

Disaster Management Assignment 7

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Solution 1:

Yes, this is a Dynamic Resource Allocation Scenario. We see that the Disaster in focus is a **Stampede** and it is **Man-made**. Human stampedes and crushes mostly occur in episodes of panic (e.g. in response to a fire or explosion) as people try to flee in fear.

Failure in Prevention:

- The necessary and most important way to handle such disasters is to prevent them.
- It is possible that the organization of the respective religions congregation was not optimal. It seems like there was no or ineffective Crowd Control.
- However, It is quite possible that even after all the preventive measures are taken, some panic in the crowd may have been intentionally or unintentionally created in the area.

Need for Dynamic Resource Allocation:

- It is a **necessary part(requirement) of Response** to a Disaster that is currently happening or that had just occurred.
- A stampede is one such scenario where **immediate response and control of the crowd are necessary to save lives**.
- To ensure no or fewer fatalities, a lot of resources like Police, Transport, A way of communicating with the crowd (Eg. A mike system), Emergency response team, Paramedics, Medical Equipment, etc are needed.
- **Optimized use** of all these resources, with changing tasks, constraints, spatial requirements (taking a critical patient to the nearest hospital), and time-varying requirements (need for more bandages, medicines, etc.) is **quite essential** in this scenario.

Tasks (with a combination/use of assets):

- **Optimal Spatial Distribution** of 100 Policemen across the 2000 people. It is essential to make sure the Police personnel will not become the victims of the Disaster and meanwhile, provide exit routes to the people and reduce panic.
- With **Dynamic/Constant Assessment of the situation**, provide **Optimal Temporal Distribution** also to the Policemen (say, for every 15 min.).
- **Communicate** the dynamically proposed **Crowd Management** strategies to the Response Team (100 Policemen) every few minutes.

- **One-One assessment and communication** (analyze each personnel and provide information specific to that one personnel). This information must include all the developments in the scenario like reaching out to the nearest personnel for help, availability of transport and medical supplies, etc.
- Policemen must **look out for people** getting crushed and take them to the nearest paramedic.
- Find some form of **communication with the crowd** to reduce panic and slow them down. Eg. Sending alerts (provide contact number to medical camp/Police Captain for help) and measures to save themselves on their mobile phones.
- Spatial and temporal analysis of **multiple exit routes** and the possibility of creating them to diverge the flow of people from a single direction.
- Look for the nearest hospital and **available medical facilities** with human help.
- Development of a **many-one communication to the medical camp**. Eg. If a policeman wants immediate medical attention at his spot, he needs to communicate directly with the medical camp to send an ambulance or a paramedic.
- **Optimal use of medical equipment and transport systems to ensure no life loss.**

Assets:

- **4 Ambulances** (for medical and transport needs) at the site + 6 ambulances (called from the nearest hospital).
- **4 Doctors** and 6 Medical Assistants at the site
- **The Wireless** (Communication System) with Policemen and **Mobile Phones** with the people.
- Accessible **Transport from people** or authorities of the congregation willing to help people.
- The **nearest Hospital**(5 km away) and all their medical supplies and equipment (15 doctors, 60 medical assistants, 1 operation theatre, and 3 triage rooms)
- Ambulances and Medical assistance from hospitals that could reach the site subjected to constraints.
- Here, the situation has cyber assets and ground assets (could ask for air assets - monitoring the situation and provide assistance)

(*Note - some pointers are also mentioned in Tasks and Assets)

Pointers of Effective Dynamic Resource Allocation:

- The main aim of Disaster Response is to primarily save lives and secondarily to reduce any other kind of loss (infrastructural, economic, social, etc). We want our algorithm to prioritize and do both. The following points imply some implementable functionalities a Dynamic Resource Allocation algorithm can have.
- Spatial and Temporal Dynamic Distribution of Response Force in an area should not only be based on coverage but also on the **places in need of attention**. This

information is best to be given as dynamic input to the algorithm based on the **call for assistance** from the people (mobile phones). The algorithm needs to be dynamic in training and predicting.

- **Resource allocation** (medical supplies and ambulances) has to do based on **First Come First Serve Basis** and it has to be **temporally dynamic**. Eg. If a more critical patient arrives, it is necessary to cater to his need first.
- The algorithm needs to **keep track of the supplies/assets consumption** and keep updating its data and try to improve their availability. This needs the use of a lot of **spatial data** which may not need much **training** but for temporal analysis and predictions, a lot of historical data has to be used to train it.
Eg. If 20 people are hurt in the first 5 minutes, based on all the data, constraints, and inputs available the algorithm must predict how many can get hurt in an hour. This output can be used to increase the resources and assets (more medical supplies, more Response Force, etc), subjected to constraints (road blockages, etc)
- We need to work on improving the algorithm's **ability to reduce Human effort, be more accurate, and automatic**.

Solution2:

Working of Primary, Reinsurance, and Retro markets in Disaster Management:

- In any Disaster, the damage to infrastructure and lives (health, economic, social, etc) is expected. Providing insurance and protecting people's lives is an important part of Disaster Recovery which builds resilience. It is a form of risk management.
- Insurance is an arrangement by which a company or the state undertakes to provide a guarantee of compensation for specified loss, damage, illness, or death in return for a payment of a specified premium.

Example: Consider the Chennai 2015 floods.

Say, 20 houses have claimed insurance. Let us see how their policy conditions, deductibles, etc are set up. Some of the companies that are involved are Policybazaar.com, SBI Life Insurance, DHFL, etc. Consider each house claims for 1 Lakh Rupees. Now they receive the claim amount - Deductibles.

- Every house can buy an insurance policy from an insurer to make sure they are financially safe in case of a disaster (say floods). They may need to approach a retailer who in turn finds an insurer. This market of selling the policies to end users/citizens is called the Primary Market.

- If they all are insured to the same company say A, the company is out of around 18 Lakhs if Deductibles for each house are Rupees 10K.
- Here, the policy conditions and Underwriting are set by using Catastrophe Modelling Softwares (from Organizations like **AIR**, eg. **Touch Stone** - gives **Detailed Loss Analysis models**), which can predict the worst-case scenarios and probabilities of almost all kinds of Hazards. Based, on this the insurance company can decide if they can sustain the claims in such a situation or they would get an insurer for themselves, which is called **Reinsurance**. Here, say if A is reinsured to a company B, then B would be paying these (18 Lakhs - Deductibles from A = 17 Lakhs, if Deductibles is 1Lakh). Here, A needs to pay premium to B.
- Reinsurance is insurance that an insurance company purchases from another insurance company to insulate itself (at least in part) from the risk of the event of a major claim. With reinsurance, the company passes on some part of its own insurance liabilities to the other insurance company. This is called **Risk transfer**. **Risk Sharing** is also in practice where 2 insurers share the loss, which is called **Co-Insurance**. If A and B are Co-insured, they would share 18 Lakhs in half. This is the Reinsurance Market.
- In Retro Market all the money is directly in the Capital Market. This helps with Insurance Risk Securitization. Eg. The capital Market buys ILS or Cat Models from Special Purpose Vehicles.