

# OPEN TEXT - BASED ASSESSMENT ANNUAL EXAMINATION 2014-15



## GEOGRAPHY (029) Class-XI

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**CENTRAL BOARD OF  
SECONDARY EDUCATION**

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## OPEN TEXT MATERIAL

### 1. Theme – *Good News from Antarctica: The Hole in the Ozone layer is Shrinking!*

#### Abstract

*Ozone, Earth's blanket which protects it from the ultra violet rays of the Sun is found in Stratosphere, the second layer of the atmosphere. Ultra violet rays of the Sun are capable of causing cancer and other medical problems. This makes ozone layer very significant for our survival. Human actions have depleted this layer to an extent that a hole had developed over Antarctica. This initiated the healing process at the global level which lately has helped in shrinking the hole. So isn't this shrinking of hole a good news!*

Ever since the early 1980s, though, a hole in this layer has developed over Antarctica during September to November, decreasing ozone concentration by as much as 70 percent. The cause is human-produced chlorofluorocarbons (CFCs), which were once heavily used in aerosols and refrigeration.

By international agreement, CFCs have been phased out of use. The policy has real effects, new satellite observations reveal. In 2012, the hole in the ozone layer over Antarctica was smaller than it has ever been in the last 10 years.

The new observations, announced by the European Space Agency (ESA) on Feb. 8, come from Europe's Met Op weather satellite, which has an instrument specifically designed to sense ozone concentrations. The findings suggest that the phase-out of CFCs is working, the ESA reports.

Antarctica is particularly vulnerable to ozone-depleting substances, because high winds cause a vortex of cold air to circulate over the continent. In the resulting frigid temperatures, CFCs are especially effective at depleting ozone. The result is that people in the Southern Hemisphere are at increased risk of exposure from UV radiation.

CFCs persist in the atmosphere for a long time, so it may take until the middle of the century for ozone concentrations to rebound to 1960s levels, the ESA reports. However, the hole in the ozone over Antarctica should completely close in the next few decades.

Stephanie Pappas, Live Science Senior Writer | February 12, 2013 12:05pm ET

Source: <http://www.livescience.com/27049-ozone-hole-shrinks-record-low>

Chlorofluorocarbons (CFCs), hydro chlorofluorocarbons and halons are recognized as ozone-depleting substances (ODS) because they breakdown in the stratosphere and release chlorine or bromine, which destroy the stratospheric ozone layer. The most damaging ODS are found in common industrial and consumer products such as coolants, refrigerants, aerosol cans, polystyrene cups, fire extinguishers, and packing peanuts. There is no vertical convection in the stratosphere as a result of which ODS can stay there for a long time. This can further be more harmful for the stratosphere.



In absence of ozone, exposure to higher doses of ultra violet (UV) rays can have adverse effects not only on human health but also on the terrestrial as well as aquatic flora and fauna. In humans, it can lead to sun burns, pre mature aging of skin and several parts of the eye including lens, retina and cornea could be damaged. Cataract cases may register a significant increase. Several of the world major crop species are vulnerable to UV radiations too. Many agricultural crops sensitive to the UV radiation of the Sun are rice, wheat, soybean, corn, sweet corn, barley, oats, cowpeas, peas, carrots, cauliflower, tomato, cucumber, broccoli etc. Planktons that form the first step of aquatic food chain are threatened by UV radiations. Adverse impact of UV radiations is seen in many marine animals found in the Antarctic region. It is not only the living beings but Wood, plastic, rubber, fabrics and many construction materials are also degraded by UV radiation.



Figure 2: An Ozone depleting substance getting released from a can  
Source: science.howstuffworks.com

Dr. Visit by cta

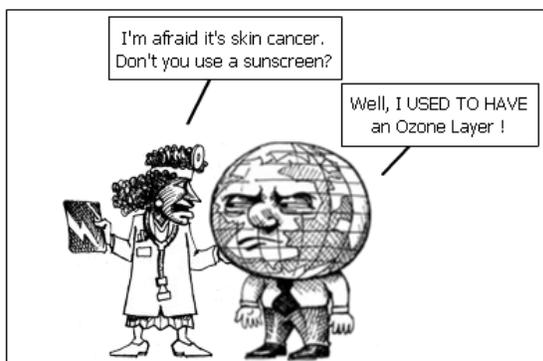


Figure 3: Ozone, the saviour  
Source: funnytimes.com

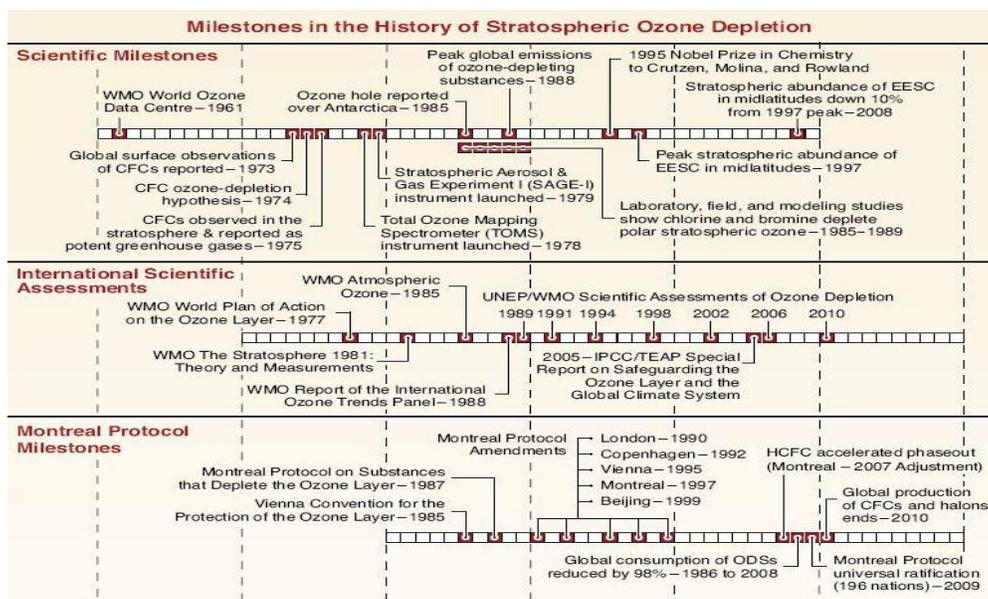


Figure 5: History of assessment of ozone depletion and the international efforts for its conservation. Source: theozonhole.com



First international effort to save ozone layer was the Montreal Protocol, an agreement to reduce worldwide CFC production signed by 184 countries including USA. Serious concerns were raised for the depletion of ozone. In 1990 an amendment to the Montreal protocol was adopted according to which developed countries were to phase out all the chemicals destroying Ozone layer by 2000 and developing countries to phase out the chemicals by 2010. On December 19, 1994, the UN General Assembly proclaimed September 16 to be the International Day for the Preservation of the Ozone Layer. This is the same day when Montreal protocol was signed in 1987. This phasing out of the ODS has helped a lot in the healing of the Ozone layer. It shall help in the keeping the health hazards posed by depletion of Ozone at bay and shall promote the use of ozone friendly technology.

The developed and the developing countries of the world came together and drew out their own plans to phase out the ozone depleting substances. India acceded to the Montreal Protocol on 17 September 1992. India's per capita consumption of ozone-depleting substances at present is less than 3 g and did not cross 20 g in 1995-97, compared with 300 g permitted under the Protocol. Various awareness generation programmes have been initiated to phase out the use of CFCs and save ozone layer from depletion. Between 2001 and 2004 various awareness campaigns regarding promotion of the ozone friendly substances amongst the users were initiated at state level. Participants in the International Ozone Day held in Delhi in 2006 pledged to protect the environment. Ozone friendly equipments were exhibited. Newsletters containing information relating to latest technological development relating to ozone protection were distributed. Various workshops are regularly conducted in all the states to make the state authorities aware of the ozone related matters. Periodic dialogues and meetings are held with state authorities for the implementation of projects focusing on phasing out of ODS consuming industries in a planned manner. Various government organisations conducted different workshops and seminars to interact with the industry and update them on the latest developments in the ozone friendly technology. All these activities are directly supervised by various government and other agencies that make sure that ODS are phased out as per the plan. Efforts by some countries are listed below.

**The Rwanda Environment Management Authority (REMA) has cautioned business people against importing items that contain harmful gases (hydro-chlorofluorocarbons (CFCs) which deplete the ozone layer and cause global warming**

Refrigeration and air conditioning appliances are among of the major sources of CFCs.

Rose Mukankomeze, the REMA director general, said activities which depend on the use of ozone depleting substances, especially for refrigeration, air conditioning and in the manufacture of mattresses, should look for alternatives to safeguard the ozone layer.





“We need to prevent excessive exposure of the earth to ultra-violet rays because they have effects on human lives. For example, they cause cancer, eye cataracts and weaken people’s immune systems,” she added.

Mukankomeze was speaking during a sensitisation workshop of importers of ozone depleting substances and equipment in Kigali recently.

Source: [in2eastafrika.net/rwanda-importers](http://in2eastafrika.net/rwanda-importers)

### Remembering Our Future: Bangladesh marks the successful phase out of CFCs in asthma medicines and adoption of ozone-friendly inhalers

**Dhaka, 15 March 2012** - “Once upon a time, there was a system in this plant on this site that used a gas called Chlorofluorocarbons (CFCs) to manufacture Metered Dose Inhalers (MDI). For the benefit of future generations, this production facility stopped using CFCs.”



These are the first lines in the *Plaque for the Successful Phase out of CFCs in the Manufacture of MDIs* in Bangladesh that was unveiled today in the symbolic ceremony that permanently closed down the CFC-based MDI manufacture of Beximco Pharmaceuticals Limited, the largest manufacturer of pressurized metered-dose inhalers (pMDIs) in the country.

Source: [unep.org/ozonaction/News/Features/2012](http://unep.org/ozonaction/News/Features/2012)

Chlorofluorocarbons (CFCs) were invented in the United States over 60 years ago. Soon CFCs found their widespread use the world over in refrigeration, air conditioning and in various other industries. In due course of time it was realised that CFCs are damaging the environment. This made US which was then the largest emitter of ODS scale down the use and production of these substances.

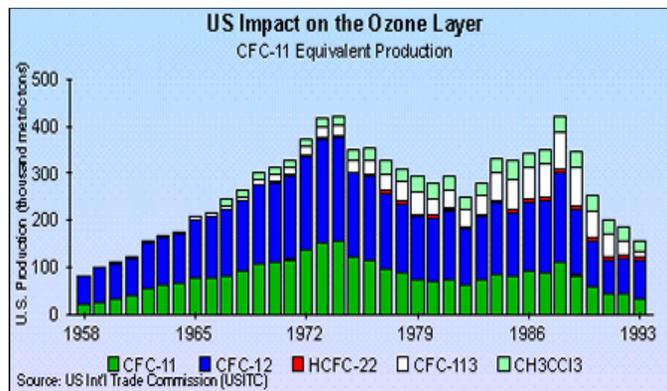


Fig 6: Temporal analysis of the production of ozone depletion substances by the USA (1958- 1993)

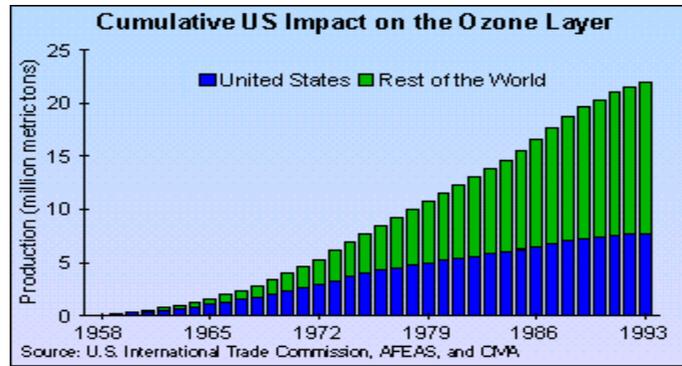


Fig 7: Comparative analysis of impact on ozone layer by the USA and the rest of the world (1958-1993)

Source: <http://www.epa.gov/ozone/science/indicat/>

### Australia's performance in phasing out ozone depleting substances

Various steps are taken by Australia to check the production and consumption of ODS. As per the Montreal Protocol it has met all its obligations to phase out ODS. It is expected that Australia will phase out the consumption of HCFC by 2016, much before the limit set by the Montreal protocol. This would drastically reduce the emission of these harmful substances into the atmosphere and shall go a long way in healing ozone. Credit for this goes to the Australian experts whose efforts have helped in early phasing out of the HCFCs. Fig 8 shows and compares the Australia's and the limits set by the Montreal protocol's controlled Ozone substances import. Throughout we find that the Australia's imports have been much lower than the limit set under the protocol and there has been a gradual reduction in imports over the years which indicates an overall phasing out of ODS.

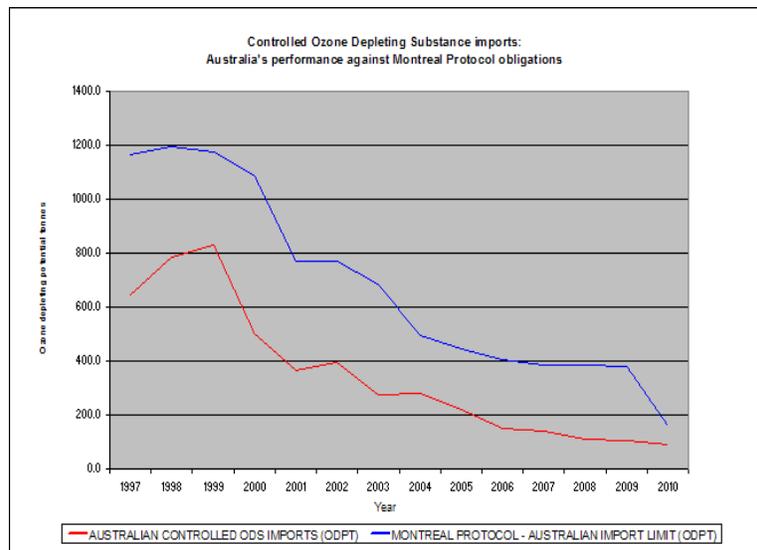


Fig 8: A comparative temporal analysis of the limits set by the Montreal protocol and the Australian controlled Ozone depletion substances imports (1997-2010).

Source: [environment.gov.au/atmosphere/ozone/](http://environment.gov.au/atmosphere/ozone/)



India has completely phased-out production and consumption of CFCs with effect from 1<sup>st</sup> August, 2008. It would now be used only for some medicinal purposes. India attributes its success in progressively phasing out the use of ODS to identifying the priority sub sector, involving key stakeholders in planning and implementation of phase out process, notifying appropriate regulations and policies to the stakeholders and building local capacity for training besides spreading awareness amongst the general public.

An assessment of the impact of the various measures undertaken as per the Montreal protocol was made in which the experts found that the ozone layer had about 10% recovered. It was mainly attributed to cuts in global emissions of CFCs and other ODS. Global efforts made under the protocol were cited as the main reason behind the achievement. Although the stratospheric ozone layer has not yet healed, the thinning has slowed and if developed and developing countries continue to meet their Montreal Protocol goals, scientists anticipate recovery between 2060 and 2075. It is estimated that efforts to protect the stratospheric ozone layer will produce approximately \$4.2 trillion in societal health benefits in the U.S. during 1990 to 2065 and prevent 6.3 million premature deaths from skin cancer.

Under the Montreal Protocol, the developed nations after 1996 could manufacture CFCs only to help the less developed countries meet their basic domestic requirements or for their own limited uses for pharmaceutical and other research purposes. Fig 9 shows the production of fluorocarbons from 1980 to 2007. It clearly shows how global initiative after the Montreal Protocol has helped in bringing down the production of fluorocarbons. The graph shows that increasing production of the fluorocarbons during 1980s came sliding down after 1988 only after the implementation of the recommendations of the Montreal protocol.

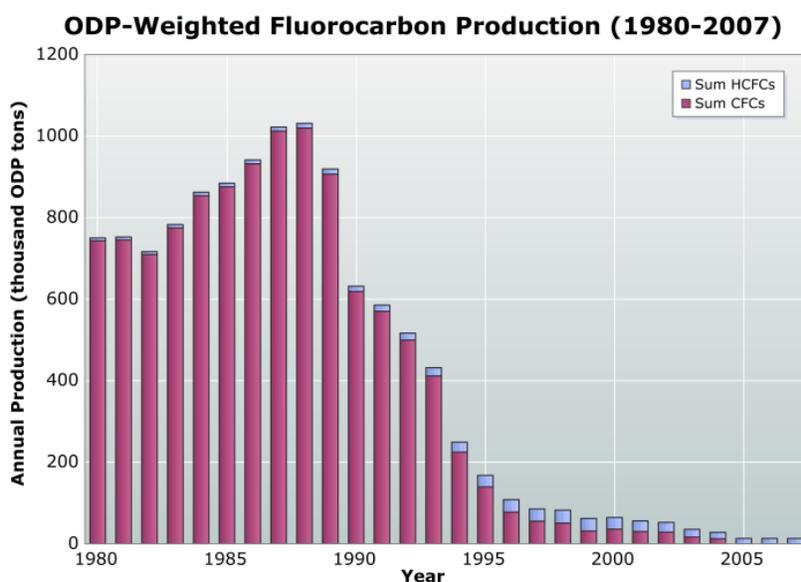


Fig 9: Reduction in the production of ODP substances by the developed world (1980- 2010).

Source: <http://www.afeas.org/overview.php>



1. Calculated from production reported to AFEAS (Alternative Fluorocarbons Environmental Acceptability) with ozone depletion potential (ODP) values from "Production and Consumption of Ozone Depleting Substances 1986-1998," UNEP, October 1999. The ODP of HFCs is zero because they do not contain chlorine. Therefore, they do not appear in the above figure.
2. CFC production was not reported to AFEAS in 2005, 2006 and 2007.

There are different ways in which every individual can contribute towards healing of the ozone layer. We can be ozone friendly consumer that is we make sure that the products we buy are CFCs and ODS free. Make sure that it is clearly mentioned on the products specially refrigerator, air conditioners, aerosol spray cans and fire extinguishers that they are 'ozone friendly'. We should dispose of all old appliances like refrigerators, fire extinguishers that contain ODS. Farmers should switch over to ozone friendly pesticides. Refrigeration servicing technicians should ensure that all the leakages are fixed in time and the refrigerants that are recovered are not cracked or leaking. Various refrigerant recovery and recycling programmes should be started. In offices attempts should be made to replace all the ODS using substances with their appropriate ozone friendly alternatives. As a student you should start awareness generation programme by making posters, organising debates, writing blog and should educate your family, friends and neighbours about the use of ozone friendly substances. There are various Non -Government organisations which can help you start the awareness campaign in your area. Save Ozone, save life on Earth.

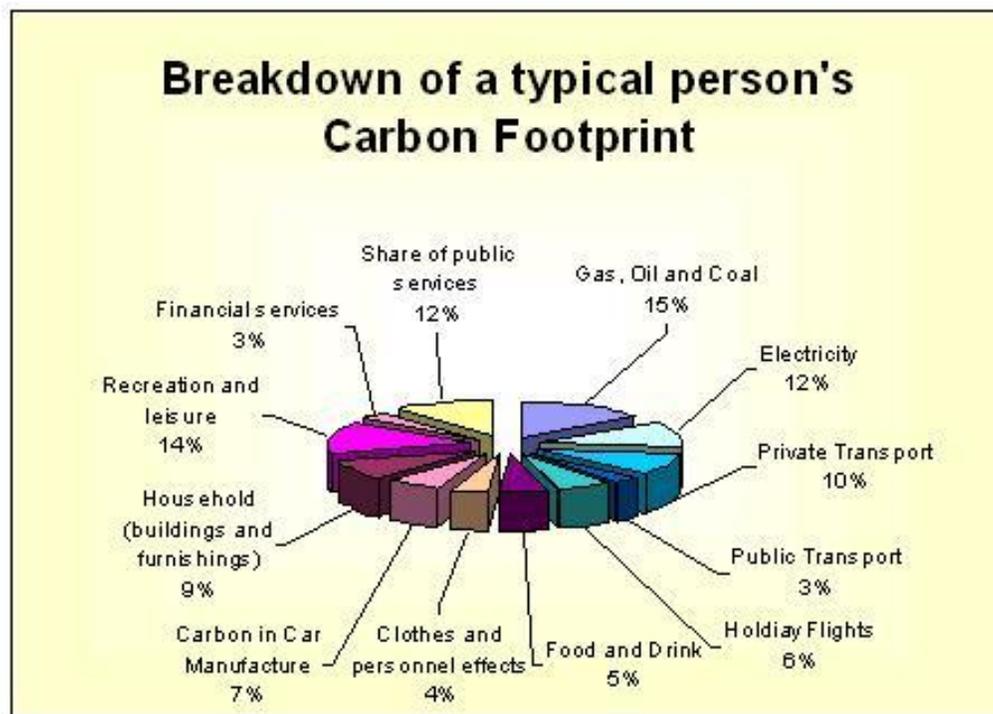


Fig 10: Breakdown of a person's carbon footprint.

Source: [www.eoearth.org](http://www.eoearth.org)



Besides ODS, various greenhouse gases have harmful impact on the environment. Like Montreal Protocol that is an agreement to reduce CFC production, the Kyoto Protocol is a legally binding agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990. The goal is to lower overall emissions from six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, HFCs, and PFCs - calculated as an average over the five-year period of 2008-12. Every individual's action has a direct impact on the environment in terms of greenhouse gases emission which is in general referred to as carbon footprints. Various steps are taken globally to check the greenhouse gases emissions. Credits are awarded to countries or groups that have reduced their greenhouse gases below their emission quota. Each one of us must make an attempt to protect environment. Fig 10 helps us understand how we leave behind our carbon footprints. A little change in the lifestyle and appropriate selection of technology can help us improve the environment. Be aware, understand and help in improving the environment. We have enjoyed enough rights; now let's shoulder a few responsibilities to better our own living conditions.

### Web References

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- [http://www.ozonecell.com/uploads/files/Book\\_Success\\_Story\\_20110919.pdf](http://www.ozonecell.com/uploads/files/Book_Success_Story_20110919.pdf)
- <http://www.afeas.org/overview.php>





## OPEN TEXT MATERIAL

### 2. Theme – Tropical Super Cyclone - Phailin, Disaster Preparedness and Response

#### Abstract

*Phailin, a Very Severe Cyclonic Storm struck eastern coast of India in October, 2013, inundating large part of Odisha coast. Despite its severe intensity the loss of human life was very less in comparison to 1999 Severe Cyclonic Storm. Such kind of result has been achieved due to high level of disaster preparedness, efficient disaster management and improved forecasting capabilities. The humongous task of rehabilitation is still due but the efforts and coordination shown by various government and non-government agencies during Phailin have set a precedent to be followed.*

#### Introduction

India's eastern coast has a long history of devastating cyclones. According to Jeff Masters, a follower of hurricanes and meteorologists, 26 out of 35 deadliest cyclones in world history have been Bay of Bengal storms. Question comes to our mind. Why Bay of Bengal is more prone to cyclones over Arabian Sea? Indian Meteorological Department says, cyclones that form over Bay of Bengal are

either those that form over southeast Bay of Bengal and adjoining Andaman Sea or remnants of typhoons over Northwest Pacific and move across South China Sea to Indian Seas. As the frequency of typhoons over Northwest Pacific is quite high (about 35 % of the global average), the Bay of Bengal also gets its increased quota.<sup>1</sup>

The cyclone over Arabian Sea either originates insitu over Southeast Arabian Sea or remnants of Bay of Bengal that moves across south peninsula. As the majority of cyclones over Bay of Bengal weaken over land after landfall, the frequency into Arabian Sea is low. The average annual frequency of tropical cyclones in the North

Indian Ocean (Bay of Bengal) is about 5-6 % of the global average and about 80 cyclones from around the globe a year. The frequency is more in Bay of Bengal than the Arabia Sea, the ratio being

TOP TEN DEADLIEST BAY OF BENGAL CYCLONES		
DEATHS	LOCATION	DATE
300-500,000	Bangladesh (Great Boha)	Nov. 12-13, 1970
300,000	Hooghly River, India	Oct. 7, 1737
300,000	Coringa, India	Nov. 25, 1839
200,000	South of Calcutta, India	Oct. 31, 1876
200,000	Bangladesh	1584 (date NA)
175,000	Chittagong, Bangladesh	Oct. 24, 1897
(some sources place the death toll from this storm at just 16,000)		
139,000	Bangladesh	May 5, 1991
138,000	Burma (Cyclone Nargis)	May 2, 2008
61,000	Bangladesh	Oct. 14, 1942
60,000	Calcutta, India	Oct. 5, 1864
60,000	India	1935

Fig. 1.1: Top Ten Deadliest Cyclones of the Bay

<sup>1</sup> FAQ on Tropical Cyclones, <http://www.imd.gov.in/section/nhac/dynamic/faq/FAQP.htm#q25>, (Accessed: 14, June, 2014)



4:1. The months of May-June and October-November are known to produce cyclones of severe intensity<sup>2</sup>.

The most recent tropical cyclone that hit eastern coast of India is Phailin. A very Severe Cyclonic Storm (VSCS) originated from a remnant cyclonic circulation from South China Sea. The term

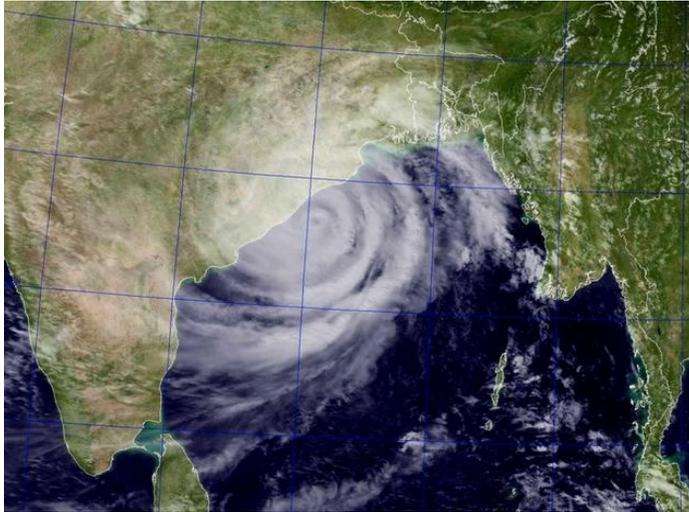


Fig. 1.2: Cyclone Phailin, October, 2013<sup>2</sup>

'PHAILIN' is derived from a 'Thai' word meaning Sapphire. Phailin was strongest tropical cyclone to affect India in fourteen years, since the great 1999 Odisha cyclone. The cyclonic circulation lay as a low pressure over Tenasserin coast on 6<sup>th</sup> October, 2013. It lay over North Andaman Sea as a well marked low pressure on 7<sup>th</sup> October. It concentrated into a depression over the same region on 8<sup>th</sup> October near latitude 12.0° N and longitude 96.0° E. Moving west-northwards, it intensified into a deep

depression on 9<sup>th</sup> morning and further into cyclonic storm (CS), PHAILIN in the same day evening moving northwestwards, it further intensified into a severe cyclonic storm (SCS) in the morning and into VSCS in the forenoon of 10<sup>th</sup> October, 2013 over east central Bay of Bengal<sup>3</sup>. The VSCS, Phailin crossed Odisha and adjoining north Andhra Pradesh coast near Gopalpur (Odisha) on 12<sup>th</sup> October, 2013 with a sustained maximum surface wind speed of 200-210 Kmph gusting to 220 Kmph (see figure no. 1.3).

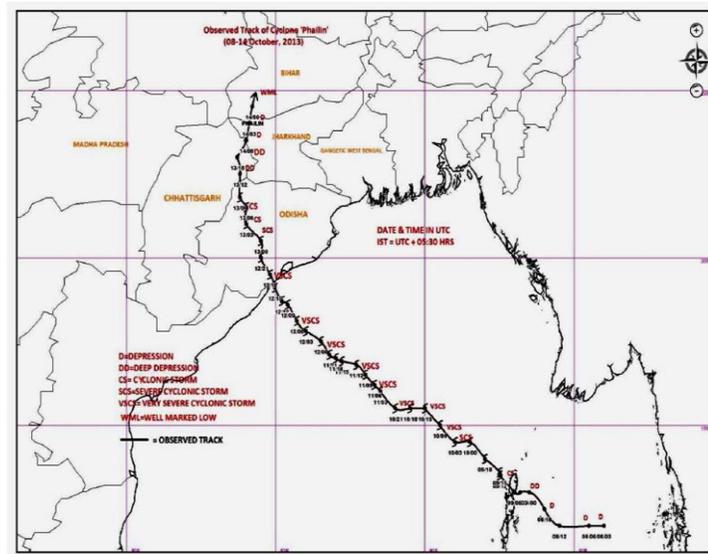


Fig. 1.3: Observed track of VSCS PHAILIN during 8th-14th October 2013.<sup>3</sup>

<sup>2</sup> <http://www.imd.gov.in/section/nhac/dynamic/faq/FAQP.htm#q25>

<sup>3</sup> *Very Severe Cyclonic Storm, PHAILIN over the Bay of Bengal (08-14 October 2013) : A Report*, <http://www.imd.gov.in/section/nhac/dynamic/phailin.pdf>, (Accessed: 14, June, 2014)

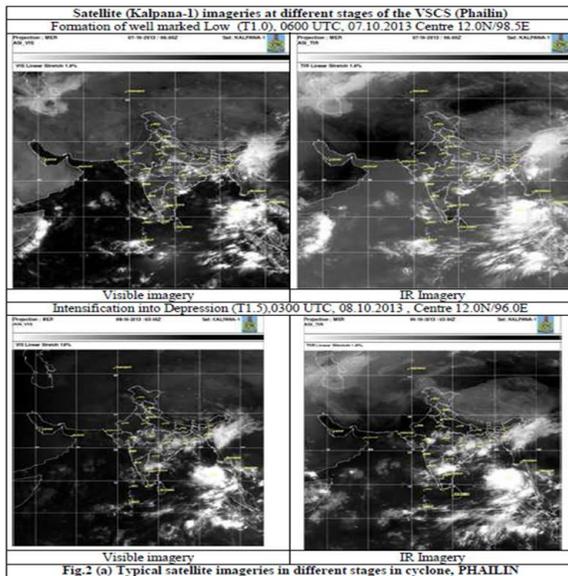


Fig.2 (a) Typical satellite imageries in different stages in cyclone, PHAILIN

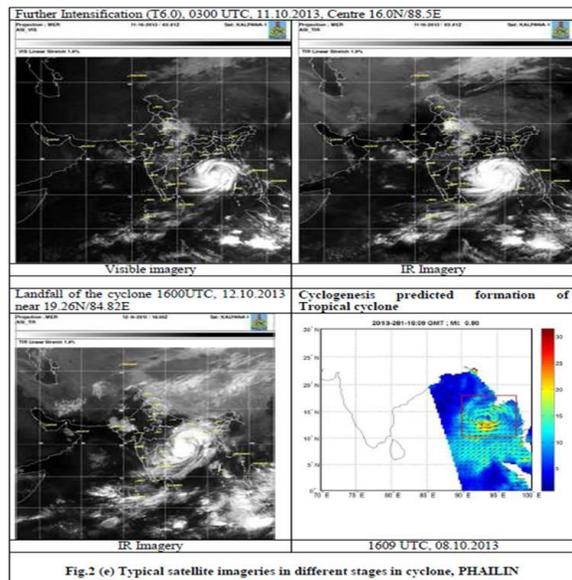


Fig.2 (e) Typical satellite imageries in different stages in cyclone, PHAILIN

Fig. 1.4: Satellite Pictures of the different stages of VSCS PHAILIN<sup>4</sup>

At the time of landfall the estimated central pressure was 940 hPa with pressure drop of 66hPa at the centre compared to the surroundings. It caused heavy to extremely heavy rainfall over Odisha leading to floods, and strong gale wind leading to large scale structural damage and storm surge leading to coastal inundation over Odisha. Maximum rainfall occur over northwest sector of the system centre at the time of landfall.



Fig. 1.5: Cyclonic Winds Strike Gopalpur, Odisha<sup>5</sup>

Maximum storm surge of 2-2.25 metres above the astronomical tide has been estimated in the low lying areas of Ganjam district of Odisha in association with cyclone and in-land inundation of saline water extended upto one kilometre from the coast. After cyclone Phailin ravaged Gopalpur and



Fig. 1.6: Ocean water surge near Odisha coast during Phailin<sup>5</sup>



Fig. 1.7: Phailin Impact: Flooding due to Heavy Rainfall<sup>6</sup>





## Loss of Flora and Fauna

It has been estimated that due to high velocity Phailin cyclone 26 lakh trees in the state of Odisha were destroyed and damaged. 1.1 lakh trees had been uprooted in worst affected Ganjam and Gajapati districts alone. The uprooted trees included species such as Eucalyptus, Gulmohar, Debdaru, Radhachura, Banyan, Neem and several fruit bearing trees. Cyclone damaged 90 per cent establishments in Chilika Forest Division. Ganjam and Gajapati districts lost 20,000 trees from the natural forests. Apart from 43 human lives, Phailin had taken a toll on 4393 animals and 1,70,970 birds including chickens in Odisha. Several migratory Siberian birds died in Srikakulam district during the cyclone. As many as 1,000 birds were killed and around 4,000 lost their nests, as several trees fell, unable to withstand the 200 kilometers per hour wind. Eggs were destroyed and chickens died. Many birds also died of starvation<sup>4</sup>. According to Special Relief Commissioner (SRC), 1487 big animals, including cattle and 2906 small animals like goats were killed in the cyclone and followed flooding.<sup>5</sup>



*Fig. 1.9 a & b: Uprooted Tree and Destroyed Nests of Siberian Birds: Post Phailin<sup>8 9</sup>*

A total of 86 animal deaths were also reported from Kaviti, Sonpeta, Ichhapuram, Mandasa, and Santhabommali of Andhra Pradesh. The Phailin cyclone and continuous rains that followed also led to migration of blackbucks from their normal habitat in Ganjam district. Before the cyclone, large number of blackbuck herds was seen close to human settlements but after cyclone these blackbucks disappeared from these areas. Due to the havoc created by Phailin, the blackbucks and exotic deer panicked and migrated to some other areas<sup>6</sup>.

<sup>4</sup> *Phailin takes its toll on fauna: 4393 animals, 1.7 lakh birds killed in floods*, <http://www.firstpost.com/india/phailin-takes-its-toll-on-fauna-4393-animals-1-7-lakh-birds-killed-in-floods-1181021.html>, (Accessed: 14, June, 2014)

<sup>5</sup> *Cyclone Phailin causes blackbuck migration in Ganjam*, <http://www.thehindu.com/news/national/other-states/cyclone-phailin-causes-blackbuck-migration-in-ganjam/article5316988.ece>, (Accessed: 14, June, 2014)

<sup>6</sup> *Cyclone Phailin in India: Early warning and timely actions saved lives*, [http://na.unep.net/geas/archive/pdfs/GEAS\\_Nov2013\\_Phailin.pdf](http://na.unep.net/geas/archive/pdfs/GEAS_Nov2013_Phailin.pdf), (Accessed: 14, June, 2014)



## How Technology Minimized Phailin's Impact

The remarkable thing about Phailin Super Cyclone was minimum human casualty. Sophisticated Early Warning System (EWS) disseminated alerts four days before Phailin struck land, allowed for the evacuation of approximately 400,000 people by 11 October (Senapati, 2013). Early warnings also allowed for the relocation of more than 30,000 animals. Several means of communication were exercised in the days prior to the landfall of Phailin to disperse early warning information. Different means and methods of communication have been applied. It included<sup>7</sup>:

- Constant news coverage before and throughout the event, including coordinates of location, intensity and timings of impending cyclone (Jain, 2013).
- Use of e-mail, fax, telephone and print media to communicate warnings and alerts including mobile sending phone text message alerts to more than 10,000 people of Andhra Pradesh day before cyclone made landfall (Price, 2013).
- Distribution of satellite phones to representatives in the 14 most vulnerable districts to ensure communication continued during the storm (GoO, 2013).



Fig. 1.10: Satellite Phones<sup>10</sup>

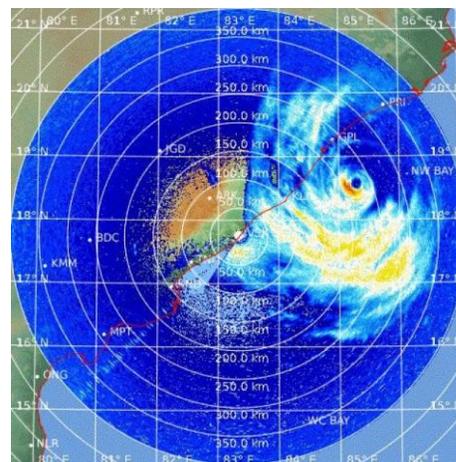


Fig. 1.11: Doppler Weather Radar Imagery<sup>11</sup>

The landfall prediction error of Indian Meteorological Department (IMD) was practically zero, as against landfall error of 50-100 Km in 24 hours forecasts in recent years, which is indeed a phenomenal achievement.<sup>8</sup> Satellites ushered in a revolution in cyclone monitoring and characterization. Satellite based weather monitoring got a boost with the launch of 'Kalpana', in 2002, a dedicated meteorological satellite. It was used for monitoring Phailin as well. First Doppler Weather Radar (DWR) was also installed in 2002. Today there are 22 S-Band DWRs in the radar network across the country. The DWRs are more useful because they provide data on wind distribution in the cyclone. Once there is information on wind speed, a quantitative assessment of

<sup>7</sup> [http://na.unep.net/geas/archive/pdfs/GEAS\\_Nov2013\\_Phailin.pdf](http://na.unep.net/geas/archive/pdfs/GEAS_Nov2013_Phailin.pdf), (Accessed: 14, June, 2014)

<sup>8</sup> *Acing the forecast*, <http://www.frontline.in/environment/acing-the-forecast/article5280719.ece>, (Accessed: 14, June, 2014)



cyclonic intensity also becomes possible. IMD now also has 675 Automated Weather Stations (AWS) for ground observations, in collaboration with the network maintained by National Institute of Ocean Technology (NIOT), Chennai and National Centre for Ocean Information Services (INCOIS), Hyderabad.

### Role of Media in Phailin's Impact Mitigation

Media (electronic and social) have also played a very positive role in Phailin's impact mitigation. Accurate forecasting by IMD and its timely and effective dissemination by media contributed towards fighting out fury of cyclone and minimizing the loss. The state run broadcaster All India Radio (AIR), which reaches 80 per cent of Odisha, particularly the rural pockets prepared days before the cyclone struck for uninterrupted transmissions. They also broadcasted special bulletins to advise people, how to respond during cyclone conditions. All the major news channels, telecasted real-time (see figure no. 1.12)



Fig. 1.12: Live Coverage of Phailin by Indian Media

position and information of Phailin which helped people and rescue agencies in preparing for disaster. United Nations also appreciated Indian Media's role during the Phailin disaster and lauded for effective dissemination of information among the people.

### Disaster Response by Odisha Government, NDMA and NDRF

When Meteorological Department forecasted that seven coastal districts – Ganjam, Gajapati, Jagatsinghpur, Khurda, Puri, Nayagarh and Kendrapara would be affected, it was a chilling reminder of 1999 cyclone. The matter became worse, as Phailin was coming during the festive period of Dussehra, when all government offices would be closed. The state administration wasted no time in cancelling Dussehra holidays. The Chief Minister of Odisha requested Defence Ministry to deploy defense personnel to carry relief and rescue operations.<sup>9</sup>



Fig. 1.13 a



Fig. 1.13 b

<sup>9</sup> How Odisha Managed the Phailin Disaster, <http://dev.epw.in/commentary/how-odisha-managed-phailin-disaster.html-0>, (Accessed: 14, June, 2014)



*Fig. 1.13 c*

*1.13 a: IAF Aircrafts taking part in Phailin Rescue Operations; 1.13 b: ODRAF rescuing people's from Phailin induced floods; 1.13c: Evacuating People to safe locations during Phailin*

The NDRF (National Disaster Response Force) was also requested to send a team to the state to deal with the fallout of Phailin. The ODRAF (Odisha Disaster Rapid Action Force) was pressed into action in districts. Medical supply, civil supply and power supply were put on alert.<sup>10</sup> Disaster Relief operations were supervised by Special Relief Commissioner (SRC) to the state government. The SRC made arrangements for relief materials and procured dry food and other essential commodities. The SRC directed all the seven district collectors to evacuate people living in low lying areas to safe places such as schools, colleges and cyclone shelters (see figure no. 1.14).



*Fig. 1.14: Phailin Cyclone Relief Shelter in Odisha*

Repeated announcements were made on radio and television about the cyclone and provided them instruction to be followed for their own safety. The state government adopted “zero loss of life” approach and all measures to meet Phailin were thoroughly planned.<sup>11</sup> According to SRC figures 9, 83, 553 people were evacuated to safer places by morning of 12<sup>th</sup> October, of this 1, 80, 000 people were evacuated in Ganjam district alone and more than 1,00,000 people each in Jagatsinghpur and Puri district.<sup>12</sup>

<sup>10</sup> <http://dev.epw.in/commentary/how-odisha-managed-phailin-disaster.html-0>, (Accessed: 14, June, 2014)

<sup>11</sup> <http://dev.epw.in/commentary/how-odisha-managed-phailin-disaster.html-0>, (Accessed: 14, June, 2014)

<sup>12</sup> <http://dev.epw.in/commentary/how-odisha-managed-phailin-disaster.html-0>, (Accessed: 14, June, 2014)



*Fig. 1.15: NDRF Personnel Clearing Destroyed Electric Poles in Odisha*



*Fig. 1.16: NDRF Personnel Clearing Fallen Trees in Odisha*

After Phailin crossed the coast and wind speed subsided, there was heavy and incessant rainfall. Flash flood occurred in northern districts of Balasore, Bhadrak, Mayurbhanj and Jajpur. The administration of these three districts evacuated 1,12,241 people from villages in flood hit areas to safer places. Besides issuing early warnings NDMA (National Disaster Management Authority) places 56 teams of the National Disaster Response Force (NDRF) at the vulnerable places as a proactive measure. The states were also advised on where to keep their State Disaster Response Personnel to avoid duplicity of efforts. The NDRF also helped district administration in evacuation of population as also informing them on actions to be taken by them at different timings. Army columns and helicopters and fixed winged aircrafts from Indian Airforce were moved nearer to the impact area at safer distances. The Indian Navy and Coast Guard helped the fishermen and ships which were caught in the grip of cyclone Phailin. NDMA also kept media informed on the movement of the cyclone as also the measures taken to minimize its effects. The preparedness and impressive response by State government, NDMA and NDRF bore robust results. The prevention, mitigation and preparedness shown by all concerned agencies and stakeholders restricted the casualties in a huge manner that also impressed the international community.

### **Comparison of Phailin and Severe Cyclonic Storm of 1999**



*Fig. 1.17: Post 1999 Odisha Cyclone*

A severe cyclonic storm had earlier hit eastern coast of India in 1999, in the month of October, whose dates almost coincided with that of Phailin. The 1999 SCS caused widespread and unprecedented damages to life and property. Its landfall point was near Paradip coast, the cyclonic storm with tidal waves 5-7 metres ravaged coastal districts of Jagatsinghpur, Kendrapara, Khurda and Cuttack. The state capital Bhubaneswar was completely devastated. The wind speed during cyclone 05B (SCS 1999) was upto 260 Km/h which is almost similar to the wind speed



recorded during Phailin. However, the 1999 SCS had more disastrous outcomes, as approximately 10,000 people lost their lives (see table 1.2). During Phailin, a total of 21 lives were lost as a result of cyclone and an additional 23 lives due to the severe flash flooding in the aftermaths of cyclone. The loss of lives has been minimized due to largest evacuation operation in India that included nearly 1.2 million people (GoO, 2013).

A COMPARISON OF LOSS AND DAMAGE IN PHAILIN & 1999 SCS OF ODISHA			
S.NO.	FACT & FIGURES	PHAILIN	SCS 1999
1	Population Affected	1,19,80,00	1,25,68,000
2	Number of Death	43	9885
3	Number of Houses Damaged	2,50,000	1,57,95,82
4	Crops Affected	Rs. 2300 Crores	Rs. 1733 Crores
5	Loss of Animal/Bird Life	1,75,363	1,77,26,22

Source: NCAR-ESIG, IFRC, Satya Prakash Dash

Table No. 1.2

Government cooperation, preparedness at the community level, early warning communications and lessons learned from 05B SCS contributed to mitigate the impact of Phailin. In response to cyclone 05B in 1999, Odisha established the first state agency in India to address disaster management specially (Odisha State Disaster Management Authority OSDMA). Regarding forecast, IMD disseminated warning as early as four days before Phailin made landfall, as compared to less than two days of warning provided for 05B SCS, 1999 (Senapati, 2013). Table 1.2 shows that the loss of crop value is almost same in case of Phailin and 05B but there is a considerable reduction in the number of human casualties and loss of animal life. This is indeed a result of high degree of preparedness and professional approach in handling disaster, which was absent in 1999.

### Preparing Children for Cyclones/Flood Conditions

Indian coastline and coastal areas are prone to tropical cyclones, particularly the eastern coast. These cyclones have been brushing up with our coast very frequently, be it Helen, Thane or Phailin. Tropical cyclones have brought death and destruction for the people living near coasts. It is not necessary that people living near eastern and western coast are only vulnerable. In fact, people, especially tourists visiting these picturesque coastal areas may also become the victims of such disasters. The key to remain safe and protected from such cyclones is preparedness and being “Cyclone Smart”. We can also become “Cyclone Smart Children”, if we follow basic instructions provided by competent authorities and spread awareness among our near and dear ones to remain prepared for disasters. In India NDMA has provided few ways in which one can prepare and protect from cyclone and flood situations.





### **When Cyclone Starts:**

- Listen to Radio (All India Radio Gives Warnings)
- Keep monitoring warnings. This will help you prepare for cyclone emergency.
- Pass the information to others.
- Ignore rumors and do not spread them.
- Believe in official information.
- Consult a map in accordance to the advice given on news.

### **When Evacuation is Instructed:**

- Pack essentials for yourself and family (medicines, food etc)
- Head for proper shelter or evacuation point.
- Do not worry about your property.
- Remain in shelter until informed to leave.

India is vulnerable to tropical cyclones. It is very important for us to share knowledge about tropical cyclones, its mechanism, movement and associated atmospheric conditions to our children in a lucid and interesting manner. It is necessary to organise lectures and audio-visual presentations on such a vital subject. It is also essential to explain the children, importance of a particular geographical location/information and its linkages with disaster preparedness and its mitigation. It is indeed very important for you to know and believe that “geographical information” is the key that makes us smart decision-makers of a proud country.

### **Sample Questions**

- Q1. Suppose you are on a vacation with your family near a coastal area and suddenly cyclone conditions build-up near the locality. How would you react to the condition? Explain. (5)
- Q2. Imagine yourself to be a NDRF member engaged in rescue and rehabilitation efforts for cyclone affected people. What challenges you may face in performing such task and how will you overcome them? Explain. (5)

### **Marking Scheme**

- A1. Depends upon student’s imagination.
- A2. Answers containing following need to be recommended.
- Bad Weather Conditions
  - Water Inundation
  - Lack of resources to rescue people
  - Convince people to leave their property and evacuate for safer places.





- 1.7: <http://www.livemint.com/Politics/38tqjSMido26tEoOGbuhf0/Cyclone-Phailin-aftermath-647-villages-still-marooned-in-Od.html>
- 1.8: <http://www.downtoearth.org.in/content/phailins-trail>
- 1.9a: <http://www.firstpost.com>
- 1.9b: <http://www.thehindu.com/news/national/andhra-pradesh/phailin-killed-over-1000-siberian-birds-in-srikakulam/article5236685.ece>
- 1.10: [http://www.icollector.com/IRIDIUM-9555-SATELLITE-PHONE\\_i12384693](http://www.icollector.com/IRIDIUM-9555-SATELLITE-PHONE_i12384693)
- 1.11: <http://www.frontline.in/environment/acing-the-forecast/article5280719.ece>
- 1.12: <http://ibnlive.in.com/news/cyclone-phailin-storm-hits-odisha-coast>
- 1.13a: <http://m.ndtv.com/photos/news/as-cyclone-phailin-approaches-massive-evacuation-on-16181>
- 1.13b: <http://ibnlive.in.com/newsttopics/rescue-operation.html>
- 1.13c: <http://www.telegraph.co.uk/news/worldnews/asia/india/10375569/Cyclone-Phailin-eases-slightly-after-tearing-across-Indias-south-causing-widespread-damage-and-loss-of-life.html>
- 1.14: <http://indiatoday.intoday.in/story/cyclone-phailin-gopalpur-ladfall-impact-rahul-kanwal/1/314380.html>
- 1.15: <http://m.ndtv.com/photos/news/cyclone-phailin-rescue-and-relief-operations-in-full-swing-16188>
- 1.16: <http://m.ndtv.com/photos/news/cyclone-phailin-rescue-and-relief-operations-in-full-swing-16188>
- 1.17: [http://news.bbc.co.uk/onthisday/hi/dates/stories/october/29/newsid\\_3691000/3691573.stm](http://news.bbc.co.uk/onthisday/hi/dates/stories/october/29/newsid_3691000/3691573.stm)