Later, on May 23-26, 2018, two cyclones with stronger winds hit Yemen. It looks that the country has potentially devastating cyclones. Murakami 2017 and Knutson 2010, instituted that climate change might be linked to anthropogenic warming and natural variability, or stochastic behavior. Murakami and his team at Princeton University in New Jersey employed a sophisticated climate model to compare conditions in 2015 to 1860, when humanity's carbon footprint was much smaller. They found an increase of hurricane risk in the Arabian Sea was linked to climate change.

In turn, Thompson, A (2017) argued that "it would be impossible to attribute one particular storm to such slowly varying climate processes," Evan, who has contributed to that research, said. This is because dry air from the Arabian Peninsula and monsoon winds tend to make the region unfriendly to storm formation and intensification

2018 Tropical Storms

MEKUNU

MEKUNU tropical storm smashed Socotra Island in May 23-26 2018 which swept through Yemen's southern coast of Hadramaut and Almahrah Governorates in the Gulf of Aden and Arabian Sea. 40 people were reported missing, 7 ships and boats capsized and cars were washed away by flood. (CHA 2018 and Weather.com 2018) Nearly I million households have been displaced with many sheltering with relatives including substantial damage to public infrastructure (Figure2). The impact is clearly inequitable where the precise cost of the disaster in loss of lives is accompanied by privations, losses of shelters, and dislocates socio-economic activities etc. (Figure2b).



Figure1a**:** Socotra after Mekunu Y I Ministry



Figure1b: Tracking Mekunu Tropical Storm

A barely week after SAGAR tropical storm which formed in the Gulf of Aden hit the Southern Coast of Yemen particularly in Socotra Island but, the impact was great in Somalia (Figure2a;b).



Figure2a'b: SAGAR tropical Storm, NASA 2018

2016 floods

Within 48 hours of 13 -14 of April 2016, flash floods and rockslides have caused devastation across the country killing at least 30 and more people missing. 14 people were killed in Hajjah due to rockslides and 15 people in Tehama Region along the Red Sea, especially in Rimah and Al-Zuhrah areas More than 4,000 families were affected in seven governorates only. The floods also have caused severe damage to vital infrastructure, property, livestock and crops. (ifrc and Relief 20016)

2015 Tropical Storms

CHAPALA

In 2015, two tropical cyclones have hit Yemen within one week. It was described as an extraordinary happening in contemporary records. Incredibly, history seems intended to repeat itself just one week later, as a second tropical cyclone shocked Yemen coastal areas of Gulf Aden and Arabian Sea (Washingtonpost 2015).

Chapala Cyclone was the second strongest tropical cyclone on record history in the Arabian Sea, according to the American-based Joint Typhoon Warning Center (JTWC). Occurred on October 28 Oct. – 4Nov.2015, with highest: 3-minute sustained: 215 km/h; 1-minute sustained: 240 km/h (Figure3). Estimated number of people may be affected were 1.1 million mainly in the two coastal governorates of Shabwah and Hadramaut where more than 40,000 people displaced or temporarily evacuated and at least 450 homes damaged with a number of 38 deaths and 34 injuries.

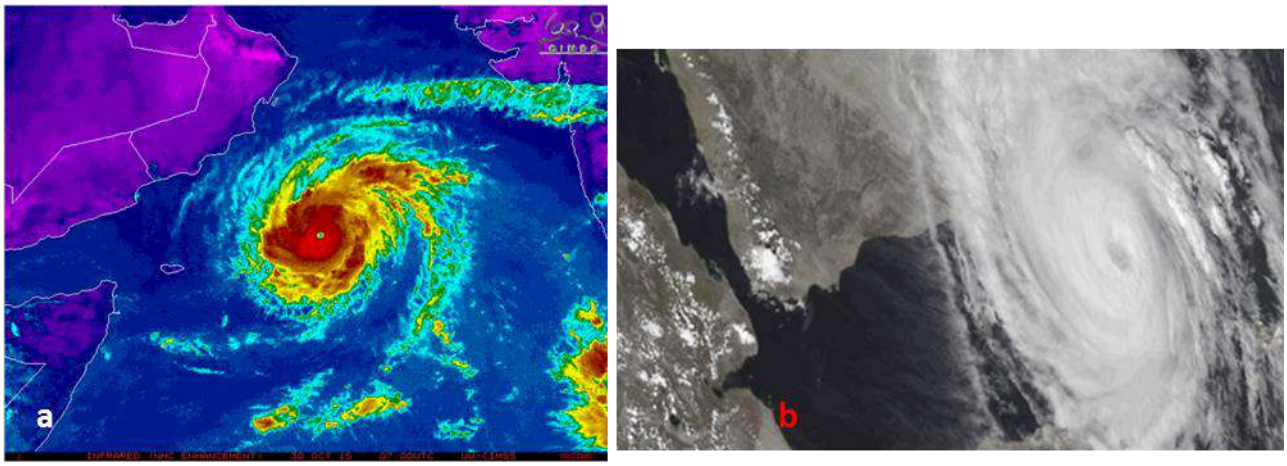
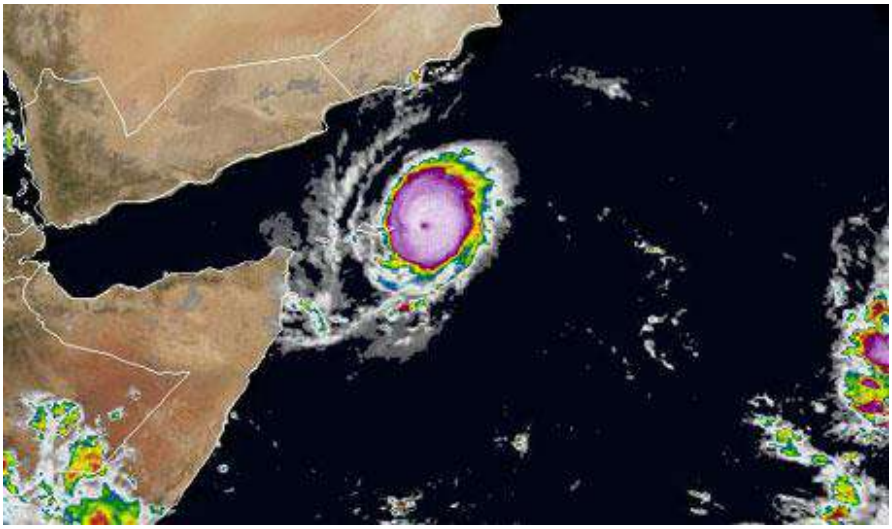


Figure3: Cyclone Chapala spins over the Arabian Sea in Yemen, UW CIMSS 2015

MEGH

Tremendously strong Tropical Storm records as the worst tropical *cyclone* ever strike Yemen particularly in Socotra Island. Formed on November 5, 2015, in the eastern Arabian Sea, and followed a path similar to Chapala including highest winds: 3-minute sustained: 175 km/h (110 mph); 1-minute sustained: 205 km/h (Figure4). The impact of Cyclone Megh on Socotra Island has been severe and it was more severe than Cyclone Chapala.

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Figure4: Cyclone Megh over the Arabian Yemen, NASA 2015

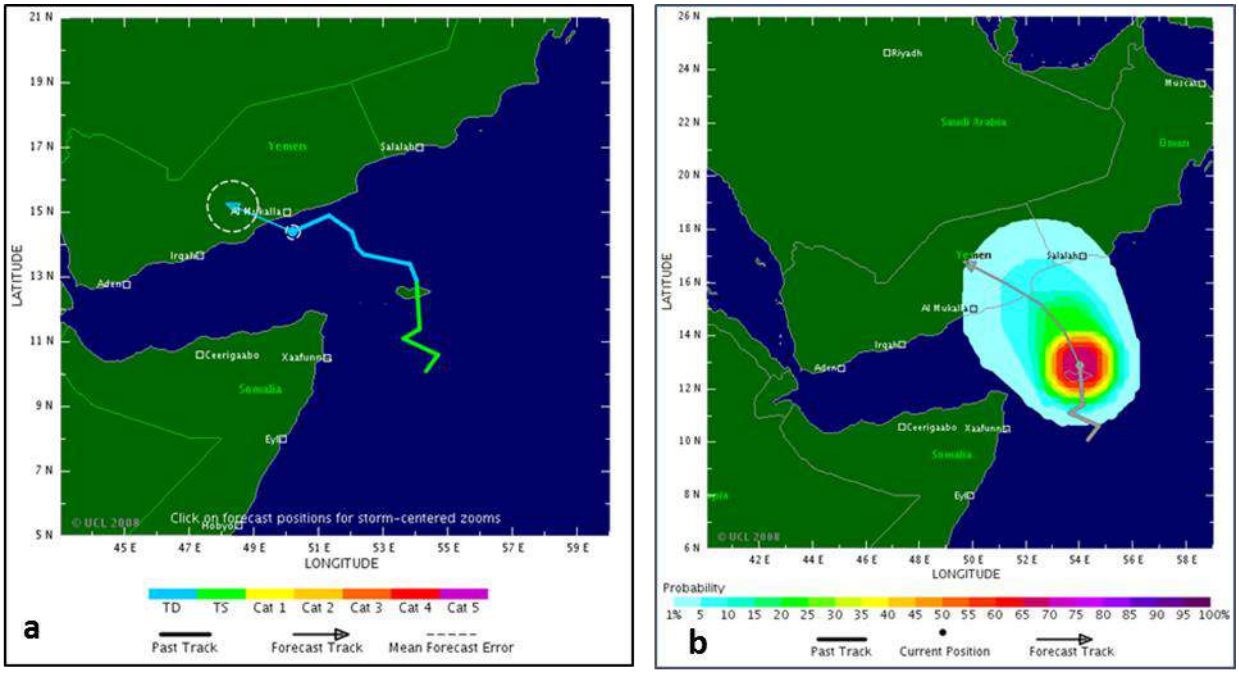
According to OCHA 2015, the total death reached 14 and over 800 houses have affected. Nearly 3,000 families displaced. In addition to infrastructure in which had been heavily impacted such as roads, communication towers, water pipelines and moderate houses, with extensive damage to fisheries and farming equipment, thousands of palm trees uprooted and a significant loss of livestock.

August 2013 tropical storm

The storms and heavy rainfall began on 14 Aug 2013 and intensified for about one week, damaging homes, roads and swamping agricultural lands. According to Fox-News 2013, flash floods including lighting have killed 50 people in 2 days. In Hajjah governorate on the border with Saudi Arabia, for example, more than 8,000 camp residents have been displaced by the flash floods causing widespread damage to the people and camp infrastructure (the Guardian 2013)

Oct. 2008 tropical storm

October 2008, a major tropical storm produced one of the worst adverse natural events ever to Yemen Southern coastal areas, mainly Hadramout and Al Mahra (Figure5). According to JTWC 2008, the effects were estimated at US$1.6 billion, equivalent to 6% of Yemen's GDP; in addition to substantial cost of life, and damage to livelihood, property and infrastructure.



Figures5: Cyclone Megh over the Arabian Yemen, NASA 2015

Environmental policy for environmental disasters

Yemen environmental institutions

Disaster Management means organizing the resources and responsibilities for dealing with all humanitarian aspects of emergencies to be prepared through with risk reduction procedures can avoid or reduce calamity events for saving maximum lives and resources. Therefore, Yemen recognized the institution related to climatology and natural disasters in 1945 when South Yemen was a part of British Empire. The purpose here is to analysis the role of the Yemeni institutions towards natural catastrophes mainly the tropical storm disasters. These for example, are The Yemen Meteorology & Aviation Authority, Ministry of Environment and Environment Protection Council. Below is an overview of the main institutions concerning environmental issues in Yemen:

a) The Yemen Meteorology and Aviation

YMA main task is safety and regulatory bodies for national airport authorities and Air Navigation Services and signing agreements with international Air companies to promote trade exchange, passenger traffic and economic relations. The second task or priority is to follow up the events of the weather disasters and associated climatology data besides to send them to the organizations in responsibility as well as to warn the population of possible disasters may occur.

b) Ministry of Environment

The Ministry of Water and Environment is one of the ministries of the Yemeni government. It was established by Presidential Decree No. 105 of 2003. The functions and responsibilities of the Ministry of Water and Environment It include 31 tasks but the main job is the water scarcity. However, none of these tasks is linked to natural disasters management. The challenge of providing clean drinking water to the urban and rural population, wastewater treatment, water resources management and planning considered as the most difficult problems of development in Yemen. The Ministry has no Departments or any sections to deal with environmental disasters, mainly tropical storms, even it has 100s of workforces.

c) Environment Protection Council

Environment Protection Council is an inter-ministerial council with broad responsibilities to manage the Yemen environmental issues. It was established in 1990 immodestly after Yemen unification, by Decree of the Prime Minister 94/1990. The EPC replaced by the former PDRY 1984 and the YAR 1987. Similarly, the role of EPC towards natural disasters such as tropical storms events is absent and has nothing to offer.

The dilemma of early warning towards tropical storms

The study showed that the Yemen Government responded toward natural disasters events was poor and communicating with International weather forecasting and Typhoon Warning Center linkages was not existed. For example, the reaction to Tropical Storm in August 2008 was catastrophic and the Yemen Government had not an ability to commentate with such networks. Although, the YMA was advised and warned by the author and university scholars 4 days early before the storm happening. The data sent by Tropical Storm Risk (TSR) included probability of hazard, magnitude, frequency, contains real-time data of unrivalled accuracy figure 5.

Suggestion and Conclusion

Yemen Lately has experienced unprecedented storms, and recent studies reveal that climate change has made such events more likely to strike. The impact is clearly inequitable. Thus, the new disaster is a wakeup call for national, regional, and international agencies involved in climate change and tropical storms disasters to coordinate efforts and develop recommendations for local and universal cooperation among agencies and departments related including local authority, universities, NGOS, and the communications media.

Additionally, the study showed a growing vulnerability to disasters. For example, in Yemen there is as yet no proper action plan for environmental policy towards natural and man-made disaster management for long. Moreover, there has been a lack of coordination among regional and international organizations therefore, it is essential to propose general policies for managing climate change and environmental disasters

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