# The role of Open Data for mapping and communication in Disaster Management

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**Abstract** - During the last years in India due to flood, heavy rains, landslides and other natural calamities several people get affected and several lost their life. In such situations, providing effective communication and timely response to the requests can save many human lives. The major challenge faced is the timely localization of victims within the disaster area and reliability of network infrastructure at that period. Mapping disaster-prone areas can facilitate the identification of areas that require attention when disasters occur. Disaster data is often incomplete or difficult to access. There's lots of data available, but the problem is making use of it easier is required. This research aims is to develop routing framework for effective mapping the locations by use of Open data for efficient response during disaster management. This can also help officials to priorities the needs and distribute supplies effectively to the people.

**Keywords** - Internet, Disaster management, OSM, Open Data, Wikidata.

## I. INTRODUCTION

Disasters are those events which occurred suddenly and cause human, economic and environmental damages. Disasters are both man-made and natural that occurs frequently. It can cause great damage and loss to life and property. Disaster Management is dealing with the aspects of emergencies, preparedness, response and recovery in order to lessen the impact of disasters. In India, the rate of disaster happening per year is increasing. There are national wise National Disaster Management Authority (NDMA) and State wise statutory bodies (SDMA) for disaster management in India. Many agencies and organizations are working on the disaster management around the world to reduce the losses and risk. Figure 1 show the cycle of disaster management.

The Internet as well as the smartphones plays an important component of information-sharing during the emergency phase of disasters last years in India. During the Chennai floods in 2015, Kerala floods 2018 and 2019 the social media get flooded with requests and images of the disaster-affected areas posted by users as well as those are affected. The images of flood affected places play an important role to understand the extent of damage in the many places.

Many pre disaster measures have been taken in different states in India to overcome those problems they faced during last natural disasters faced. Although some measures have taken, the major problems faced during the time of disaster are the unavailability of proper information from the disaster affected zones and the communication problem occurs during the period of disaster. Mapping disaster-prone areas can facilitate the identification of areas that require attention when disasters occur. There's lots of data available, but the problem is making use of it easier to access to use, re-sue and to share is required.

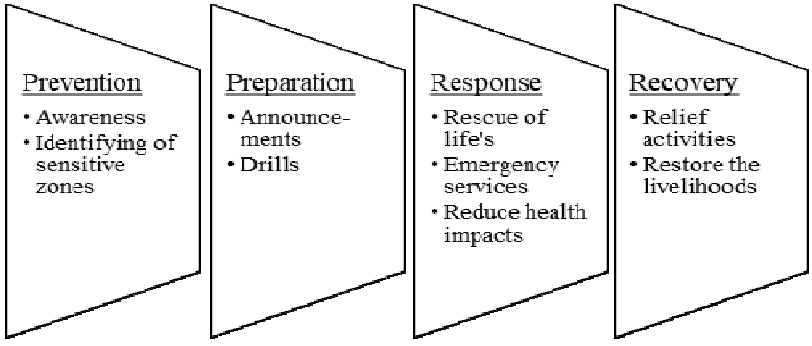


Fig.1Stages of disaster management

Open data is the idea that says, the data should be freely available to everyone to use, re-use and shared. Open data license allows anyone freely to access, reuse and redistribute the data.Open data is one of the valuable sources for mapping and communication which plays crucial role in disaster management which includessatellite maps, satellite imagery, GISdata.

Many countries including India has an open data platform known by Open Government Data Platform (OGD) India which includes access to Datasets in open format published by Ministries and Departments in India. There are many collections of large complex data sets available. But making a structured format of data helps to reuse the data whenever required. OpenStreetMap (OSM) is an open sourced free editable map that has been used for mapping purposes. During disasters OSM data has played a good role for mapping purposes. In India during Chennai and Kerala floods the crowd sourced mapping helps to locate flooded streets and was able to locate the rescue requests on map. Data sharing can helps to locate public health emergencies and reduce health impacts.

## II. DISASTER MANAGEMENT TECHNIQUES

### A. Need for Disaster Management

According to NDMA more than (58.62%) of the landmass in India is prone to earthquakes of moderate to very high intensity; over 40 million hectares (12%) of its land is prone to floods and river erosion; close to 5,700 kms, out of the 7,516 kms long coastline is prone to cyclones and tsunamis; 68 of its cultivable area is vulnerable to droughts; and, its hilly areas are at risk from landslides and avalanches [1]. Disaster management is very important to survive. Large scale disasters like flash floods and landslides are affected frequently in last years in different locations in India. Climate change also has played an important role in causing large-scale floods across different parts of India. It helps us to be aware about the hazards resulting from the disasters and thus makes us to prepare for the consequences. Below table gives the information of total number of camps and people displaced in Kerala floods 2018. Almost all the camps were schools in the state because of availability of the space to accommodate more number of people.

TABLE 1. KERALA RELIEF CAMPS IN 2018

| Number of Camps | Number of People Displaced |
|---|---|
| 4664 | 1031327 |

It is necessary to get accurate and complete details to respond to the requests. So Disaster Management plays an important role.

### B. Disaster Management Techniques

NMDA is an agency formed in 2005 in India to coordinate response to man-made or natural disasters. They frame laws, guidelines and coordinate with SDMA in states of India. They provide guidelines for preparation of disaster management plans. Volunteers use their mobile devices to provide near-real-time information about the events. During last disasters in India, mobile phones provide vital support for disaster management in many ways which includes communication, monitoring, warning, evacuation, rescue and relief aid. Smart phones supporting GPS functions assists in disaster management by locating and mapping the affected areas.

## III. PROPOSED METHODOLOGY

Flood hazard and risk are increasing day by day. It is therefore important to collect data, monitor floods over various scales, and provide accurate and reliable model predictions. In a state, the immediate response team during crisis will be the State Police or the Fire Force.During a rescue operation, officials don't have time to wait and need the maps immediately. Many of the rural and urban places are not mapped and the data of these are not open sourced. Adding the vertical elevation of major places above thesea level and making it open can help mapping disaster prone areas and safe zones nearby. This helps in pre planning the disaster management works. Since centralised monitoring and data collection will delay in the rescue and relief operation, a decentralized monitoring and data sharing method is proposed. In each district every Taluk is taken as a decentralized monitoring and data collection point under the monitoring of District centres (DC). In the proposed method the Talukcentres (TC) are the prime centres which collect information of the rescue centres, hospitals, other emergency centres and the request for help in that area.

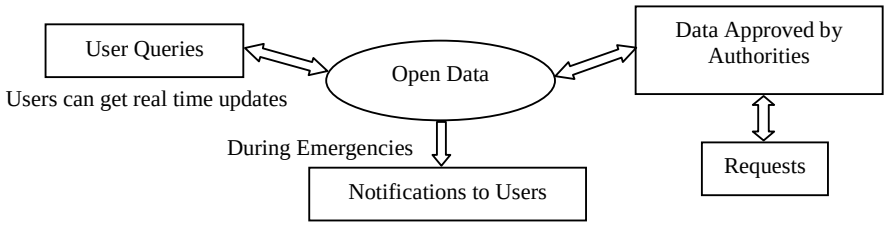


Fig. 2 Block diagram of the proposed idea

Authorities can add updated information so that users can contribute to the database and get results for their queries. This can help faster response to requests. During Kerala floods most of the relief camps were schools. By making the

information of schools and other previous camps details open sourced makes to get access to these details faster during emergencies.

A. Open Data Sites by Government

Government of India has started anOpen Government Data (OGD) Platform for supporting Open Data initiative. The portal publishes datasets, documents, services, tools and applications collected by them for public use. The data available in this portal can be downloaded and visualized.

B. Wikidata – Open sourced Data access

The proposed method uses Wikidata that offers a wide range of linkedopen data. The data published in Wikidata is under the CC0 "Public domain dedication" license. This data can be accessed in several ways and also can be edited. It can be accessed by Bots, MediaWiki API, and SPARQL query. [2] The main advantage is that it is multilingual. So language may not be a barrier of the data access and write. There are several projects running in Wikidata to improve data sets. In OGDPlatform there is information available of every hospitals and health centres in India.

These open data can be imported to Wikidata and can be accessed at any time by the above mentioned methods. Since it's in astructured format, machine as well has human beings can read and write the data available here.The data can be accessed easily by the example SPARQL query for getting nearby rescue centres.

```
#defaultView:Map
SELECT ?item ?ilLang ?geo WHERE {
        { ?item wdt:P31 wd:Q16917. }
        UNION
        { ?item wdt:P31 wd:Q31207. }
    ?item (wdt:P131*) wd:Q2429655.
    OPTIONAL {
    ?item rdfs:label ?ilLang.
    FILTER((LANG(?ilLang)) = "en")
    }
    OPTIONAL { ?item wdt:P625 ?geo. }
}
```

Listing.2SPARQL query for getting nearby schools

The above sample SPARQL query gives an output with OSM map overlayed locations of schools as in the Figure 2.


Fig. 2 SPARQL queryoutput Map

## IV. CONCLUSION

As a conclusion we can say Open Data is valuable tool and plays an important role is mapping for disaster management. This data can be used for early-warning systems that can save and protect huge numbers of lives.Since Wikidata is a multilingual project, it can be very useful especially in India for disaster management. Users can askqueries and get updated result faster. By making the data open, it can be analyzed and can be utilized for study purposes to create a pre disaster management model.

## ACKNOWLEDGMENT

WikiProject Kerala is project in Wikidata started in 2019 for creating and improving data content related to Kerala.The information of schoolswas made available through this project during the Kerala floods 2019 that helps to locate and identify many relief camps.

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