Communication Facilities for Disaster Management

Syllabus

Choose any **one** method of communication from various means of communication like radio/satellite/television/Ham radio which are used by Government departments such as the Indian Meteorological Department to disseminate information. Find out how the information is disseminated by them at various levels during disasters. Prepare a report.

(**Note for the Teachers:** The students can visit the government departments such as the All India Radio, Doordarshan, etc. Principals are expected to issue a letter to the concerned Government Department so as to inform the department that the information collected will be solely for project purpose. Case studies can also be collected to make the project more interesting).

INTRODUCTION

Natural disasters are often frightening because we have no control over when and where they happen. What we can control is how prepared are we as a community and government to deal with dangers that natural disasters bring.

Places that are more likely to have natural disasters such as earthquake prone areas or coastal areas vulnerable to hurricanes require accurate methods of predicting disaster and warning the public quickly.

Disaster risk reduction begins with information and its appropriate dissemination. The advances in information and communication technologies (ICT) that have emerged over the last two decades lend themselves to greater possibilities of different communication systems.

Need of Functional Communication Links

— India is a monsoonal land. Floods and droughts are the recurring twin problems of our country. If Rajasthan suffers from severe drought, floods cause major devastation in the states of Assam and Bihar every year.

— Due to severe floods, district headquarters get totally cut off from the neighbouring districts. This happens because of

(*i*) submerged telephone exchange

(*ii*) damaged cables

(*iii*) disrupted road and railway communication.

(*iv*) The state Headquarters were not able to provide the much needed relief and rescue in the worst affected districts.

(*v*) This happened in 2004 in the flood affected areas of Assam and Bihar.

It is therefore absolutely essential to have a reliable and a functional communication network in the country.

Need of Alternative Communication

— To help the government agencies to function smoothly during emergencies.

— To help the local people or volunteers working in the disaster-affected areas.

— To help in establishing the link between the state Government and local authorities to enable them in the Search and Rescue operations, relief and response measures.

— To ensure the rapid movement of resources to the right place at the right time. Extra Terrestrial Contacts have now become possible with the Prime Communication Networks of the Government of India.

— The Public Switched Telephone Network (PSTN) is the most popular means of communication. This public wired telephone provides the prime network that connects all Government and private offices, police and fire stations, hospitals, majority of homes, business places, etc.

— The premier communication network of the Govt. of India is the (1) National Informatics Centre (NIC) and The Bharat Sanchar Nigam Limited (BSNL).

— National Informatics Centre (NIC). It is the Primary Science and Technology Organisation in India. It has set up a nationwide Information and Communication Technology Network for IT services in the Central Govt., the State/Union Territories, Secretariats and almost all the 602 District Collectorates of India. This whole nationwide Communication network is designated as the Government Network.

— The Bharat Sanchar Nigam Limted (BSNL). It is the leading telecommunication company in India and the largest public sector undertaking. Its vast network covers over 5000 towns. It aims at improving the quality of telecom services, expansion of telecom network, introduction of new telecom services in the village.

A CASE STUDY

Assam Floods 2004

During the severe floods in Assam as a result of heavy monsoon rains, the state headquarters and the neighbouring districts got completely cut off from each other. The results were (1) submergence of telephone exchanges. (2) disruption of road and rail communications damage to cables.

As a result, the need for relief and rescue operations could not be communicated to concerned authorities. At the request of the state govt., the National Disaster Management Division of Govt. of India swung into action. Its first priority was to arrange satellite phones to establish communication links among various state departments and agencies.

Inference: From the above case study we infer that during any major disaster or emergency situation it is necessary to have completely *functional communication links* between the Government authorities at various levels so that help can be provided to the affected population.

Alternative communication systems is one of the available resources to face disasters. In practise it is a means of communication that offers alternate choices when the existing communication systems may not be operational or be defective or be overloaded.

Objectives of Alternative Communication System

— To undertake monitoring of a hazard.

— To complement the existing communication links.

— To respond to the whole spectrum of emergency needs.

Importance of Alternative Communication

— **Failure of Existing Communication.** During a major disaster or an emergency situation, **failure of existing communication** aids increase the vulnerability of a community as disasters like earthquakes, tsunamis, floods, etc. may cause damage to communication and render them inoperative.

— **Overloading of Existing Communication.** There may also be **heavy load in existing system** and it may cause great delay in transmitting. In case of overload, the urgent needs of disaster affected population cannot be known to the Government authority. It may thus enhance the vulnerability of the community.

— **Capacity Building Measure.** Alternative communication system is a capacity building measure in order to increase the ability of the people to cope with a hazard.

— **Prevention of Losses.** Alternative communication system helps to prevent losses in terms of human lives, livestock and property.

Reasons for Disruption of Networked Communications

The reasons for disruption of communication networks are the following:

1. **Damage to Cables.** The disasters such as earthquakes cause damage to cable lines, telephone poles, exchanges, mobiles and cellular transmission towers.
2. **Lack of Manpower.** The personnel who man these services fail to report on account of themselves being victims of the fury.
3. **Overload.** During disasters there is a lot of burden on the existing network. This disrupts the communication traffic what it cannot handle beyond capacity means which leads to congestion of the network or in worst case its complete failure.
4. **Jamming of Networks.** Radio and other signals of approximately the same frequency are bundled together in a confined space leading to jamming. It can cause total failure of the system rendering it non-functional.

Modes for Emergency Communication

At various national and international conferences and seminars, several recommendations have been made to use alternate means of communication like UHF (Ultra High Frequency) based radio communication, HAM radio and satellite phones to overcome the shortcomings of networked systems.

I. Radio Communication. The method of radio communication is generally known as Wireless system. It is important to know that not all frequency bands can be used effectively because of the following reasons:

— The radio waves travel in straight lines while the earth is curved. Unless the waves are reflected they cannot carry the message to their destination.
— The High Frequency (HF) band of radio is used mainly for long distance communication.
— Radio waves of high frequency band get reflected from the ionosphere and hence they travel across the world.
— Ultra High Frequency (UHF) band of radios or handheld wireless sets called WALKIE TALKIES are used mainly for local communication.
— Walkie Talkies are more resilient than other frequency band radio wave.
— The transmitter that receives the waves, generates radio signals of a particular frequency or carrier wave.
— Radio Signals of Ultra High Frequency (UHF) bands tend to bounce from the buildings hence they are suitable for communication in built up areas.

II. Ham Radio. Ham Radio is also known as Amateur Radio. The word Amateur implies the use of radio communication for non-commercial purposes.

It is regarded as an alternate means of communication because it is different from the common radio communication.

1. It doesn't use any ground based infrastructure:
2. It has low power requirements and can work on batteries or generators.
3. It is open for use in non-commercial buildings and is not much subjected to load factor.

Salient Features of Ham Radio

— Ham Radio is based on radio waves (electromagnetic waves) of certain frequency.
— Frequencies to be used for HAM Radio are defined universally by the International Telecommunications Union.
— In India its affiliated body — the Wireless Planning and Coordination Wing of the Ministry of Communication is the designated organisation for granting licenses to HAM operators.
— **HAM Radio** set can also be linked to a satellite.
— The Indian Space Research Organisation launched HAM SAT—a microsatellite in 2005.
— HAM needs a special set of rules to use a certain frequency governed by the International Telecommunication Union (ITU).
— HAM Radio system was successfully used during the Orissa Super Cyclone in 1999.
— Many amateurs used the HAM during the Bhuj Earthquake in 2001 when all other means of communication had been destroyed.
— During tsunami of December 2004, HAM was put to use as reported in the TRIBUNE—Sandeep Baruah, a licensed HAM operator, based in New Delhi, helped to relay messages between people stranded in Andaman and Nicobar Islands and relief agencies.

Training Programmes-Amateurs

To create a trained force of license Amateur operators the government has set up necessary infrastructure and training facilities in India.

— The Department of Information Technology has established Amateur Radio stations in different parts of the country.
— The Wireless Planning and coordination Wing of the Ministry of Communications has already given license to about 15,000 Amateur Radio operators (Hams) in India.
— On May 2005-India launched its own HAM SAT satellite-a micro satellite to provide satellite based Ham Radio service to the Indians and the international community of HAM Radio Operators.

Satellite Based Communication Systems

— Satellite communication refers to the system of transmitting telephone and television signals over long distances. Satellites orbiting the earth at a height of about 36,000 km provides a good global coverage.
— Satellite based communication system exists for users on the earth. They function through an equipment called Satellite established in space.

Uses of Satellite Communication

The knowledge and satellite applications have been found useful in a variety of fields like

— Real data acquisition
— Remote sensing
— Telemedicine
— Disaster management
— Communication.

Types of Satellite Communication

— Satellites are of different types and carry out different jobs. For example, a communication satellite which is basically a radio relay station in space. They are sometimes called 'COMSATS-meaning satellite communications SATCOMS and SATPHONE-referring to a satellite phone terminal.

Features of Satellite Communication

— **Transponder.** A transponder is like a radio or radar that automatically transmits or signal upon receiving the designated incoming signal.
— It receives the conversation on one frequency and then amplifies it and retransmits it on another frequency back to earth.
— There are generally hundreds or thousands of transponders fitted in a satellite. They routinely receive data, television images, telephone transmissions, etc. and transmit the same back to earth stations.

Video Conferencing

Another important feature of satellite communication system is Video Conferencing-especially during disasters.

India has created a Decision Support Centre (DSC) at Hyderabad. It has been set up at the National Remote Sensing Agency (NRSA) Hyderabad. The DSC has been linked to Emergency Operation Centres functioning in state capitals and other critical areas.

Present Operational Indian Space System

— India has a highly developed space programme technology. It has applied this knowledge successfully for its rapid development and is presently offering a variety of space services globally.
— ISRO — Indian Space Research Organisation was set up in 1969.
— It carries on India's space Programme
— Two major space programmes launched by ISRO in 1980's are.
  (*i*) INSAT-Indian National Satellite
  (*ii*) IRS-Indian Remote Sensing Satellites
— The **INSAT systems** is one of the largest domestic communication satellite systems in the Asia-Pacific region.
— Being a multipurpose satellite system it provides service to
  (*i*) Telecommunications
  (*ii*) Television telecasting
  (*iii*) Weather forecasting
  (*iv*) Disaster Warning
  (*v*) Search and Rescue.
— **IRS-Remote Sensing Satellite.** India is a leading nation in the field of Remote Sensing satellite.
  (*i*) IRS provides data or services for management of resources.
  (*ii*) IRS also provides these services not only at the national but also at the global level.
  (*iii*) CARTOSAT-I is a Remote sensing satellite system launched in May 2003.

Advantages of Satellite Based Communications

— Satellite based communication is the most reliable system in all situations.
— This is so because the satellite communication such as the radio relay stations exist in space. They are not vulnerable to natural disasters occurring on the earth's surface.
— Satellite communication systems are easy to set up. These can be set up with very small satellite antennas which are portable and easy to instal.

Satellite Based Networks For Disaster Management

— The most important instrument for satellite communication in disaster is SATELLITE Phone.
— It either uses the services of 'Geosynchronous satellites—for e.g. INMARSAT phones or Low Earth Orbit Satellite *e.g.* IRIDIUM and THURAYA phones.
— The satellite works as a telephone exchange.
— The satellite phone provides very reliable voice and data communication.
— Satellite phones are very handy, workable and can be easily transported to any location.
— As there are many multi-hazard districts/states in India—the Government of India-as a matter of policy is equipping the Disaster Managers with portable satellite phones.

— This would help in maintaining proper communication links among the Administrators/Disaster Managers at the local and state levels even if all the main communication lines fail.

Different Types of Satellites Launched by India

Geo-Synchronous Satellites

— This Satellite orbits the earth at the same speed as the earth rotates on its axis.
— They are positioned at a height of about 36,000 kms above the equator.
— They remain stationary above the earth maintaining the same position.
— As wealth satellite they send images which help in making weather forecasts and cyclone observations which we see on our television screens.

Asynchronous Orbits Satellites

— These satellites are positioned in the lower orbits around the earth lower than 36,000 km above the equator.
— There are three types of Asynchronous Orbit Satellites.

(*i*) **Observation satellite.** These satellites normally orbit at altitude ranging from 480-870 km.

(*ii*) They act as relay stations to re-transmit distress or emergency signals of a ship in trouble or a drowned aircraft.

(*iii*) They are useful in Search and Rescue Operations.

(*iv*) **Science satellite.** These satellites orbit the earth at an altitude of 4,800-9700 km.

(*v*) They send their research data images to the ground stations on the earth through radio telemetry signals.

(*vi*) **Global positioning system satellite.** These satellites are positioned at an altitude of 9,600 km – 19,200 km. They are used to determine the exact geographical location of places on earth in terms of latitude and longitude.

In addition to the above mentioned satellites. These are:

(*i*) **Global Mobile Personal Communications Systems (GMPCS's)** are very popular due to their efficient voice and data communications.

(*ii*) **Hand-Held size of Satellite Phones.** Iridium Phones, Thuraya Phones.

Early Warning Capital and Preparedness

Use of Radio and T.V.

— The INSAT systems are being used for satellite news gathering. It helps in on the spot real time news coverage.
— **Prasar Bharti** is the public service broadcaster in India. It has two constituents —All India Radio and Doordarshan.
— It has 12 digital outdoor broadcast terminals. They operate through the INSAT network. The INSAT network covers important events in different locations for transmission via satellite.
— The data is then transmitted to the central station at Delhi from where it is re-broadcast over the Doordarshan Channels.
— The **Press Trust of India** (PTI) is also using the INSAT System.

— It uses the broadcast facilities of INSAT-3C satellite which provides high speed news and information to a wide range of media and other users.
— There are 15 terminals-14 from PTI and 1 shared with AIR (All India Radio) for satellite news and fax discrimination in operation.
— All major TV/radio channels in India and abroad including the BBC in London receive the PTI service.

Disaster Wise

If a situation arises when all communication networks fail, army personnel involved in rescue and relief operations can still contact each other – through MERCURY FLASH – by The Signal Corp Indian army's broadband satellite network. This is the army's first major foray into the domain of Satellite network communication.

Situation 1: A deluge far more severe than the one in Mumbai in 2008 destroys all communication networks. The army is called for rescue and relief. But Army Headquarters are unable to reach its men.

Situation 2: A conflict more serious than the Kargil uses in the North-Western border and the communication networks are paralysed by the enemy keeping in mind situation like these—the army is introducing a strategic broadband satellite network that would make communication easier during war and disasters.

It is called Mercury Flash-army's broadband satellite network by the Signal Corps, is the Indian army attempt to reach out to people when terrestrial networks break down. Twenty locations have been identified across the country to be connected with this network.