Disaster Risk Reduction and ICT Applications – a Conceptual Framework for Tourism Management in Uttarakhand, INDIA

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Abstract— **Uttarakhand is one of the major disaster prone states in India having multiple hazards and vulnerability. Number of districts are affected regularly by the landslides, earthquakes, cloud burst, flash floods, heavy rains etc. Despite its vulnerability to different hazards the Uttarakhand is also attracts large number of tourists and pilgrims. Char DhamYatra is one of the most popular pilgrim circuit in Uttarakhand, attracts millions of people across India and abroad. Trekking and adventure sports activities are also putting temporary population pressure in the fragile Himalayan region.**

Anthropogenic Hazards play an important role towards the risk factor of the region. Being an important pilgrim destination, the region is facing high influx of human and vehicles seasonally. Hence, high pressure on natural resources creates an imbalance in ecology and environment. To cater to the huge seasonal pilgrim pressure; roads, bridges, hotels, guest houses and other constructions related to hospitality and support services through out the year, certainly put pressure on the natural equilibrium in terms of land use change, land degradation, over exploitation of water resources etc.

The present study is primarily focused to analyze the overall tourism perspectives and suggestive ICT based framework for efficient management of the tourists for disaster risk reduction. The ICT based framework for effective tourism management will also be helpful to support emergency and disaster management in the districts and states.

Index Terms— **Disaster Risk Reduction (DRR), Radio Frequency Identification (RFID), Geographic Information System (GIS), Hazard, and Tourism Management.**

I. INTRODUCTION

World is facing increasing impact of disasters caused by the combination of natural hazards and vulnerability. By virtue of fragile geo-climatic condition and ecosystem Himalayan region is facing very frequent disasters. The disasters in this region ranging from small-localized landslides to catastrophic flash floods and earthquakes. In recent past Himalayan state Uttarakhand experienced an unprecedented rainfall and subsequently catastrophic flash floods. Seven districts of Uttarakhand, India had been ravaged by the cloudburst and flash flood induced catastrophic disaster in June 2013. The focus of the disaster wasKedarnath, where the 8th century temple of Lord Shiva was covered under 6 feet of sludge. Its surroundings and the 18-km trek to the 3,581 meter sacred spot savaged by landslides and gushing debris flow. Over 60 villages had been flattened in the vicinity and 90 dharamshalas that shelter pilgrims during the peak season completely destroyed. The monsoon hit the state in advance from its scheduled entry with an enormous rainfall on 16th and 17th June 2013. Official record shows the death toll for the extreme incident was about 6000 human lives and thousands livestock. The disaster also causes infrastructures and other environmental losses in significant level.

The government of Uttarakhand is preparing for the big crowd every year to mange the three-month long pilgrim activities in the different sacred places. Though the local administration and state government are prepared the government mechanism to cope up with the situation in effective and efficient manner, use of ICT in the entire tourism management cycle need integration. It is also a known fact that the investment during pre-disaster phase will give better pay-off during disaster and the impacts of the disaster event would have less effect on the live and livelihood. Disaster Risk Reduction through ICT application in tourism management would be an interesting aspect for considerations. Integration of ICT components in planned manner to manage the tourist /pilgrim flow into the vulnerable pockets of the state will definitely help decision makers of the districts and states for effective and efficient planning and response in case of any emergency.

II. DISASTER RISK REDUCTION (DRR) IN INDIA

Natural hazards and vulnerability constantly threaten people'slives and livelihoods through out the World and causing manifold impact of disastersto the human societies. Most of the disasters have derailed socio-economic progress, especially in the developing countries and put millions of people into dire poverty. In recent days Disaster Risk Reduction (DRR) hasbeentaken pace and recognizedasaprioritybyIndia,andalso hasbeencommittedtovouchedfor "HyogoFramework for Action" 2005-2015 (HFA): building the resilience of nations and communities to Disaster". Thoughwe have crossed major HFA time period,implementation on the HFA priority still need more serious thoughts. In the Indian context, the urgent need to address HFA locally and other committed approaches to DRR is an urgent imperative, since these commitments will continue to remain paper works and non efficient unless field level appreciation, understanding, participation, local resource development and institutionalization is carried out. Local level involvement to address HFA and cater to build an action-oriented agenda, development of tools on integrated approach on community based DRR through schools, hospitals,

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developmental schemes and capacity building initiatives are very much relevant in recent days. Therefore, addressing wide range of hazards towards reducing risk through direct intervention in local development, capacity building and awareness on risk reduction at local community levels are some of the major concern on HFA.

The five priorities of the Hyogo Framework for Action (HFA) are as follows:

1. Ensure that DRR is a national and local priority with a strong institutional basis for implementation.
2. Identify, assess and monitor disaster risks and enhance early warning.
3. Use knowledge, innovation and education to build a culture of safety andresilience at all levels. 4.Reduce underlying risk factors.
5. Strengthen disaster preparedness for effective response at all levels.

III. Technology Solution for Tourism Management in Uttarakhand

Radio Frequency Identification (RFID) is not a new technology and has passed through many decades of use in military, airline, library, security, healthcare, sports, animal farms and other areas. RFID is being used for various applications such as personal/vehicle access control, departmental store security, equipment tracking, baggage, fast food establishments, logistics, etc. The technology could increase efficiency in the tourism traffic management and hence safety and security of the pilgrims and tourists through resource optimization. RFID system consists of RFID tag, RFID reader and back-end Database and storing and remotely retrieving information or data [1]. RFID tags store unique identification information of objects and communicate the tags so as to allow remote retrieval of their ID. RFID technology depends on the communication between the RFID tags and RFID readers. In this particular case the strategic RFID locations or Traffic Access Points (TAP) would have been identified and established to to manage vehicular movement and tourists or pilgrims. The operational frequency of the RFID decides the range of the RFID tag and reader. Basically, the application, which manipulates tag deduction information for the end user, communicates with the RFID reader to get the tag information through antennas.

How RFID System Works

RFID systems consist of tags, which could be attached to the vehicle or individual identification card to be identified. Each RFID tag has its own “read-only” or “rewrite” internal memory depending on the type and application [4]. The RFID reader generates magnetic fields that enable the RFID system to locate objects (via the tags) that are within its range [3]. The high-frequency electromagnetic energy and query signal generated by the reader triggers the tags to reply to the query; the query frequency could be up to 50 times per second. [2]. The reader performs the operations to register the data attached with the RFID tags one by one on each tag with the combination of customized software and computer. A typical RFID system work cycle can be seen in figure 1.

The RFID system consists of following five components:

- Tag (attached with an object, unique identification).
- Antenna (tag detector, creates magnetic field).
- Reader (receiver of tag information, manipulator).
- Communication infrastructure (enable reader/RFID to work through IT infrastructure).
- Application software (user database / application / interface).

RFID tags contain microchips that store the unique identification (ID) of each object i.e., Vehicle and persons. The RFID chip is made up of integrated circuit and embedded in a silicon chip [4] and memory can be permanent or changeable depending on the read/write characteristics. RFID tags can be different sizes and shapes depending on the application and the environment at which it will be used.

Ding the tag’s identifier number and writing data in to tag [7]

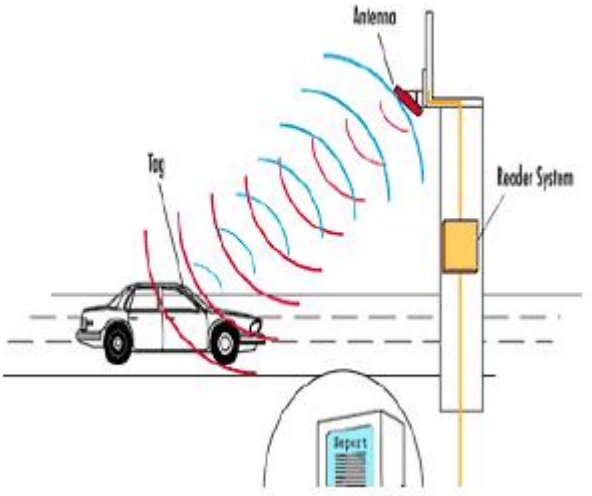

Figure 1: A typical RFID System [4]

RFID applications make the toll collection/ traffic flow estimation better with improved traffic flow, as cars/vehicles cannot pass through toll stations without stopping for interim registrations or payments. RFID is used to automatically identify the vehicle and person to locate and effectively manage the traffic flow. This application helps to keep better traffic flow and to identify traffic patterns using data mining techniques. The information on traffic flow could be useful for administration or Decision Support Systems (DSS) to take decisions on improved traffic management and also develop future policies [6].

Integration of RFID, Geographic Information System (GIS) and wireless communication technology could provide an efficient tourism management system, which could be significantly useful for the administrators and decision makers. The state and district administrations could use the real time traffic flow data for the use of emergency related plan and decision making for further activities. Efficiency and effective decision-making would be faster and could prevent hazards turn-into disaster.

Wireless communication and RFID

Number of wireless communications techniques for data transmission of RFID is well established for extensive use of the technology for the traffic and tourism management application purpose. For example V-SAT communications integrated with GIS / Digital maps could be used for the seamless and manageable data transmission and hence effective and efficient decision-making during emergency and normalcy. The integrated use of the various ITC tools and techniques could reduce the time of actions; provide better and live situation updates for the actionable plans. Real time information about the inflow and outflow of the vehicular traffic and pilgrim movements with the number of vehicles and passengers will certainly enable district as well as state administrations to plan for effective Char-Dham-Yatra or tourism management.

Summary and recommendations:

Recent organization research indicates that an expanding number of organizations are facing increasingly unforgiving socio-political-economic contexts (D'Aveni, 1994). In general operational failures result inappropriate, incomplete and mindless organizational response to unexpected and demanding environmental contingencies - such as major and unforeseen natural disasters, road blockages, communication breakdown or other essential supply collapse due to extreme weathers

By virtue of the tough Himalayan terrain, road connectivity and other facilities required to support the huge floating population of tourists need more development and efficient.

Vehicles on the tourism circuit and tourists could be given RFID tagged ID for vehicles and persons at the entry points for Char DhamYatra or at the tourist registration office by the government. There should be one central control at Dehradun with the linkages to all the traffic access points through out the Char-Dham root for real-time traffic management and control. For any emergency situations or road blockage number of tourists as well as local vehicle could be counted at any given span of road distance. Vehicle movement could be regulated through the barrier gates in multiple Traffic Access Points (TAP) (Figure 2). The state as well as district administration would be updated through web-based applications. A detailed primary survey for locating the on-ground traffic access points for the RFID reader along with the Computer and other communication and networking instruments could be performed with the appropriate domain expert(s) selected or deputed by the government.

Apart from the traffic access points for RFID based monitoring; refreshment points at regular interval could be another welcome step for tourists and pilgrims. For any unforeseen situations and road blockage, basic facilities like drinking water, washrooms, communication facilities, food and television etc. should be available for the stranded tourists / pilgrims. Locations and operational modalities could be worked out with state and district administrations.

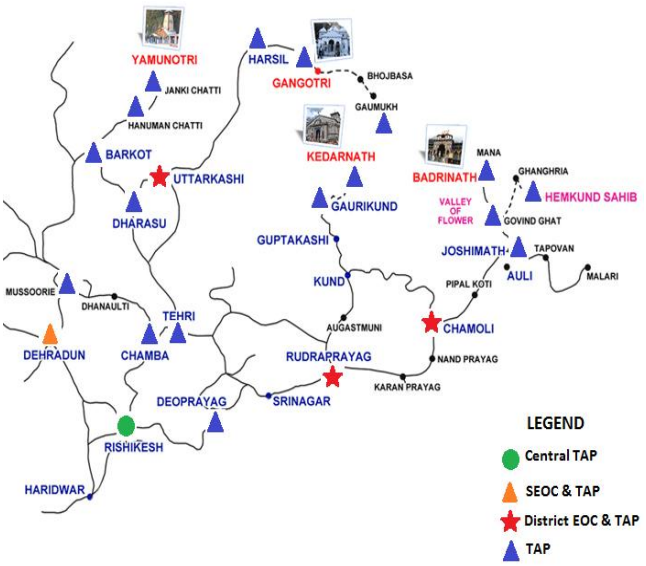

Figure 2: Schematic map of Traffic Access Points (TAP) for Uttarakhand Char-Dham-Yatra circuit

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