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Civic Groups Engagement in Saving Bengaluru Lakes: A Study

DIPAK MANDAL*
S MANASI**

ABSTRACT

This article discusses the role of civic groups in the protection and management of lakes in Bangalore. It explores the different activities of civic groups and how they help improve the city environment in lake management. Nowadays, civic groups play a significant role in community interests where the ecology and environment are central concerns. In addition, this paper discusses how urban expansion has collected huge tolls from the lake environment and how civic groups form over a period to save the lake environment. The paper also examines how the groups negotiate with the government and other agencies for policy change and the adaptation of sustainable practices to save the lake environment in the city.

Keywords: Urbanisation, Urban Environmental Movements, Urban Lakes, Civic Groups, BBMP, Bengaluru

INTRODUCTION

Urbanisation in Bengaluru started increasing after the economic liberalisation when the massive scale of the private sector and Multinational Companies (MNCs) across the world took part to raise the city Gross Domestic Product (GDP) (Husain, 2019). During the period of 1993 to 2004, the country's GDP growth rate was 7.93 per cent, where the city had a 20.76 per cent growth rate.¹ In addition, many universities and colleges are located in the city, which attract youths from different parts of the world. As a result, software, MNCs and industries have set up their headquarters in the city, leading to massive migration into the city. This situation has caused a variety of problems for the city, especially environment-related.

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However, when the urbanisation process is fast and urban challenges get intense, it poses severe challenges to public urban government institutions, affecting the quality of life. When problems reach an unacceptable threshold for the citizens, we see various forms of protests through collective action by civil society organisations demanding change. These are pressure groups that push the government authorities to make the necessary changes and have led to environmental movements in urban contexts when the magnitude of the problems gets uncontrollable, with profound implications. For instance, Environment Support Group has filed a Public Interest Litigation (PIL) against lake privatization in Bengaluru. Residents such as *dhobis* (washer community), fishermen/women, Resident Welfare Associations (RWAs) supported Mr Leo Saldana on this issue, and they got huge attention. Finally, on March 3, 2011, the High Court of Karnataka accepted the letter to protect urban lakes in Bengaluru.

Given this backdrop, it has been observed that citizens' involvement in governance has immensely increased. Bengaluru city citizens' networks are vibrant in action and have showcased marked improvement in solid waste management, lakes' rejuvenation, and tree planting. This paper is confined to lake-related movements only. It briefly discusses urban environmental movements and elaborately explores how the citizens have been active and created an environmental movement in the context of lake rejuvenation at length.

Urban Environmental Movements

The urban environmental movement seeks to protect the natural world and promote sustainable living in urban areas. The urban environmental movements are conceived as broad networks of people and organizations engaged in collective action in the pursuit of environmental benefits in urban areas. Manasi and Deepa (2020) talk about arsenic contamination and environmental degradation of Hootgalli Village in Mysore. This village is affected by water contamination (arsenic) due to industrial effluents. This industrial effluent is the primary source of Potassium Nitrate, which came from the manufacturing sector. Potassium Nitrate has increased the Biochemical Oxygen Demand (BOD) in the lake, water-borne disease, and arsenic contamination in groundwater. The political leaders identify problems and mobilise local people to protest against the industrialists. The local people demand their rights for unpolluted drinking water, which can happen only with the shutting down of the industries. Vote banks and political ideology have played a significant role in this movement. This local conflict has a significant impact on politics, the economy, and the society.

Another paper by Manasi and Smitha (2012) documents a case in Koramangala that focuses on urban floods, resulting in conflict (Mansi & Smitha, 2012). An apartment complex of 300 plots was built on the gradient of Shinivagulu Tank bed in 1989 by the Bangalore Development Authority at Koramangala. A storm water drain of about 40 feet passes through the layout. During heavy rains, water enters the households causing inconvenience to the residents. Hence, a secondary drain was built to divert floodwaters into storm water drains solving the problem partially. The natural slope of the Koramangala valley of which Shinivagulu Tank bed is a component, facilitates water to drain through the wetlands into the Bellandur Lake, affecting the natural flow and causing flooding along the belt. The residents filed a writ petition in the High Court against the nuisance of the drain, asking for covering. The government came up with a Rs110 crore project of re-modelling the open drains passing through four valleys in Bengaluru but this remains incomplete. This pursuance helped resolve the issue wherein Rs 400 crore was sanctioned for re-modelling the drain and resolving the issue.

The above-discussed problems highlight the intensity and dimensions of the problems leading to agitations and environmental movements. Thus, the environmental movement can be described as a social and political movement, mainly concerning preserving the environment and improving the state of the environment (P.P. Karan, 1994). It can also be said of the green and conservation movement. Generally, environmentalists favour the sustainable management of natural resources and the protection of the environment via changes in public policy and individual behaviour.

Methodology

The article is based on the urban environmental initiatives in Bengaluru city, India, the citizen networks and their approaches, with specific reference to asserting lake rejuvenation. The information is based on a review of literature on urban environmental initiatives which have gradually transformed into environmental movements, lake rejuvenation, secondary data analysis and some focus group discussions. Secondary data was collected from several sources such as books, journals, and websites. This data will help overview the location of local Urban Environmental Movements (UEM), nature of environmentalist actors, population engagement, and source of funding. Qualitative data helped identify citizen perceptions, the structure of movements function, socio-political and economic status. The sample frame of the study was prepared based on different parameters: location criteria, organisational status, actors involved, the area covering of actors, their

involvement in the issue, and their period of struggle and influence of change. Indicators were developed to measure the outcomes of UEM.

Actors involved in Urban Environmental Movements

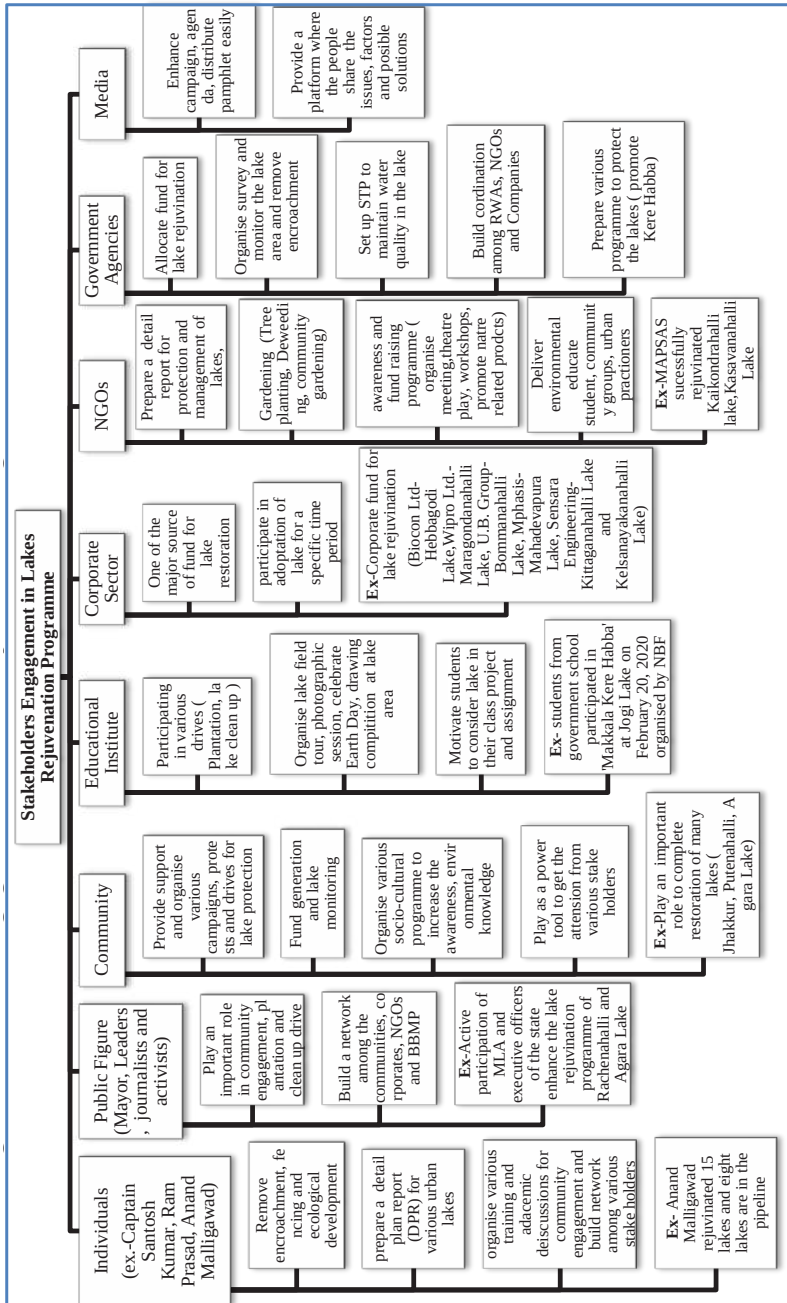
Several factors trigger urban environmental movements. It is observed that citizens, civil society, media NGOs and Residents Welfare Association (RWAs), individual organisations are various institutional organisations involved in collective action in demanding change, more so when the threshold level is reached, affecting the quality of life (Fig. 1). For instance, the agitation against the Lingadeeranahalli processing plant near the Turahalli forest view, Bengaluru, is apt. People were agitated with the foul smell they had to bear and the anger that the nearby lake was polluted with leachate. It is essential to have a processing plant, but the technology must be in place to ensure no pollution.

Interestingly, it is observed that Bengaluru is characterised by high civic activism. Some of the initiatives have effectively influenced policy change, thus improving urban governance. More than 20 NGOs are working specifically on environmental concerns. In India, urban environmental problems vary across cities because of their geographical location, economic activity, socio-cultural factors, local governance and citizen perceptions. For example, Chennai and Mumbai face urban flooding and other natural hazards, and Kolkata faces poor urban service and encroachment of public space. Similarly, Delhi faces air pollution; Bengaluru faces land encroachment and industrial effluents, causing lake pollution and urban waste.

Bengaluru City Lake Details

There are no accurate statistics of lakes and water bodies in Bengaluru, so it is not easy to provide a complete picture of lakes in the city (Thippaiah, 2009). As there are inadequate data sources on lakes and tanks, the current study has attempted to draw attention to Bengaluru lakes and tanks. The 'Garden City' of Bengaluru had 260 lakes, ponds, and water bodies in 1962. It was sufficient for groundwater recharge for the supply of drinking water and it also fulfilled the water demands in the city's agriculture sector and the outside suburban areas. Also, these numbers (total number of lakes and water bodies) were able to control the local climate variability (Rau, 1986). One study done by Deepa mentioned that in 1973, the Bangalore Urban District had a total number of 379 tanks and out of this, 138 and 241 tanks were located in North Taluk and South Taluk respectively (Bharadwaja, 2016). However, today, most of the lakes have vanished, are polluted, sewerage fed, encroached by developers due to unplanned urbanisation, increased

Fig. 1: Stakeholders' Engagement in Lakes Rejuvenation Programme

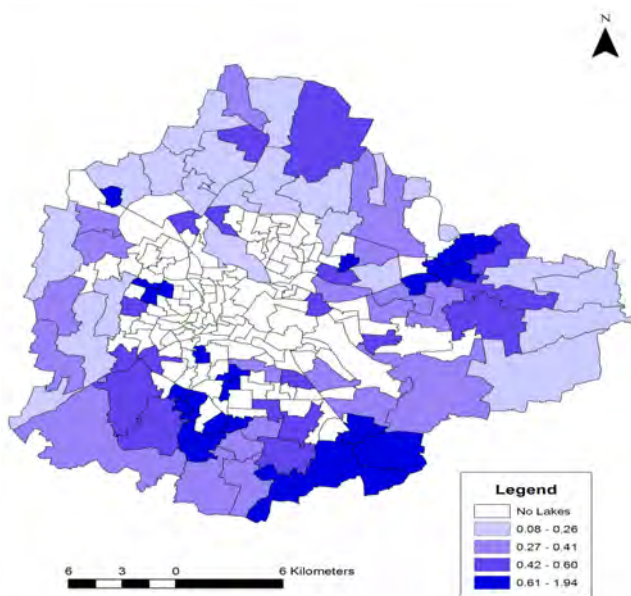


Source: Field Observation by the Authors.

population growth and anthropogenic activities. The total number of lakes has reduced from 262 to 127, and out of these, only 81 lakes are liveable in the city (Namma Bengaluru Foundation, 2014).

The city has a maximum number of lakes located on the periphery (See Map 1). The southern part has more lakes, followed by northern, eastern and western parts of the city. The highest lake density is occurring in the south-eastern and northern part of the city limit, and moderate density is located in south-western and north-western part of the city limits. The lake density in the core area is very low compared to other parts of the city as the transport nodes, i.e., bus station, railway station, industrial and commercial activity, are concentrated here. In the overall scenario, rapid urbanisation and population growth significantly reduce the number of lakes and lake density.

Map-1: Choropleth Map Showing the Ward-Wise Lake Area in km², 2011



Source: Map prepared by author based on BBMP's Lake Department Data, 2011.

Role of Civic Groups in Lake Rejuvenation Programme

Lakes are an essential focal point of several civic groups, NGOs, resident associations, academicians, and environmentalists. The group formed is usually based on the people residing in the lake neighbourhood and several other associations, NGOs and volunteer groups. To draw the attention of the residents and the government, the concerned groups organise photographic sessions, file Public Interest Litigation (PIL),

campaigning, and painting competitions among the students. Similarly, they organise lake clean-up drives, celebrating cultural and religious festivals, awareness creation programmes, community meetings, *KereHabba* (lake festival), and plantation programmes. The civic groups also discuss issues with the local government and corporate bodies as they share possible solutions to rejuvenate the lakes.

Some citizen groups secure lake ownership from the Bruhat Bengaluru Mahanagara Palike (BBMP), like United Way of Bengaluru, Mahadevapura Parisara Samrakshane MattuAbhivrudhi Samiti (MAPSAS), and Puttenahalli Neighbourhood Lake Improvement Trust (PNLIT). They are maintaining seven, five, and one lake, respectively. For rejuvenating the lakes, these citizen groups are following three significant steps. They are:

- (i) The first step includes cleaning, gardening, beautification, and maintaining of the lakes;
- (ii) The second step involves working with the BBMP and forming guidelines to increase the strength of lake revival activities; and
- (iii) The third step includes getting the attention of the local community groups, organising the programmes, community meetings, and lake festivals for the involvement of people, and other civic groups towards the lake rejuvenation programme.

Timeline for Formation of Civic Groups

Most of the environmental NGOs, civic groups and volunteer groups were formed during the post-economic reforms period. The reason is that under this policy, several MNCs, IT firms, and service sector industries got started in Bengaluru city. This created a large job market, better infrastructure and improved the living standard of the citizens as well. It also increased the population growth and built-up area in the city. India has significant economic disparities between the rural and urban areas, and people prefer to migrate from rural to urban areas. The concentration of population and the rapid urbanisation created several environmental problems in the city.

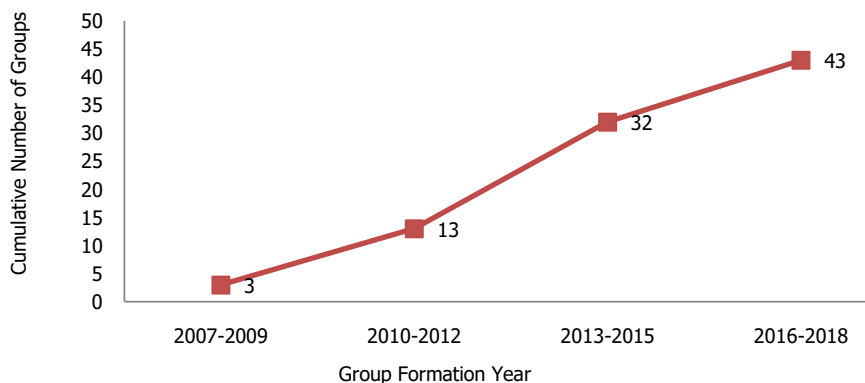
To protect and conserve the city environment, various citizen groups, volunteer groups, NGOs and activists formed a network to combat these problems and challenges. These groups play a significant role in creating awareness, citizen involvement, fixing the programme schedule, and reaching the targeted goals. The groups frequently discuss with the neighbours, politicians, academic institutes and other groups

to create public pressure, file PILs, get attention or seek funds from the government and other agencies.

Digital media plays a significant role in urban environmental movements. Social media is an easy way to disseminate the issues, agendas, activities, events, and contacts with ordinary people and other groups. These civic groups have a Facebook page and Whatsapp groups to discuss the problems and solutions concerning the related issues. Various stakeholders, like BBMP officials, urban planners, academicians, and engineers are attached through these social media groups (Fig. 2).

The line graph (Fig. 2) is showing the group formation year of forty-three groups in the city. The study found that more than ninety per cent of the groups were formed after 2010. As per census data, 2011 the population growth and area expansion have drastically increased after 2000, which has created numerous problems for the lake environment in the city. Some of the civic groups' activities are discussed in details as below.

Fig. 2: Line Graph-Showing the formation year of civic groups



Source: Compiled by the authors from the different sources (Field Survey, LDA Data, News papers)

The Role of Jalmitra to protect the Rachenahalli Lake

Jalmitra is a local voluntary citizen group that is committed to social services for conserving and maintenance of Rachenahalli Lake. Jalmitra is playing a significant role in mobilising local community groups and is also involved in cleaning the lake of its debris, parthenium, and other weeds. It is a civic activity group consisting of around 200 volunteers along with local community groups, academicians, Members of the Legislative Assembly (MLAs) and students. It provided a platform where everyone can fulfil their civic and social responsibilities. Jalmitra

was formed when Rachenahalli Lake was severely affected due to increasing migration and urban expansion. In the initial stages of Jalmitra, fifteen volunteers had set specific goals for the protection of Rachenahalli Lake. To achieve these goals volunteers identified specific problems with the nearby apartment residents, local community groups, local leaders, and concerned government departments to resolve the identified issues. The core group of Jalmitra consists about twelve volunteers, who also work towards expanding their team and formalising the structure for official purposes to engage in various activities related to improving and maintaining the lake. They organise weekly meetings, seminars and educational programmes such as World Environment Day, Varshikotsav, and World Earth Day to educate and motivate people for coming together to protect the lake. Due to this initiative, many citizens have joined the group and are working along with the intervention of the government for rejuvenating the Lake. In the year 2016-17, they were successful enough to sign a Memorandum of Understanding (MoU) with the BBMP for rejuvenating and protecting Rachenahalli Lake and other urban water bodies.

Ecological Importance of Rachenahalli Lake

Rachenahalli Lake is an ecologically crucial natural resource located on the northern outskirts of Bengaluru. The total area of Rachenahalli Lake is approximately one hundred and forty acres. It is performing a significant role in maintaining the ecological balance, the habitat of flora and fauna, groundwater recharge, reducing urban waterlogging, and also catering as a recreation centre. Around the lake area, there are plenty of trees, plants, bushes, and medicinal herbs. The lake attracts migratory and territorial birds and the island located in the middle houses many of these birds. The lake and the attached wetland are the habitats of several birds such as Woods and Piper, Kingfisher, Sun Bird, Baya Weaver, Egret, Spot Billed Pelican, Grey Heron, Pond Heron, Darter, and Purple Moorhen.

Involvement of Local Political Leaders

Sri Krishna Byre Gowda, MLA is engaged with Jalmitra voluntary citizen group. He is guiding Jalmitra to help the government and BBMP with the protection, planning and maintenance of the lake. He is very much interested in ensuring the revival and rejuvenation of all lakes of the entire Yellamallappa Chetty lake series of Hebbal valley and mainly the lake in his constituency. He is playing a useful role in the Jalmitra citizen group by involving citizens from his constituency and also receiving funds from the BBMP.²

Community Participation

Community participation and engagement in the protection of common property resources are essential to ensure that the natural resources are well preserved. For protecting and managing the lake, volunteer groups discuss the issues and challenges with local people for its rejuvenation. Surrounding the lake area several community groups and citizens are involved with the activities of the Jalmitra civic volunteers group. On March 18, 2017, a community meeting was held, and garden equipment was distributed to ensure the upkeep of the lake. Subsequently, every weekend people continue to attend the lake clean-up drive.

Involvement of Academicians and Resource Persons

The formation of Jalmitra Trust which was envisioned by the Executive Director of MGIRED (Mahatma Gandhi Institute of Rural Energy and Development) Sri Punati Sridhar, Indian Forest Service (IFS) in 2015 has resulted in the involvement of the community for better management of the lake and its environment. The chairperson of the trust is Major (Retired) General Haridas Gopalan, who has been very effectively taking care of the issues and concerns related to this lake. The Managing Trustee of Jalmitra Dr Shobha Ananda Reddy and Director of Biome Mr Viswanath are playing a significant role in sustaining the Jalmitra civic volunteer group. When Dr Shobha Ananda Reddy was working as an Executive Director of MGIRED, she formed a team of colleagues from MGIRED and with the assistance of Viswanath to visit Jakkur lake maintained by Jolaposhan. When the team visited Jakkur Lake, they were very much impressed by the volunteers' activities for the lake development and protection of flora and fauna. Subsequently, they were motivated, inspired and pushed to form Jalmitra as a civic volunteer group for the protection of Rachenahalli Lake.

Involvement of Other Civic Groups

Jalmitra has a reliable connection-cum-association with other civic and volunteer groups, such as BIOME, United Way for Bengaluru and so on. The Jalmitra citizen group is similarly managing the upstream Jakkur Lake with the help of Jalposhan.

Involvement of Academic Institutions

In August 2015, a team was created in the initial stages of Jalmitra with the help of staff and students of School Energy Clubs from MGIRED. Their task was to visit house to house, distributing pamphlets regarding the need for citizens' movement for the protection and maintenance of the lake. They invited citizens and local community groups for a meeting

on August 1, 2015, on the premise of MGIRE. They received a massive number of responses from the people, and more than one hundred people attended the meeting. Some of the active members present in the meeting were from St. James School, Jakkur; St. John's School, Jakkur; Government Pre-University College, Jakkur; and Sheshadripuram College, Yelahanka. The group is also associated with Indian Institute for Human Settlements (IIHS); Shrishti School of Art and Design; the Indian Institute of Management, Bengaluru; and KLE College.

Jalmitra is a guardian of Rachenahalli Lake, and this civic volunteer group is playing a significant role to conserve, protect and maintain the lake. From a dump yard, wasteland Jalmitra has converted Rachenahalli Lake into a beautiful park-cum-recreational resource. Jalmitra acknowledges the support extended by United Way for Bengaluru (UWBe) in maintaining the lake under the tripartite agreement between BBMP-Jalmitra-UWBe. Based on the requirement of the Lake Division of BBMP a formal structure had to be formed to persuade the government for taking up infrastructure related works in and around the lake. Surrounding the lake areas are passionate people with a great concern for the environment whose help is needed to manage and maintain the lake. In February 2016, Jalmitra got itself registered and entered into a tripartite agreement with BBMP and UWBe for maintenance of the lake by June 2016. Further, the tripartite agreement strengthened the trust's activities of lake management.

List of Activities of Jalmitra

- Discussion with the local community to engage in the lake protection;
- Discuss the lake conservation-related problem and motivate community members;
- Interaction with the temporary settlements outside the lake who use the lake for several activities;
- Discuss with BBMP lake division officials to get funds and conserve the lake;
- Educating school children about precautions to be taken for safety at the lake;
- Regular meetings for discussing the progress and proposed activities;
- Promote students' interaction with the migrant labourers to understand social aspects related to lake; and
- Experimenting with different methods for maintenance of water

quality in consultation with BBMP and Fisheries Department; introducing ducks, setting up floating wetlands all along the periphery of the lake with Lotus, Vetiver and other species.

Volunteers Mobilisation Activities

- Meeting and regular clean-up drives in 2014-15 with the members, students, surrounding people and BBMP officials;
- Educate the students about the importance of the Urban Lake Eco-System and its maintenance;
- Engage the college students in a short-term project to study social issues, environmental issues, and ecological issues related to lakes in urban areas;
- Jalmitra team supports BBMP in managing the idol immersion in Kalyani of the Rachenahalli Park during Ganesh Chaturthi festivities for the last three years. They also educate people to come to Kalyani about the harmful effects of Plaster of Paris (PoP) idols and request the public to use clay, mud or turmeric idols; and
- Jalmitra, UWBe and BBMP Lake Division jointly organised “Deepavali Celebration at the Lake Side”. Around sixty people participated and lighted around two hundred and fifty mud *diyas* (lamps). The primary objective of the events was to create awareness about the hazards of crackers and nature-friendly ways of celebrating festivals.

Jalmitra volunteer citizen group is helping the government in managing Rachenahalli Lake, and it is coordinating with the BBMP for further improvement of the lake. Over the last few years, the Jalmitra group is bringing several remarkable changes to protect and conserve Rachenahalli Lake. The initial task was challenging and almost impossible to clear the lake of its extensive undergrowth, dumped garbage, sewage entry, and control the practice of open defecation. However, they have secured success because they mobilised several local citizen groups, cleaned the lake every weekend and organised several effective programmes to conserve and protect the lake. The ultimate aim of the citizen group is to protect and preserve the lake environment which is fast gaining momentum through optimum government public partnership. This kind of citizen group driven management of common property resources can help in better maintaining and conserving the environment. It requires much effort at all levels and a positive bent of mind towards each other by both civic groups and government which will go a long way in preserving the city's natural resources.

Puttenahalli Lake Rejuvenation Programme

Puttenahalli Lake is located in BBMP ward no-187 in Jaya Prakash Nagar, Bangalore South. The total lake area is 13 acres and 25 guntas. The primary water source of this lake is rainwater. However, due to the urbanisation, and encroachment by the builder, the lake was filled with weeds, garbage, and untreated sewerage. To save the lake, some of the concerned citizens started organising campaigns, seminars, and group discussions towards lake rejuvenation. The volunteer groups also collected monetary contributions from the neighbouring apartments and houses. In June 2007, they formed 'Puttenahalli Neighbourhood Lake Improvement Trust (PNLIT)' as a trust to protect and save Puttenahalli Lake.

Lake Conditions before Restoration

The lake was dried most of the time and the lake bed had become a marshy dump yard. The lake area was covered by mounds of garbage and had been encroached by the private parties and people living in huts. Further, the lake was getting untreated sewerage from the neighbouring residents and apartments. People residing in huts have encroached on the eastern side of the lake area and also they use to throw garbage directly into the lake.

Ecological Importance of the lake

The lake is playing a very vital role in groundwater recharge, reducing waterlogging problems, and maintaining the ecological balance. The lake is a habitat for a variety of flora and fauna. The lake is a beautiful spot for bird watchers and some of the bird photos captured by the visitor at Puttenahalli Lake are- Duck, Geese, Grebes, Herons, Kingfisher, Kites, Sandpipers, Pelicans, Wagtails, Warblers, Bulbuls, Bee-Eaters, Crows, Hornbills, Kites, Owls, Parrots, Sparrows, and Woodpeckers.

Lake Restoration Activity

The lake restoration activity was started by a few neighbours residing around the lake in 2007. They organised a signature campaign to revive the lake, and more than two thousand people signed the campaign. After the signature campaign, they went to meet BBMP officials to restore the lake. The BBMP was very supportive, and they promised to assist by extending financial support. Moreover, the BBMP also suggested forming a registered civic group to restore the lake. The civic group started collecting contributions from the neighbouring residents for registration of the group, and a significant amount of donations came from Brigade Millennium and Larson and Toubro (L&T) from South

City. They incurred an expense of Rs. 2000 from the contribution for registering the group as a Trust and in 2010 the group registered as a trust came to be known as 'Puttenahalli Neighbourhood Lake Improvement Trust (PNLIT)'. The trust employed a wild date palm tree for their logo, which is situated inside one of the islands in the lake. They used that tree for the logo; because that was the only tree that had survived for a long period before the restoration of the lake. According to them, it represents the characteristics of resilience and perseverance. They included the word 'neighbourhood' word in the name of the trust as they received immense support and cooperation from the citizens residing in the lake vicinity.

With the help of BBMP, they started rejuvenating the lake, but in the initial stages, some of the engineers and environmentalists were against the Trust's activities. They argued that the drying and filling of the lake is a natural process, and any human interference will destroy this natural process. Another major issue faced by the Trust was encroachment, particularly in the eastern and south-western parts of the lake. This lake area had been encroached on by the residents, and they were opposed to any lake restoration activities. A multipurpose Convention Centre had also encroached on some of the lake areas in the north-western part. However, the Trust started its rejuvenating activities for managing and protecting the lake despite these issues. The trust followed two-step strategies for reviving the lake. In the first step, they identified the actual lake area and started fencing the lake boundary. In the second phase, de-silting, infrastructure development, and lake beautification were included. In the second phase, they built walking track (920 meters), gazebo, exercise bars, a toilet, dry and wet waste dustbins, a security cabin, garden waste collection bins, rainwater harvesting, a bicycle stand, and park benches. The lake is getting eight lakh litres of water per day from South City Sewerage Treatment Plant and has four treated sewerage entry points in this lake.

On July 17, 2010, PNLIT organised a tree-planting drive with the help of neighbouring residents, and they planted 127 saplings around the lake area. Sh. Satish Reddy, Member of the Legislative Assembly, was the chief guest, and he planted the first sapling. Sh. Ramesh, then Corporator of Puttenahalli and Sh. Purushottam Ravi, then Corporator of Arekere planted the saplings along with the other participants. In May 2011, PNLIT signed a Memorandum of Understanding (MoU) with the BBMP for the maintenance of the lake. PNLIT is the first civic body that has secured such MoU to support the lake. PNLIT also engages in other additional activities related to the betterment and improvement of the neighbourhood.

Mobilisation Strategy

The first mobilisation strategy towards lake restoration was meeting neighbourhood people and securing a signature campaign. To get more signatures and people's attention, they went door to door campaign and discussed the problems with the neighbouring citizens. To create awareness and importance of the lake environment the group organised several environmental-related programmes such as photography sessions, lake clean-up drive, and tree plantation programmes with the residents, as well as students from schools and colleges. On the first Saturday of every month PNLIT celebrates 'Family Gardening Day', and many family members spend their time wherein they clean and beautify the lake.

In the initial stages, the participants were fewer, but later there was increased participation over a period. In 2010, the group registered as a Trust and in May 2011, they signed a MoU with BBMP for three years. Through the MoU, BBMP assured PNLIT that they would provide financial assistance for three years for lake rejuvenation and improving the infrastructure of the lake area. After the post-signing of the MoU, the primary source of funds for the lake restoration programme was mostly the financial assistance extended by BBMP. Currently, the primary sources of funds are public donations and Corporate Social Responsibility (CSR) funds. They have connections with the various CSR activities and corporate volunteers from CISCO, Deloitte, and VMware. They also have merchandise called 'PNLIT Merchandise' to raise funds and create awareness. Merchandise includes cloth bags, t-shirts, calendars, postcards, and photo frames.

During the lake visit, one of the trustees mentioned that they engage in several educational and environment-related projects. For securing projects, the Trust shares its experiences, activities, and target goal with CSR representatives as well as other organisations. In the last year, a private bank had adopted the lake for one year. This initiative has helped to get funds and also acts as another vital link to engage them with their group's activities. Further, many of the organisations and CSR representatives continue to keep in contact with Trust and assist them after their discussions and meetings. The Trust has maintained a Google Email Group and Facebook page, where they post their current activities, pamphlets, handbills, leaflets, flyers, and programme schedules. Also, they publish a Trust Annual Report wherein they discuss details about lake rejuvenation activities, current challenges, the status of present flora and fauna, cultural and educational activities, corporate connections, and audited accounts which are all shared with the people.

PNLIT activities are one of the success stories of the lake rejuvenation programme. Various organisations have recognized and awarded the Trust for their involvement in the lake rejuvenation programme, such as

- In March 2013, Namma Bengaluru Award 2012 by Namma Bengaluru Foundation;
- In April 2015, 'Sahar Green Karo Contest' by Earth Day Network;
- In September 2015, the Prakrti Mitra Award by B.N. M. Institute of Technology; and
- In July 2012, the People's Green Award by Tata Consultancy Services (TCS). (Annual Report 2015-16, PNLIT)

Present Status

The PNLIT core committee consists of seven trustees, and they are assisted by four gardeners, one sweeper, and one manager. The Trust has a good connection with the BBMP and Karnataka State Pollution Control Board (KSPCB) and has also signed a MoU for receiving funds from BBMP. At present, the Trust is facing financial problems to maintain the lake, and the only sources of funds are public donations and CSR contributions. However, this fund is not sufficient to provide a salary for the gardeners, sweepers, managers, and maintenance of the lake. Furthermore, PNLIT is continuously fighting to overcome financial as well as additional problems. Another major hurdle faced by the Trust is an encroachment on the eastern side of the lake area, occupied by people living in huts who do not want any restoration of the lake. None of them has participated in the lake rejuvenation programme. PNLIT discussed this matter with the BBMP officials and the government has taken up the resettlement initiative. However, they do not want to leave their huts as they have voter identification cards, due to which vote bank politics also plays a significant role. As of now, there are conflicts between the Trust and the people living in huts, and it is considered one of the significant problems. They have damaged the fence, dump garbage directly in the lake bed, and dry their clothes on the fence. Meanwhile, BBMP has promised to build a fence once again on that side of the lake and also assign some home guards to monitor the lake.

Suggestion by PNLIT for Lake Revival Programme to other civic groups

Citizens should change their behaviour and mindset towards protecting the lake environment in the city. Every problem can be resolved if a

large number of people express their concerns. The civic groups have to identify the current issues and discuss them with the neighbourhood. In general, citizens living in the neighbourhood are more concerned about their surroundings and the development of their vicinity. Some environment-related events are to be organised wherein citizens, students, government officials, and other organisations can share their knowledge and experience. People's participation is much more crucial compared to government participation as people can easily participate in lake restoration activities. The civic groups need not have a large number of inactive people; instead eight to ten committed people are enough to rejuvenate the lake.

Summary

Environmental challenges have become more prominent issues in the contemporary world. The civic groups play a significant role in this regard by organising the people, identifying the problems and putting up pressure on the authorities. The environmental challenges are interconnected in nature, so it is getting attention from the different parts of the world. As a result, the area of civic groups is spreading, overlapping with the regional, national, and world levels (Khondker, 2001). The groups share their problems, opinions and practices with other groups to create a proper framework to combat the environmental problems.

For forming a group, the residents of the area residing/near and around/the lake take the first initiative, discuss the problems with the people and try to organise them. The residents generally organise weekend and public holiday meetings and discuss possible solutions and future activities. Sometimes, to draw the public's attention to the problems and save the lake, they gather, agitate, and criticise the existing policies. By using social media, they are trying to mobilise the people, and many of them have lake rejuvenating Whatsapp, Facebook groups, and websites and internet blogs.

In summation, the citizen networks have provided a platform for engaging in the management of the city environs and also aided in monitoring both the local authorities and the urban ecosystems. The networks have created opportunities for stakeholders to connect and discuss the requirements and interventions needed for transformations. Besides, their approaches have been unique to match the local contexts across neighbourhoods and provide lessons amongst them and others. For instance, Jakkur Lake's transformation showcases the success of the citizen group wherein they worked closely with the government. Besides, involving volunteers at various levels is a strong point. During the process, they do face issues on the ground and these are addressed

by negotiations. Since some of the issues remain, the groups do see the need for change on several fronts. As a whole, these civic groups have played an important role in transformations that aid in protecting and sustaining water bodies in Bengaluru and showcased the strength of citizen participation in improved governance.

REFERENCES

1. (2016). Annual Report 2015-2016. Bangalore: Puttenahalli Neighbourhood Lake Improvement Trust.
2. Bharadwaja, A S (2016). Bengaluru Lost Its Water Bodies, and Here is What is Remaining. Retrieved May 01, 2019, from Citizen Matters: <http://bengaluru.citizenmatters.in/bangalore-water-bodies-ndwi-images-research-7994>
3. Husain, M (2019). Bengaluru's Growth Story. Retrieved June 02, 2019, from The Hindu: <https://www.thehindu.com/opinion/open-page/bengalurus-growth-story/article27102964.ece>
4. Karan, P P (1994). Environmental Movements in India. *Geographical Review*, 32-41.
5. Khondker, H H (2001). Environment and the Global Civil Society. *Asian Journal of Social Science*, 29(1): 53-71.
6. Manasi, S. and Deepa, N. (2020). Pollution in Hootgalli Village, Mysore. *Water Conflicts in India* (pp. 176-181). Routledge India.
7. Namma Bengaluru Foundation (2014). Survey on Lake Encroachments. Bengaluru. http://www.indiaenvironmentportal.org.in/files/file/Survey_on_Lake_Encroachments.pdf
8. Rau, L (1986). Restoration of the Existing Tanks in the Bangalore Metropolitan Area. Report of the Expert Committee.
9. S. Manasi with K. C. Smitha (2012). Case Study - Floods in Bengaluru: No Respect for Water Bodies and Water Courses, in 'Agony of Floods - Flood Induced Water Conflicts in India' Edited by Ekalavya Prasad, K. J. Joy, Suhas Paranjape, Shruthi Vispute, Forum for Policy Dialogue on Water Conflicts in India, October.
10. Thippaiah, P (2009). Vanishing Lakes: A Study of Bangalore City. Bengaluru: Institute for Social and Economic Change.

Footnotes

1. <https://www.thehindu.com/opinion/open-page/bengalurus-growth-story/article27102964.ece>
2. '(December 2014 to 2017). Voice of Jalmitra: a Newsletter. Bengaluru: Jalmitra: Guardians of Rachenahalli Lake'.

Spatial Planning Strategies for Crime-Prone Public Spaces: Amritsar City

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ABSTRACT

Urbanization leads to changes in the social, cultural, physical and environmental structure of cities, generating criminal elements in cities. The higher the rate of urbanization, the higher will be the crime rate of cities. The overall crime rate of India increased by 3.4% from 2014 to 2015. In the case of Amritsar city, the registered crime rate in 2015 was 163.8 per lakh population. This paper attempts to understand the nexus of crime, land use, population density, and vulnerability factors to identify vulnerable areas, crime hotspots, and crime rates. It aims to identify crime-prone public spaces for snatching and vehicle theft and suggests planning strategies to counter them. It provides an insight into crime prevention strategies from the perspective of a land use planner. Thus, the present paper provides a way forward to initiate a potential partnership between the government, the police and spatial planners to work with communities to reduce crime in public spaces.

Keywords: *Crime, Land use, Crime Rate, Hotspot and Vulnerable areas*

INTRODUCTION

Crime has been part of our society since the existence of mankind. Over the years, the type of crime, urban setting, social and economic conditions of the people changed so did the methods to commit a crime (Malik, 2016). The phenomenon of urbanization gained attention for its positive and negative impacts on social, economic and environmental

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aspects because 31% of India's population is in urban areas. Though the urban population seems low, the increasing rate of urbanization tells a different story about our cities. It is due to higher accessibility to better opportunities of education, employment, physical infrastructure and lifestyle.¹ On the other hand, urbanization has led to a housing shortage, real estate inflation, slum growth and unauthorized development, urban sprawls, low income, unemployment and high pressure on existing physical infrastructure. Hence forcing cities to develop faster to fulfill the rising demand of its inhabitants at the cost of open spaces, parks, gardens and public spaces. This instigates a rat race amongst nations and individuals to achieve a certain level of economic and lifestyle standards. While failing to do so can lead to repercussions like crime. According to Indian Census 2011 reports, the cities with maximum urbanization are Delhi, Mumbai, Bangalore and Kolkata (in descending order) and have high crime rates (13%, 6.3%, 5.6%, and 4.7%, respectively) (NCRB, 2014). Therefore, it can be said that the increase in population influences crime and the higher the rate of urbanization, the higher the crime rate.

Amritsar is a developing metropolitan city. It is located in northwestern India, approximately 450 km from Delhi. It lies at the international border of India and Pakistan. Amritsar district covers 1394.19km² approximately, with a population of 2490656 (Census, 2011). The area under municipal limits is 142.37 km², while the population is 1132383, with a growth rate of 17.11% (Census, 2011). With an increase in urbanization, there has been an increase in the rate of crime. According to the reports of the National Crime Record Bureau (2016), Punjab has 37983 IPC (Indian Penal Code) registered complaints during the year 2015 (per 1 lakh population). Amritsar had 1939 IPC registered complaints while the crime rate was 163.8 in 2015 (NCRB, 2016). The crime rate has been calculated only for the registered cases so, there are chances that some occurrences have not even been reported.

The walled city (central area of Amritsar) was formerly known for its planned layout that was resistant to external invasions during the medieval era. Currently, the same area (walled city) provides an opportunity for crime because of grey areas and inadequate lighting. During the last couple of decades, the city has evolved organically, which means it has haphazard developed areas (majorly in southern and eastern areas), while there are some small planned neighbourhoods developed by the Amritsar Development Authority (ADA, 2012). These areas also have crime incidents, but the time of occurrence and the type of crime is different from the walled city because the degree of vulnerability of the areas varies.

The land use and diversity of the activities make the city unique

therefore, it is important to know the character and structure of the city to understand the crime opportunity that has been created in public areas and strategies formulated to counter it.

The objective of this paper is to understand the nexus of crime, land use, social, and vulnerability factors to identify crime-prone public spaces in Amritsar. This paper also attempts to propose place-making solutions that can bring cooperation between the government, planners, police and communities against crime.

Methodology

The study has been conducted based on the data collected from secondary sources which included journals for creating a theoretical framework; a Census Report (2011) for demographic data; the Amritsar Police website (2016), National Crime Record Bureau NCRB (2016), Report Writing (RW) department (2016) for registered crime records and administrative maps; Master Plan (2010-2031), City Development Plan (2025), a study conducted under HUDCO chair on the State of Cities in North-Western India: A Case of Selected JNNURM Cities (Study Focus City: Amritsar 2013) for landuse map, existing and proposed implementation plans. After reviewing the collected data and reports, the shortlisted crimes for this study were snatching and vehicle theft during the year 2016. The study was limited to the municipal limits of the city.

The collected records were filtered and spatially allocated on a map using GIS. An overview of crime for each police jurisdiction was created and analysed hotspots and calculated the crime rate. The crime rate is calculated based on the formula given by National Crime Record Bureau (an Indian government agency).

The vulnerability of the areas has been identified based on six parameters such as social disparity, dark spots, street infrastructure, connectivity, busy / overcrowded areas and unkept open spaces. These parameters are taken into consideration based on the visual observations as well as the perspective of the local communities on the issue of safety. Later the literature review also supported the selected vulnerability parameters.

Theoretical Framework

Crime originated from a Greek expression 'Krimos' and the Sanskrit word 'karma' means the social order (Syed Mohammad Aamir Ali)². In the 1800s and 1900s, crime theories were devised to understand the psychology of the offenders, victims, vulnerable areas, vulnerable

population, gender-biased crime, gender-oriented crime, effects on victims and pattern of crime. These theories can be categorised as origin-based, law-based, offenders-based, victim-based and place-based. This paper focuses on the place dimension of theories covering topics like a place of occurrence, loopholes of community, lack of security and placemaking. The place dimension theories can help to understand the pattern of snatching and vehicle theft in Amritsar.

Labelling Theory was given by Émile Durkheim in 1897 to understand social construction and interaction. It mainly labels the people as unlawfully deviants or criminals based on the type of crime committed (Evans, 2012). Over the years, there have been debates on if it brings any good to put people under labels or not. But, the idea of labelling areas can be taken forward as it can help to track criminal activities spatially and to establish and understand the spatial pattern and trends.

The Broken Window Theory was given by James Wilson and George Kelling in 1982. Broken Window means that whole of the neighbourhood is labelled as a 'Black Spot' as crime can easily be committed and offenders can escape. This creates a sense of fear amongst people and they go against moral values. The low quality of life is considered one of the main reasons to commit a crime. The community becomes vulnerable because it lacks maintenance as well as security. The colonies, which have weak security or the offenders can easily break through the security without being caught is also marked as broken window. If these areas are identified then it can at least help to reduce minor crimes in the area. The theory mainly focuses to reduce petty crimes by keeping the neighbourhood safe by using high security and create secure urban areas (Wilson and Kelling, 1982).

The Brantingham and Branting-ham Theory was given by Chicago School in 1981 which stated that crime is committed by offenders only when they get an opportunity where they have to put the least effort and there are least chances of getting caught by police. The offender needs to be the master of the area to commit a crime in that particular area therefore, he has to have the best knowledge of the area and its people. The crime is committed when the activities of the people overlap with the activity of the offender or it lies within the radius of his knowledge. The theory works on two principles, i.e. Distance decay functions on victims who move out of their normal activity area and Distance decay difference on offenders – range of distance travelled to commit a crime (Brantingham et al., 1995). The theory focuses to avoid the overlapping of paths, spaces, and activities of victims and offenders which helps to reduce the chances of crime.

The Rational Choice Theory was given by Derek Cornish and Ronald Clarke in 1985 which states that an offender commits a crime only after weighing the pros and cons of the risk taken which includes his chances of safe escaping and valuable gain. The theory is based on calculating the risk that an offender can afford to take just like a cost-benefit analysis (Clarke and Felson, 1993). Therefore, it suggests creating spaces where offenders can find more cost on their part than benefit and get discouraged to commit a crime.

The Defensible Space Theory was given by Oscar Newman in 1972 which states that it is important that society holds a public place, not the government. Therefore, it is important to create a sense of ownership amongst the people which will encourage them to stay alert all the time. This in turn helps to secure the place. As per Oscar Newman, there are five factors which create a defensible space against any crime. Five factors for defensible space: Territoriality, Natural Surveillance, Image, Milieu and Safe Adjoining Areas. The theory focuses on creating areas which are vibrant and can naturally be under surveillance. It also promotes public participation which is usually missing (Eck, John and Weisburd, 1995).

The Routine Activity Theory was given by Cohen and Felson in 1979. The routine activity theory is based on the activities that take place in the surroundings of the people and how the missing elements lead to allowing the offenders to commit a crime. The theory focuses on the lack of security in daily routine which can lead to allowing the person to turn to be a victim. The offenders also have their playfield where they have the best knowledge about the escape routes and hideouts (Geason and Wilson, 1988).

Techniques of Mapping

Racheal Boba (2008), states that crime mapping is a process of using a geographic information system to conduct spatial analysis of crime problems and other police-related issues. The mapping of crime was introduced in the 19th century in France. Initially, the Single Symbol mapping was used by the police which turned out to be ineffective because at a certain stage it will reach a saturation level. Therefore, a demand to use alternative mapping techniques was created. The alternative technique to map crime based on the scale was Graduated mapping. The other mapping techniques introduced are Density (concentration-based), Buffer (Influence area), Chart (different types of crime) and Interactive (Santos, 2013).

This paper covers snatching and vehicle theft crime which uses

density mapping to identify hotspots. Later the overlapping of identified vulnerable areas and hotspot shows crime-prone areas of Amritsar.

Crime Prevention through Environment Design (CPTED)

National Crime Prevention Strategies (1996) states that there are four pillars of crime reduction strategies. It aims to reduce the opportunity for offenders to commit crimes by using planning and management principles in the built environment. There are five principles given by Kruger-et-al which explain ways to reduce crime. First, an area is safe only when there is a presence of natural surveillance and visibility of the area. The second factor is that the people living in the area should have an attitude of owning that place which helps to manage that space. The third factor is the accessibility of the area, accessibility should facilitate the easy entry and escape possible during an emergency. The fourth factor is the appearance of the area which means that an aesthetically pleasing area is likely to be less vulnerable to crime than an unkempt public area. The last factor is the target hardening which means that the place should be secure enough to give a hard time for the offender to break through. More the time required to break in, the more the chances of the offender dropping the idea of entering that area. The strategies that are proposed at the end of the study are based on the theories and CPTED principles (Kruger,2005).

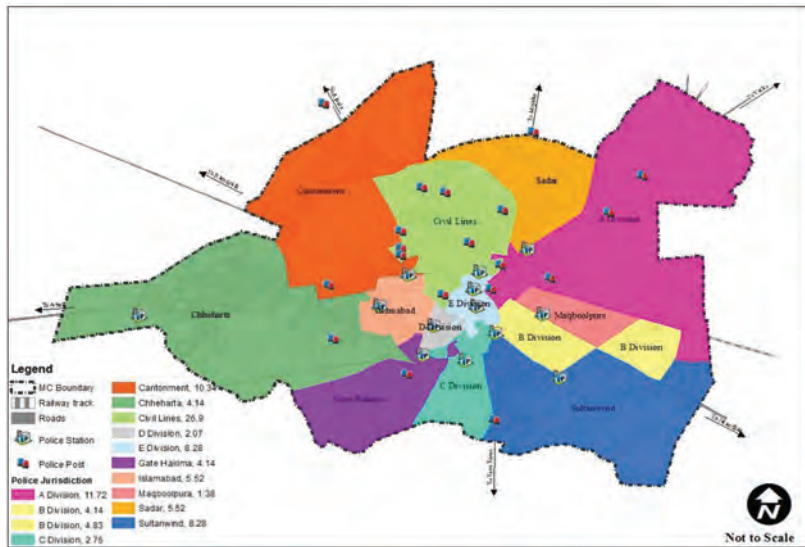
Findings

Amritsar is divided into 13 police jurisdictions which are as follows: A division (north-east, to Verka), B division (east, to Jalandhar), C division (south, southern part of the walled city to Tarn Taran), E division (central - northern part of the walled city), Cantonment (north-west, to Ajnala and Ramtirath), Chheharta (west, to Pakistan border), Civil Lines (north), Gate Hakima, (south-west), Islamabad (central but outside walled city), Maqboolpur (east), Sadar (north), and Sultanwind Gate (south-east, covers 2 regions). Each police jurisdiction is supported by a police station and various sub-stations and posts (refer Map 1).

Amritsar police records showed that the total registered snatching and vehicle theft cases were 145 (Amritsar Police, 2016) out of which 87 were of snatching and 58 were vehicle theft.

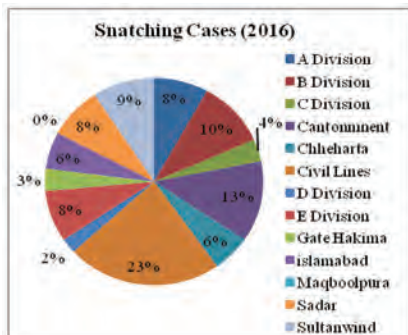
Figures 1 and 2 show the distribution of snatching and vehicle theft respectively, for each police jurisdiction. The graphs show the percentage of individual cases in each jurisdiction for the total number of crimes registered for each category. Figures 1 and 2 show that the majority of the crimes had been occurring in the civil lines jurisdiction

Map 1: Police Jurisdictions



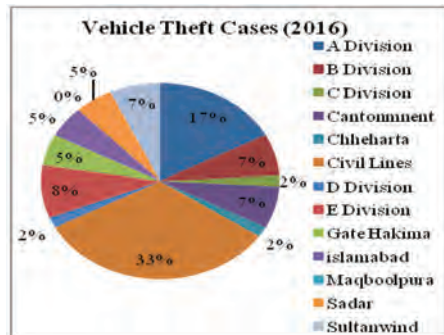
Source: Police Department, Amritsar.

Fig. 1: Snatching 2016



Source: Computed Values from Police Department Data.

Fig. 2: Vehicle Theft 2016



Source: Computed Values from Police Department Data.

and D division jurisdiction had the least number of registered cases. Therefore, civil lines had a maximum share of 26.9% while A division had 11.72% and cantonment had 10.34%. Maqboolpura had a minimum share of 1.38%. The recorded data showed that 78% of criminal activities of snatching were committed in the evening hours between 6 pm to 12 am. The majority share of the vehicles stolen is 2 wheeler, i.e. scooter, motorcycle or activa which is 64% while 27% of the cases are registered for stolen cars. The result showed that vehicle theft activities occur throughout the day but the majority of the theft (i.e. 39%) is committed in the evening between 6 pm to 12 am.

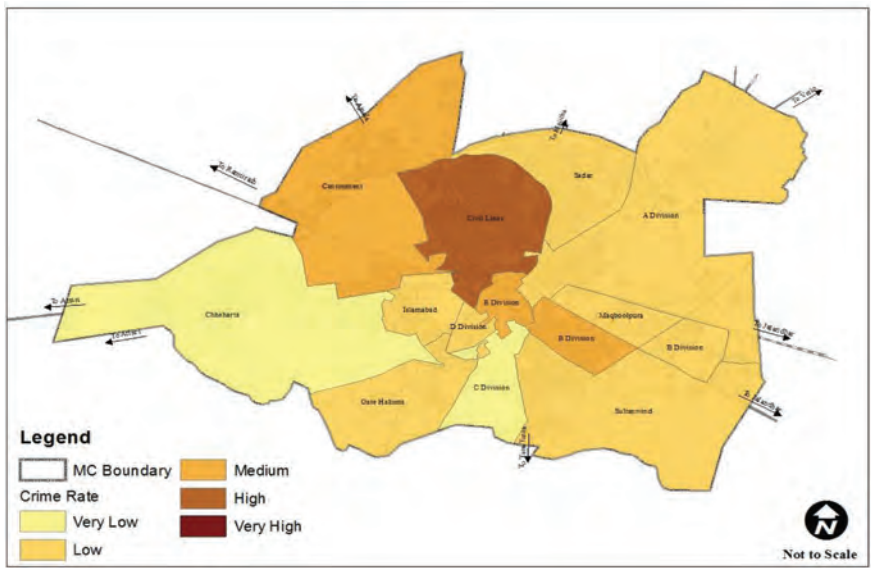
Crime Rate

The crime rate has been calculated at two levels: city level and jurisdiction wise. In both cases, the rate has been calculated per one lakh population (NCRB, 2016).³ According to the given formula, the crime rate for Amritsar is calculated below:

$$\text{Crime Rate of Amritsar city} = \frac{145}{1219478} \times 100000 = 11.89$$

Similarly, the crime rate for each police jurisdiction has been calculated. The results show that the civil lines jurisdiction had the highest crime rate (30.14), while the cantonment jurisdiction and the E division had the second-highest rate (20). Chheharta division had the lowest crime rate (3.2), followed by the C division (4.9) and then the D division (5.8). Based on the highest and the lowest crime rate values, five categories were formulated (lowest, low, medium, high and very high). The intermediate-range units were set at a regular interval of 10. Map 2 shows a comparative ranking of the crime rate of jurisdictions. The figure shows that the Chheharta jurisdiction and the C Division have very low crime rates while the D division, Maqboolpura, Sultanwind, Sadar, Islamabad, Gate Hakima and B division fall under the low crime rate category. The B division, Cantonment and E division fall under the medium crime rate category. There is no jurisdiction which had a critically high crime rate; therefore, no jurisdiction was a very

Map 2: Crime Rate



Source: Computed Values from Police Department.

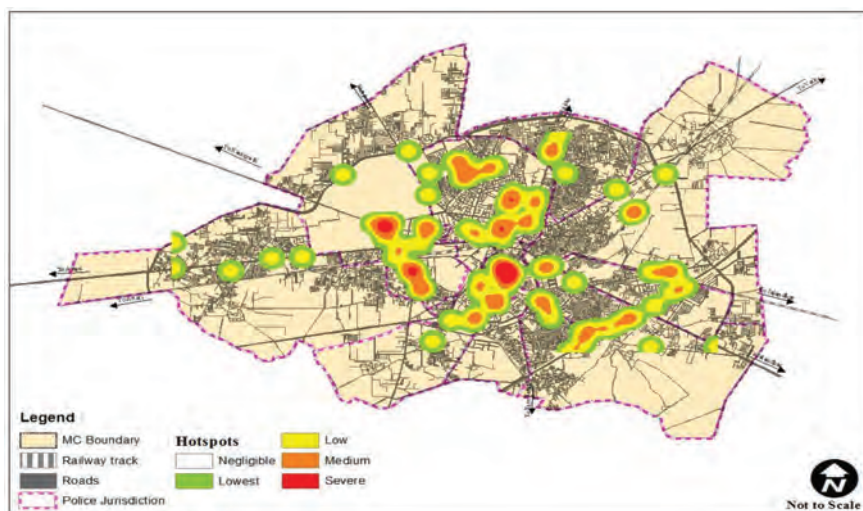
high crime rate. Overall, the comparative ranking shows that majority of jurisdictions were labelled as low crime rate areas but that doesn't mean that other types of crimes cannot take place in these jurisdictions.

Crime Nexus

Crime Hotspots, Vulnerability Factors and Land Use Nexus

The analysed spatial data in Geographic Information System (GIS) identified crime hotspots. The density mapping of both crimes gave an overview of the existing loopholes in the community (Paynich, 2013). Map 3 shows the identified hotspots of snatching which are Lawrence Road, Ranjit Avenue Commercial complex, Mall Road. The potential reason for higher vulnerability is due to the areas' prominent commercial landuse. These commercial areas are easily and conveniently accessible through private vehicles. Hence, those people become an easy target because of inadequate lighting, dead spots and unkept spaces. The major landmarks and nodes like Bus Stand, Bhandari Bridge, Trillium Mall, Ranjit Avenue and Rose Garden (lies in A division, E division and Civil Lines jurisdiction) have a large number of users on daily basis. The Higher Income Groups (HIG) and Middle Income Groups (MIG) people are users or the residents of these areas and also the most probable victims of snatching, those are: Hakima Mandi, Sultanwind Road, Logarh and Islamabad areas have informal markets; therefore, these areas are unplanned with high social disparity thus providing crime opportunity. The areas

Map 3: Snatching Hotspots

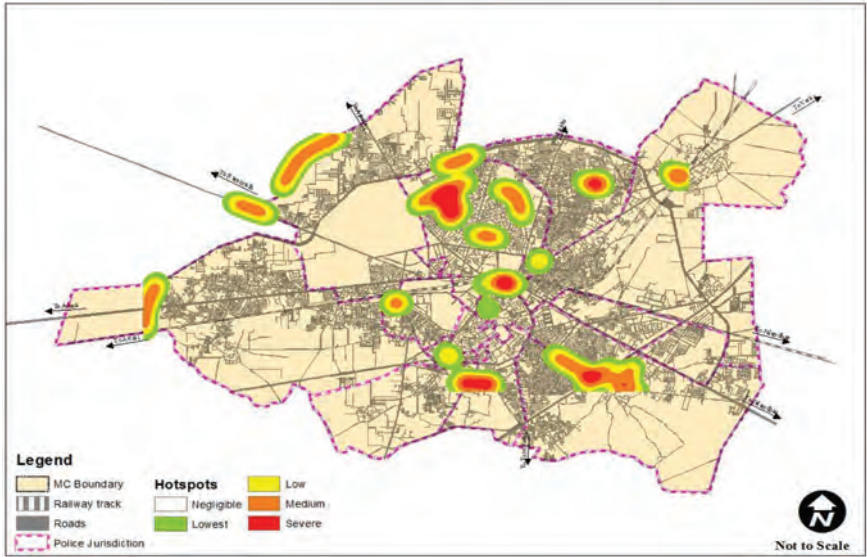


Source: Computed Values, Primary Survey.

at the periphery of the Walled City like Katra Sher Singh, Beri Gate, and Khazana Gate have observed a change of land use from mixed to purely commercial or residential land use leading to an increase in the number of vacant buildings which increases the chances of the crime. The lack of ownership, surveillance and lack of street infrastructure further lead to an increase in the chances of crime.

Similarly, Map 4 shows the identified vehicle theft hotspots, which are mainly located in the peripheral area of the city because people travelling for recreational activities located in the peripheral areas or living in the villages or travelling to neighbouring cities would use their private vehicles for time-efficiency and convenient travelling. The peripheral regions are not active as compared to the central city and lack surveillance hence giving opportunities to offenders to conduct vehicle theft. The unkept open spaces and parks along the major roads like Hakima Mandi, Sultanwind Road and Batala Road and railways tracks are used for open dumping of garbage and parking of vehicles, which lack security and ownership, hence, increasing the vulnerability of the area. Similarly, there are many hospitals, marriage palaces and farmhouses (near the Bypass) which are accessible through private vehicles only. These areas lack security and street infrastructure; therefore, on-street parked vehicles become an easy target. The public, semi-public regions are more active for a short period during evenings and nights but are dead during the rest of the day. The majority of the

Map 4: Vehicle Theft Hotspots



Source: Computed Values, Primary Survey.

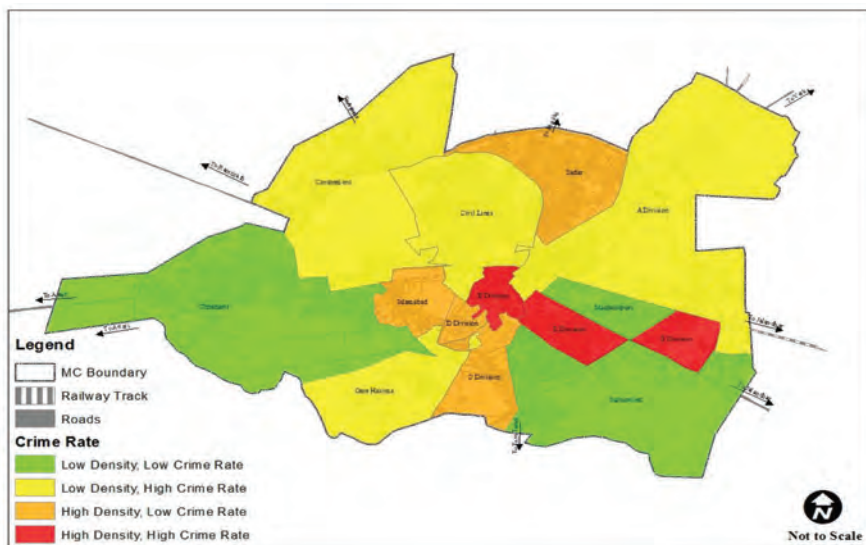
activities involve transportation, venue and event logistics which allow only staff to work around these areas.

Crime, Social Disparity, Population Density Nexus

Population Density can be correlated to social disparity to understand the dynamics of metropolitan cities. In the case of Amritsar city, the D division, E division and Islamabad are high-density jurisdictions with LIG (low-income group) and MIG (middle-income group) populations. These areas have inadequate basic infrastructure and poor maintenance of public spaces. The low-density areas include the Civil Lines, A division and cantonment jurisdictions supporting the MIG and HIG (high-income group) population of the city (PUDA, n.d). The disparity can be related to the crime rate to understand the dynamics of crime in the city.

Map 5 shows the comparative nexus between crime rate and population density. The nexus of crime rate and population density can be described in four categories (high-density, high crime rate, high-density low crime rate, low-density high crime rate and low-density low crime rate) which categorised 13 police jurisdictions under them. Hence, attempting to understand the interrelation of both the topics. Sultanwind, Chheharta, and Maqboolpura jurisdictions have low crime rates and low density because of the restriction of development in the west. The A division, Cantonment, Civil Lines, and Gate Hakima

Map 5: Crime Rate and Population Density Nexus



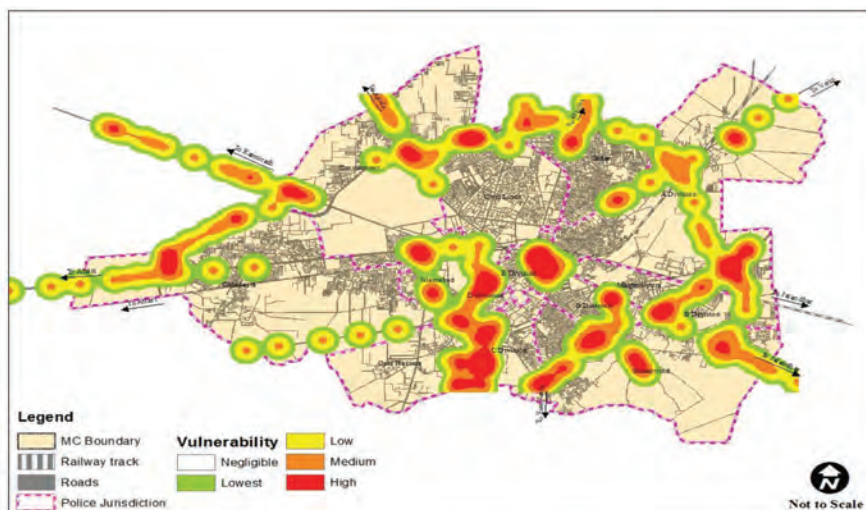
Source: Computed Values, Primary Survey.

jurisdictions have low density and higher crime rates because of the larger window of opportunity and higher stakes. The peripheral areas whether low-density or high-density have the maximum crime because of vulnerability factors like lack of surveillance, unkept spaces and lack of ownership which create higher opportunity windows. The central area of the city has a high-density, low crime rate because these areas have informal surveillance, more sense of ownership amongst people and making these areas harder targets for crime. Gate Hakima area has low density but has high crime rate because vulnerability factors like high social disparity, lack of street lights, lack of maintenance of open spaces and lack of security around the informal commercial market. The Islamabad, Sadar, D division and C division jurisdictions have high-density, low crime rates because these areas have medieval-era characteristics.

The main concentration of the crime was found in the areas where vacant land was unkept, lacked security, illumination and had higher social disparity. The main reason for high density is the proximity to the highway and bus stand, which means easy access to changing mode of travel. The Civil Lines is well-planned jurisdiction while the Cantonment Jurisdiction is a planned and restricted area so, there is no illegal development. It has low-density and high crime rates as it lacks the local sense of ownership and natural surveillance. The B division and E division have high-density, high crime rates because of the proximity to the highway at the periphery. At the city scale, the main concentration of crime is along the central axis of the city. The areas along the Bypass and Grand Trunk Road are more prone to snatching or vehicle theft because of lack of accessibility, inactive activities, and inadequate street infrastructure. The area around the Municipal Corporation boundary along Bypass and GT (Grand Trunk) Road are the hotspots as people tend to change their mode of transport. The western international border acts as a restriction of development and also proves to be a harder target because of the tight security. But at the same time, the common criminal activities in these areas are related to burglary, drugs, vandalism, etc. The crime and land use nexus helped to understand that the vulnerable areas of the city were of pure land use while the mixed land use had different criminal activities.

The nexus of crime, land use, social disparity, population density, crime rate and vulnerability are the major factors which helped to identify crime-prone public spaces in the city. Map 6 shows the identified vulnerable areas based on vulnerability factors which include social disparity, inactive areas/dark spots, inadequate street infrastructure, inaccessibility, overcrowded areas, and unkept open spaces. The areas

Map 6: Vulnerable Areas



Source: Derived from Police Data.

like Bhagtanwala, Hakima Gate, Sultanwind, and Chheharta have LIG and EWS housing while Ranjit Avenue, Green Avenue, Basant Avenue, and Kashmir Avenue (civil lines and A division) have HIG and MIG housing (potential victims). The variation in social disparity brings the opportunity for crime in posh areas while poor people are usually labelled as potential offenders. Basant Avenue, Ranjit Avenue, Mall Road, Lawrence road (civil lines) area along the Bye-pass road and residential area of A Division are inactive at night whereas lack of ownership and security led to an increase in crime (NCPC, 2003). The recreational areas, open spaces, and parks are inactive during afternoon hours and lack informal surveillance hence providing a window of opportunity for criminal activities.

The residential areas of the A division, Civil Lines, Cantonment, Sultanwind, Islamabad jurisdiction and the residential areas Bypass road have poor street lights, pedestrian footpaths, foot over bridges, pedestrian ramps, road signages and landscaping, hence, making these areas vulnerable. Ranjit Avenue, Mall Road, and Lawrence Road have prominent commercial activities that tend to attract a lot of attention but lack natural surveillance, security and accessibility through public transport. Therefore, these areas become broken window outside the working hours. The areas in the proximity of the Bypass road, Verka Bypass and Mehta Road areas lack ownership, are highly inactive especially during off wedding season, have poor physical infrastructure and are inaccessible through public transport at night. So, these areas

become broken window, leaving a higher window of opportunity. The areas in proximity of the major roads, pedestrian bridges and commercial facilities such as banks, shopping complexes, bus stands, informal commercial markets and restaurants have a higher tendency of crime because of the availability of easy escape windows. Katra Sher Singh, Katra Khazana, Katra Hakima (walled city areas), Ranjit Avenue, Sultanwind and Nawa Kot have vacant plots, unkept open spaces, and vacant buildings which becomes black spot making the surrounding areas highly vulnerable, hence become the broken window of the city.

RECOMMENDATIONS

In this section, the recommendations are proposed based on the place-based theories of crime spatial planning fundamentals, and CPTED principles (Crime Prevention through Environmental Design). The methods of mapping helped to analyse snatching and vehicle theft data and develop maps identifying hotspots, jurisdiction-wise crime rate comparison, crime and density relation and vulnerable areas which overall depict the crime-prone areas of Amritsar. The crime-prone areas mentioned in the previous section were mentioned along with their land use, and prominent vulnerability factors which make them the broken window of Amritsar. The spatial planning strategies that are proposed to mend these broken windows in each land use category are given below:

- **Residential** – The residential areas of the A division, Civil Lines, Cantonment need to increase the security and build a sense of ownership amongst the residents. So a bottom up approach to include residents to build common public spaces – is encouraged to be applied. Whereas street infrastructure upgrade can be recommended for the residential area of Sultanwind and Islamabad jurisdictions, and the residential areas around Bypass road. A nightwatch/CCTV can also be incorporated which adds to surveillance of the areas. The slums located in the Islamabad, Gate Hakima, Sultanwind and Verka should be provided with the basic physical infrastructure and the street infrastructure is also required to be upgraded. The landscaping of residential areas of the A division, civil lines and Cantonment jurisdiction can also be modified to allow residents to have an informal surveillance around their house/street. The walled city is of mixed land use therefore, the street infrastructure can be improved to increase illumination in the areas.
- **Commercial** – The commercial areas in the Civil Lines and Cantonment jurisdictions which include Basant Avenue,

Majitha Road, Mall Road and Ranjit Avenue need to increase surveillance which will add some sense of ownership and make them a harder target of crime. Regulated informal markets can be strategically placed in these jurisdictions to add informal surveillance. The informal markets in Logarh gate, Hall gate, Ram Bagh and Hakima Gate areas are recommended to be well-lit and there should be 3m² of the area around the *rehris*/carts for easy movement of the people (manoeuvring space) to harden the target, hence reducing the window of opportunity. The *Mandi* or farmers' market should at least have a minimum infrastructure to support its working, e.g. parking space inside or outside the drivers' inn, security guards, CCTV cameras, illumination, etc. this will help to harden the target for the offenders (Kruger, 2005).

- **Public and Semi-Public** — The major public and semi-public landmarks are Bus Stand, Sri Harmandar Sahib (Golden Temple), Durgiana Temple, Chintpurni Temple, Jallianwallah Bagh, Museums, other religious sites, etc., which are major tourist attractions of the city. Hence, these areas by default become vulnerable, providing a window of opportunity. But intensive surveillance and spatial planning methods are required to avoid and reduce crime in these areas. The religious places and major landmarks of the city should have emergency booths installed for the tourists and local people at intervals of 300m - 700m. The Booth should be active 24 by 7 which will act as additional security for the area making the areas a hard target for the offenders. Government / Semi-Government buildings should be installed with CCTV cameras while the open space around the built-up should be well maintained, i.e. no dumping of waste, planting ornamental trees like Gulmohar. Police stations and police posts which are the Emergency stationary units should be available within the range of 500 m -1000 m while the mobile unit should be available within the range of 300 m – 500 m. Mobile vans are extremely useful in tourist places like Golden Temple, Durgiana Mandir, Jallianwallah Bagh, etc. The strategic positioning of help desks, police posts, cars, etc. increases the surveillance in the area. The public/semi-public regions around the periphery areas should be provided with regular surveillance. Also, the upgradation of street infrastructure can help to make the area active and interactive for the users.
- **Parks and Open Spaces** — The parks and open spaces in the

civil lines, Chheharta, Cantonment, A division and Sadar jurisdiction need additional informal surveillance during the afternoons and nights. Public participation should be encouraged to build and maintain open spaces so that they don't deteriorate into negative spaces, and become a dumping ground. Also, these parks or open spaces can be converted to a multi-functional park which can increase the daily activity leading to mending broken windows. The landscaping along the roads should be designed and planned to provide privacy to the inhabitants but at the same time allow them to have an eye on-street for their safety.

- **Traffic and Transportation** – The bypass road, highways, major roads and G.T road should have surveillance which can be in the form of Highway Watchers. Highway Watchers are the people working in the proximity of highways who can work in collaboration with the authorities to look over highway activities. For instance, New York and Pennsylvania have used highway watchers or pike watches to add surveillance and security. So, the highway watchers would harden the target for potential offenders and decrease the black spots. In the case of minor roads, and streets, adding little bit of security and informal surveillance can mend the broken window. It is recommended that the spaces and walls around flyovers, FOB, sidewalk, etc. should be made interactive to orient the movement of people, hence these areas become dynamic. The increased land use and transportation interaction can mend the broken window and doesn't allow negative space formation. There should be regulated and authorized parking in the walled city and around the outer ring roads which can help to reduce vehicle theft.
- **Miscellaneous** – Community participation plays a vital role to reduce crime as it helps to bring a sense of ownership amongst the people and automatically they become caretakers of the area. Community volunteers groups can work with residents, business owners, and city officials in advocating for parks and recreational spaces, designing open space areas, and working with environmentalists to clean up vacant lots and contaminated areas. The awareness campaign can involve the community in cleaning and managing vacant areas which are unkept and negative spaces of the area can be reused for different activities like kennels for street dogs, etc.

CONCLUSION

Public spaces of a city tend to become vulnerable as soon as it shows any issues like an increase in social disparities, degradation of open spaces, inactive area or dead spots, inadequate street infrastructure, low connectivity or inaccessibility and overcrowding. When public areas show a combination of any two or more vulnerable parameters then it becomes a broken window. Hence, it is important to mend the broken windows before the damage increases.

The landuse of the city gives a unique character to the city. The spatial arrangement of the land use orients the movement of the people forming connectivity patterns in the city. So, any alteration in the land use changes the interaction between different land uses which can either bring incoherence or mend the broken window. In the case of Amritsar mixed landuse has promoted better public spaces with a lower crime rate as compared to pure landuse areas.

The recommended strategies are measures to create surveillance by bringing eyes on the street- a popular concept by Jane Jacobs where the monitoring of commercial areas as well as neighbourhood is done by the residents themselves while doing their routine activities of selling and interacting in the areas thereby making the area safer and free from crime, reducing the not-in-my-attitude of the people by creating a sense of ownership among them. It makes them feel that these spaces are living entities with a sense of belongingness. Hence, community awareness and participation are some of the influencing factors in the successful implementation of the strategies. Transportation planning tends to give a direction to the future development plans. Therefore, improving inter-and intra- connectivity of the city, it can influence the characteristics of the city.

This paper is an attempt to bring forward the idea that police, government and planners should collaborate to prepare strategies to reduce crime in the city. Also, the inclusion of public participation can help in the successful implementation of the strategies. Rachel Boba has stated that there have been cases in Connecticut, Kansas, San Diego, Boston and Pennsylvania, where police agencies joined hands either with police department's research forums, universities, private associates or corporates to reduce crime. Also, campaigns on social media on safety of the neighbourhoods can be run through various channels like facebook, Instagram, whatsapp etc. by making people aware of the activities going in the neighbourhood. GIS mapping as mentioned in the above tool can be used to identify various hotspots

where various kinds of analysis can run thereby showing true picture of the city to the citizens, administrators, police, etc. Lastly, an effective monitoring system should be created using planning indicators, vulnerability indicators and IT networks to reduce crime.

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REFERENCES

1. Amritsar Development Authority (ADA), (2012). Approved Colonies. Amritsar: ADA. retrieved from <http://www.adaamritsar.gov.in/category/residents/approved-colonies/>
2. Boba, Racheal (2008). Crime Analysis and Crime Mapping. New Delhi: Sage Publications.
3. Brantingham, P.L., and Brantingham, P.J. (1995). Crime Analysis Through Computer Mapping. Washington, DC: Police Executive Research Forum, pp. 129-149.
4. Clarke, R., and Felson, M., (1993). Routine Activity and Rational Choice. Transaction Publishers, Vol. 5.
5. Census Organization of India, Amritsar District: Census 2011-2019 data retrieved from <http://www.census2011.co.in/census/district/602-amritsar.html>
6. Chapter 2 - Crime: Concept, Definition and Analysis. Retrieved from http://shodhganga.inflibnet.ac.in/bitstream/10603/37657/7/07_chapter%202.pdf
7. Eck, John and Weisburd, David (1995). Crime Places in Crime Theory. Maryland: Weisburd Hebrew University.
8. Evans, K., (November 23, 2012), The Labeling Theory. Prezi. retrieved from <https://prezi.com/ra3yttfwbalc/the-labeling-theory/>
9. Geason, S. and Wilson, P., (1988). Crime Prevention Theory and Practice. Canberra: Australian Institute of Criminology.
10. Kruger, T., (2005) Building Safer Communities – Reducing Crime through Environmental Planning and Design. World Congress on Housing, XXXIII IAHS.
11. Malik, A., (January, 2016). Urbanization and Crime: A Relational Analysis. *IOSR Journal of Humanities and Social Science*, Vol. 21, pg 68-74
12. Mohammad Ali Syed, (n.d.) Study Materials: Criminology & Victimology. Assistant Professor of Law, Indian Institute of Legal Studies, Siliguri272402_1612076278.docx (live.com)

13. National Crime Research Bureau. (2014) Crime in India: 2013. New Delhi: Ministry of Home Affairs.
14. National Crime Research Bureau. (2016) Crime in India: 2015. New Delhi: Ministry of Home Affairs.
15. National Crime Prevention Council (NCPC). (2003). *Crime Prevention through Environmental design guidebook*, Singapore: NCPC.
16. Paynich, R., (2013). Identifying High Crime Areas (Doctoral dissertation, Curry College), International Association of Crime Analysts. retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.692.7179&rep=rep1&type=pdf>
17. PUDA (Punjab Urban Planning and Development Authority), Draft Master Plan Amritsar 2010-2031, Mohali: PUDA.
18. Santos, R., (2013) Crime Analysis and Crime Mapping, New Delhi: Sage Publications.
19. Wilson, J. and Kelling, G., (1982). Broken Windows. *Atlantic Monthly*, 249(3), 29-38.

Towards Safe Public Transport – A Case of Delhi Transport Corporation (DTC)

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SEWA RAM**

ABSTRACT

Road accidents have been a major safety issue and are causing a significant loss to the economy. To minimise this economic loss, one needs to be able to assess the existing road safety scenario of the public transport undertakings and plan safer bus routes in cities. Public transport whether road or rail based are considered as the safest mode of travel for most people across the globe. In absence of a database at world level focusing only on traffic safety associated with buses, individual data sets/information has been presented in this paper from various countries from the developed as well as from the developing parts of the world. The case of India and particularly the case of Delhi Transport Corporation (DTC) which operates public transport buses in Delhi has been elaborated in this paper. In order to plan safe public transport routes in any city, it is important to understand the road safety scenario of public transit buses in the cities of urban India. Few Indian bus corporations operating in major metropolitan cities have been undertaken for this study. An attempt has been made to carry out a detailed spatial and temporal analysis of all the DTC bus accidents, to understand the causes of accidents, the probable remedial solutions to avoid the crashes and the way forward.

Keywords: *Road Safety, Planning Safe Public Bus Transport, Bus Crashes*

INTRODUCTION

Road traffic crashes are one of the leading causes of deaths in the world from past several years and its burden is borne majorly

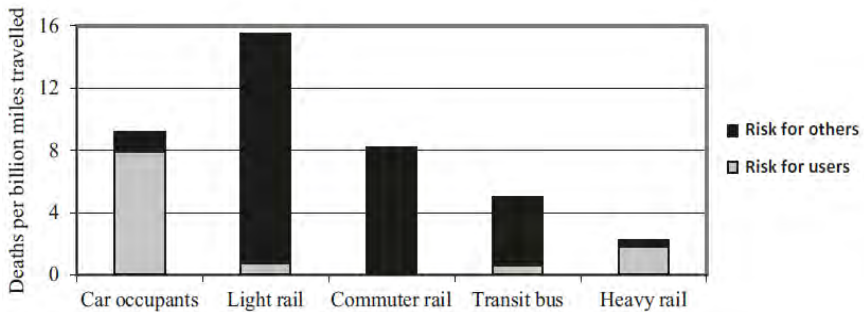
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by the private vehicle modes. However, the road traffic crashes and injuries involving bus transportation are very less; and it is seen as one of the safest modes of transport to commute [(Truong & Currie, 2019); (Schepers, Lovegrove, & Helbich, 2019)]. For instance; studies have shown that the risk of fatality due to a traffic crash is eight times more while travelling by a car than travelling in a bus, while the same risk is increased up to 50 times when you are walking (Sam, Daniels, Brijs, Brijs, & Wets, 2018). Bus transport is often seen as an alternative by urban practitioners to private vehicle modes as well, in order to reduce the overall exposure of humans to road traffic crashes.

Buses form the marginal groups when it comes to the whole vehicle populations in any country or a city. Their proportion mostly lies about one per cent or even less of the total vehicle population (Cafiso, Graziano, & Pappalardo, 2013) and public transport buses constitute of even lesser percentage amongst them. In addition to this, the total number of crash fatalities involving buses are also comparatively very less than the other modes of transport (Fig. 1). Thus, there is a possibility of negligence or lesser attention towards the road traffic crashes involving buses and similar reflection was felt while searching for literature on the subject.

Fig. 1: Crash fatality rates per billion passenger miles travelled



Source: (Litman, 2012).

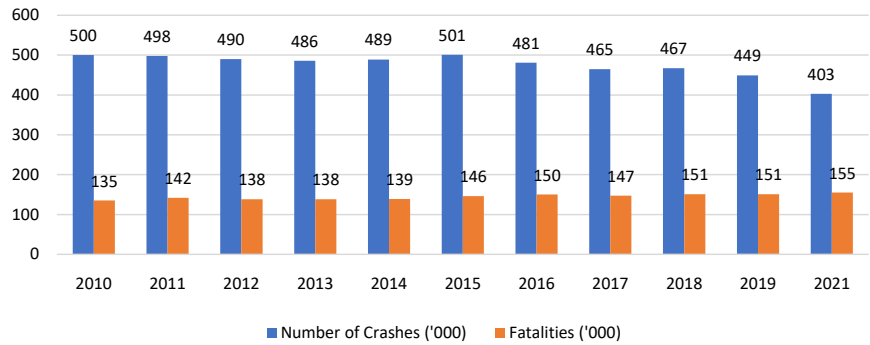
BUS-BASED PUBLIC TRANSPORT IN INDIA

From decades, buses in India are one of the most important means of transport for intercity travel, as well as intracity trips. The bus systems are well-planned and widely used by commuters especially in few of the cities. The mega cities and few million plus cities are heavily dependent on bus transport. The work trip information as collected by the Census of India in 2011, showed that 22 per cent of India’s workforce commutes daily using a bus (Tiwari & Nishant, 2018). However; the population of buses is on a continuous decline as the total share of buses in the

vehicle fleet has gone down to even less than one per cent, which was around 11 per cent in 1951 (Road Statistics Yearbook, 2017). This shows the declining trends of bus transport in the country, but as our cities are growing, the need for planning and designing public transport in form of buses is rising. More importantly, a safer public bus transport will be vital to the sustainable urban growth and towards achieving the Sustainable Development Goal SDG-3.6 by 2030, states to halve the number of global deaths and injuries from road traffic accidents.

In terms of road safety, India is the leading country in the world in total road fatalities and the numbers are on a rise yearly. An average 0.15 million fatalities happened in India in last four years (2015-19), which is almost 11-12 per cent of global road fatalities. As can be seen from Fig. 2, the number of crashes has been on a slow decline but the number of fatalities has been steadily increasing in the past decade. This indicates the severity of crashes in the country.

Fig. 2: Road traffic crashes and fatalities in India



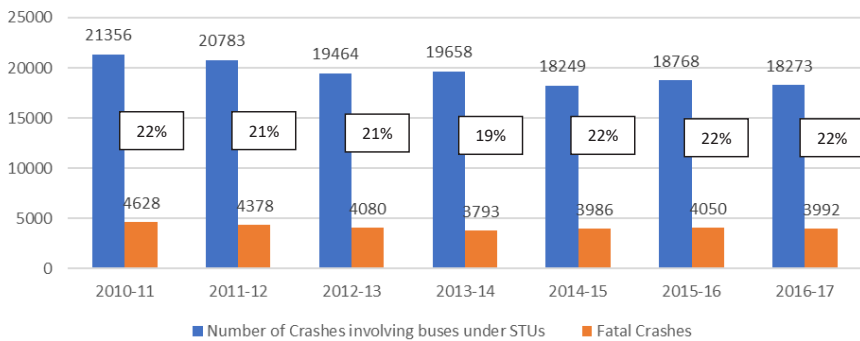
Source: Ministry of Road Transport and Highways, Government of India.

Buses are involved in 5-10 per cent of the total crashes and fatal road traffic crashes as per the Ministry of Road Transport and Highways (MoRTH's) official nationwide crash records. These shares are higher than the European or Western counterparts of the world, where buses were involved in around one per cent of the total crashes and even lesser share in terms of fatal crashes. However, these Indian shares are lower than what were observed in other developing nations such as Ghana or Bangladesh.

Besides 5-8 per cent of all the victims losing lives in the fatal crashes involving buses, are the bus occupants. These numbers are showing the countrywide statistics which might be different for public buses in cities or may vary region-wise.

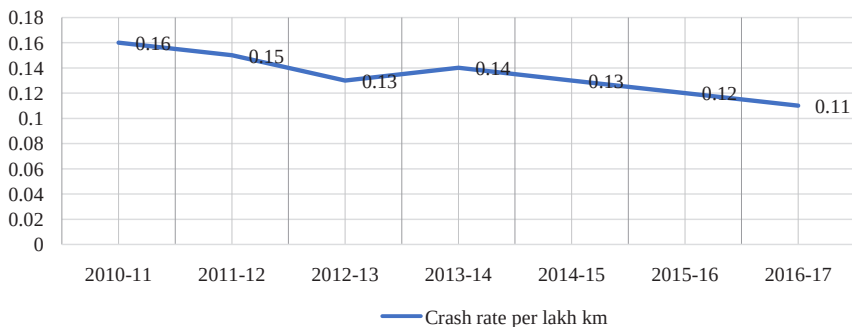
In India, transport is a state subject and thus public buses are operated by different State Transport Undertakings (STUs) and Special Purpose Vehicles (SPVs). It is important to note here that due to limited technical capacity of public transport planners in these organisations, the importance of data collection and analysis in planning safer routes in the cities is missing. Ministry of Road Transport and Highways (MoRTH) and Central Institute of Road Transport (CIRT) have been compiling the performance parameters for all the Indian STUs from past few years. Figure 3 shows the performance of all the STUs in India in terms of road traffic crashes and fatalities. There has been a minor decline each year in the total number of crashes involving buses and the fatalities as well. Figure 4 also shows the declining trend in the rate of road traffic crashes per one lakh kilometre of buses driven. However, the ratio of

Fig. 3: Road traffic crashes and fatalities involving buses in India (under State Transport Undertakings)



Source: Transport Research Wing, Ministry of Road Transport & Highways and; Central Institute of Road Transport.

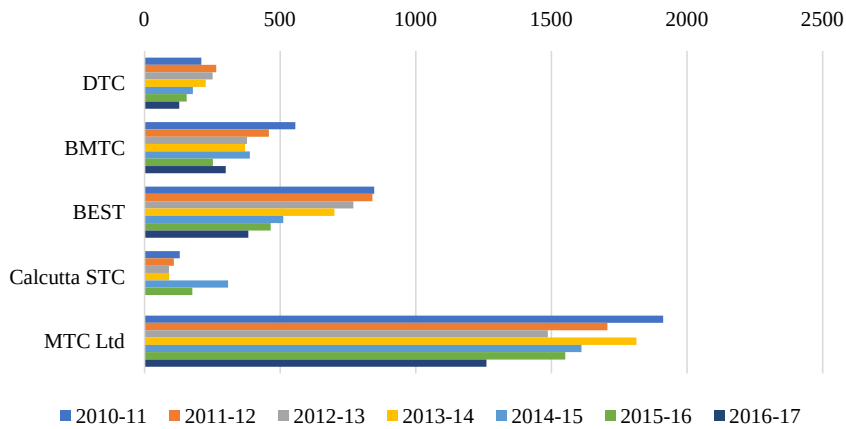
Fig. 4: The rate of road traffic crashes involving public buses per one lakh km of vehicle driven



Source: Transport Research Wing, MoRTH and Central Institute of Road Transport.

fatal crashes to the total crashes still remains the same (shown in boxes in Fig. 3). This indicates the increased severity of the bus crashes over the years. Also, as discussed earlier, the number of buses in the total vehicle fleet are decreasing in India and it could be a possible reason for the decline in road crashes involving buses. During this seven-year period (2010-17 in Fig. 5); states of Maharashtra and Andhra Pradesh have been the states with highest road traffic crashes involving public buses.

Fig. 5: Total number of crashes involving Buses in Metropolitan Cities of India



Source: Author, 2021.

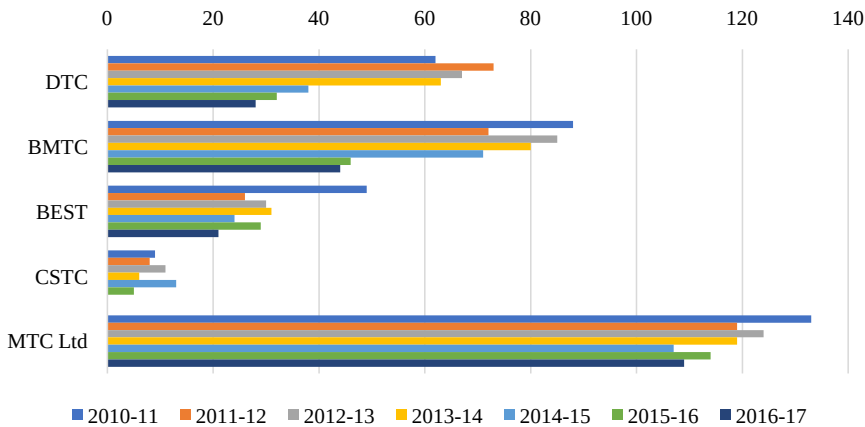
The STUs are also responsible for running buses in different cities under a state. In few cities, buses are run by the municipal undertakings or a private company as well. In order to understand the road safety scenario of buses in urban India, few Indian bus corporations operating in major metropolitan cities and whose crash data is available is shown below in Table 1 and Fig. 6, 7. It can be seen that Chennai city in the state of Tamil Nadu observes the highest crashes. The cities of Mumbai and Kolkata observe a smaller number of fatal crashes and this can be due to the low speeds in these cities due to higher congestion levels, and thus it results in lesser number of severe crashes. However, the ratio of fatal crashes depicts a different story where Delhi observes a greater number of fatal crashes out of its total crashes. This may be due to the availability of a vast road network (resulting in higher speeds) and Delhi being the most populous city of India. And thus, Delhi is being chosen as a case city to further investigate in the road traffic crashes related to buses.

TABLE 1: CRASHES AND FATALITIES INVOLVING URBAN BUS SERVICES IN
INDIAN METROPOLITAN CITIES (AS PER FINANCIAL YEAR RECORDS)

STU/ Year	2010-11			2011-12			2012-13			2013-14			2014-15			2015-16			2016-17		
	Total Crash- es	Fatal Crash- es	Ratio of fatal crashes	Total Crash- es	Fatal Crash- es	Ratio of fatal crashes	Total Crash- es	Fatal Crash- es	Ratio of fatal crashes	Total Crash- es	Fatal Crash- es	Ratio of fatal crashes	Total Crash- es	Fatal Crash- es	Ratio of fatal crashes	Total Crash- es	Fatal Crash- es	Ratio of fatal crashes	Total Crash- es	Fatal Crash- es	Ratio of fatal crashes
DTC	209	62	30%	264	73	28%	251	67	27%	225	63	28%	178	38	21%	155	32	21%	128	28	22%
BMTC	556	88	15%	485	72	15%	378	85	22%	370	80	22%	388	71	18%	252	46	18%	299	44	15%
BEST	847	49	6%	840	26	3%	770	30	4%	700	31	4%	511	24	5%	465	29	6%	383	21	5%
Calcutta STC	130	9	7%	108	8	7%	90	11	12%	91	6	6%	308	13	4%	176	5	3%	-	-	-
MTC Ltd Chennai	1912	133	7%	1706	119	7%	1487	124	8%	1813	119	7%	1611	107	6%	1551	114	7%	1260	109	8%

Source: Transport Research Wing, Ministry of Road Transport & Highways and; Central Institute of Road Transport. (DTC - Delhi Transport Corporation, BMTC - Bengaluru Metropolitan Transport Corporation, BEST - Brihanmumbai Electricity Supply and Transport, Calcutta STC - Calcutta State Transport Corporation, MTC - Metropolitan Transport Corporation [Chennai] Limited).

Fig. 6: Total number of fatal crashes involving Buses in Metropolitan Cities of India



Source: Author, 2021.

THE CASE OF DELHI

Delhi which is the capital of India can be seen as one of the severe affected cities, in terms of fatalities occurring in road traffic crashes involving buses. The city is heavily dependent on its bus transport system which travels around 10 per cent of the Delhi’s vehicle kilometres but caters to 54 per cent of total passenger kilometer (PKM) demand and 76 per cent of the total public transport PKM demand (Suman, Bolia, & Tiwari, 2017). In addition to bus transport, there are metro services and informal modes of transport services as well.

Delhi’s bus transport system is operated by two organisations namely: Delhi Transport Corporation (DTC) and Delhi Integrated Multi-Modal Transit System Limited (DIMTS). Out of these two, DTC has a greater number of buses (close to a fleet of 4000 urban buses) and caters to more passengers as well. DTC operates on more than 500 bus routes which covers the area of Delhi and few neighbouring rural counterparts as well.

As discussed in previous sections, Delhi witnesses’ significant amount of road traffic crashes involving buses and has the highest ratio of fatal crashes involving buses amongst all metropolitan cities (Table 2). This section will detail out the characteristics of the road traffic crashes involving buses and specifically, DTC buses in Delhi. The focus is given on total crashes and the fatal crashes; as the injuries are mostly under reported in India as stated by {(Dandona, Kumar, Ameer, Reddy, & Dandona, 2008), (Mohan, Tiwari, & Bhalla, 2016)}.

TABLE 2: YEARLY ROAD TRAFFIC CRASHES AND FATALITIES IN DELHI

Year	Total crashes in Delhi	Total crashes involving DTC buses	Share of DTC bus crashes	Total fatal crashes in Delhi	Fatal crashes involving DTC buses	Share of fatal DTC bus crashes	Total Fatalities	Fatalities in crashes involving DTC buses	Share of bus crash fatalities involving DTC buses
2013	7566	236	3%	1778	66	4%	1820	67	4%
2014	8623	189	2%	1629	39	2%	1671	40	2%
2015	8085	162	2%	1582	32	2%	1622	35	2%
2016	5671	130	2%	1548	29	2%	1591	32	2%
2017	5017	137	3%	1565	31	2%	1584	32	2%
2018	6515	109	2%	NA	21	--	1690	22	1%
2019	5610	128	2%	1433	32	2%	1463	32	2%

Source: Ministry of Road Transport and Highways, Government of India and Traffic Safety Cell, Delhi Transport Corporation (DTC).

TABLE 3: YEARLY ROAD TRAFFIC CRASHES INVOLVING PUBLIC BUSES IN DELHI

Year	Insignifi- cant	No. of Minor crashes	No. of Major crashes	No. of Fatal crashes	No. of Total crashes	Total Injuries	Total Deaths	Percentage of minor crashes	Percentage of major crashes	Percentage of fatal crashes	Avg. crashes per lakh kms
2013	2	151	17	66	236	175	67	64.0	7.2	28.0	0.07
2014	1	139	10	39	189	166	40	73.5	5.3	20.6	0.06
2015	-	115	15	32	162	127	35	71.0	9.3	19.8	0.06
2016	1	94	6	29	130	91	32	72.3	4.6	22.3	0.05
2017	1	92	13	31	137	109	32	67.2	9.5	22.6	0.05
2018	1	75	12	21	109	85	22	68.8	11.0	19.3	0.04
2019	1	87	8	32	128	98	32	68.0	6.3	25.0	0.05
Total/Avg	7	753	81	250	1091	851	260	69.0	7.4	22.9	0.06

Source: Traffic Safety Cell, Delhi Transport Corporation.

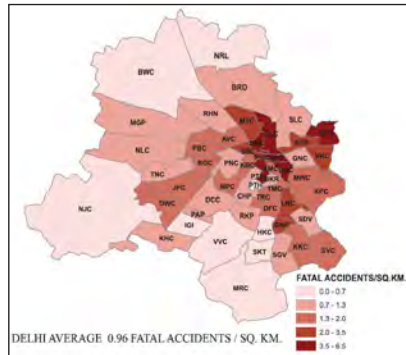
Table 2 shows the year-wise data for road traffic crashes and fatalities in Delhi; along with similar depiction of public DTC buses. Over the years, the total crashes in Delhi have reduced along with the crashes involving DTC buses but Table 3 shows that the ratio of fatal crashes out of total bus crashes remains constant which signifies the severity of such incidents. Also, year 2019 alone saw a sudden increase of 45 per cent in the number of fatalities, which were falling till the previous year.

A detailed account of the road traffic crashes involving DTC public buses for the year 2019 were collected from the Traffic safety cell of Delhi Transport Corporation (DTC). 70 per cent of these crashes in 2019 took place in an urban setting and rest in rural counterparts, since Delhi's buses also cover the nearby villages. Map 1 depicts the outer fringe portions of Delhi, which are not much urbanised yet, and which witness a greater number of fatal bus crashes. These include areas in North-east and Western fringes of Delhi such as Najafgarh, Vivek Vihar, Seemapuri, Civil Lines, Kalyanpuri, etc. Map 2 shows the total fatal crashes in Delhi in 2019, which highlights that the majority of the fatal crashes occurred in the central areas of Delhi. This can possibly be due to high population density, high mix of vulnerable road users, high speed vehicles, etc. in the Central and few north-eastern parts of Delhi.

Map 1: Fatal crashes involving buses in Delhi (2019)



Map 2: Fatal crashes in Delhi (2019)

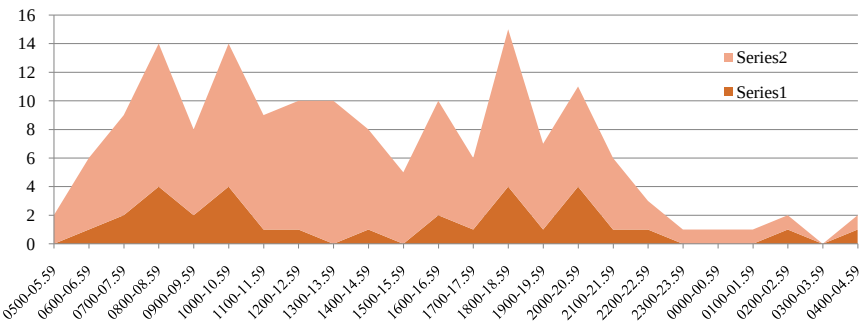


Source: Accident Research Cell 2019, Delhi Traffic Police.

The temporal distribution of occurrence of accidents throughout the week shows that Thursdays and Fridays witnessed more crashes and fatalities in the year 2019. Figure 7 depicts the crashes and fatalities as per the time of the day. It can be observed that starting from the morning when roads are less crowded, there is a rise in the crashes and fatalities respectively. This rise continues till office going hours and then reduces

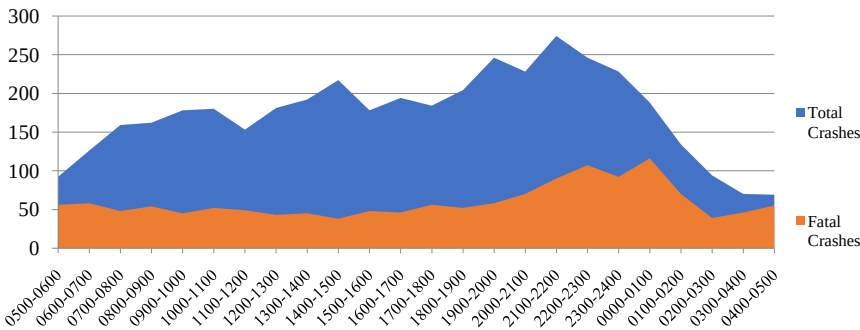
in the afternoon till evening peak hours where it rises again (when people return to home after work). The evening crest continues till 9 pm and then settles down. This might be due to the absence of daylight and subsequent inadequacy of street lights. The fatal crash peaks also follow the same trend, i.e., when the total number of crashes increase, there is a rise in the fatal crashes as well. Figure 8 shows the temporal distribution of overall crashes in Delhi in 2019 and it is different from the trend observed in bus crashes as shown in Fig. 9.

Fig. 7: Temporal distribution of road traffic crashes and fatal crashes involving DTC buses in Delhi. Series 1-Fatal Crashes and Series 2-Total Crashes



Source: Traffic Safety Cell, Delhi Transport Corporation.

Fig. 8: Temporal distribution of road traffic crashes and fatal crashes in Delhi



Source: Accident Research Cell, Delhi Traffic Police.

There are more than 500 routes of public buses being operated in Delhi, but certain number of routes have been identified from the DTC crash data of 2019, where the crashes and fatalities are higher. One fourth of the total crashes and almost one third of the total fatalities involving buses happened on these 10 routes mentioned in Table 4. Also, more than two-thirds of the fatal road crashes occurred in North and East Delhi.

TABLE 4: DTC BUS ROUTES IN DELHI WITH REPEATED
CRASHES AND FATALITIES

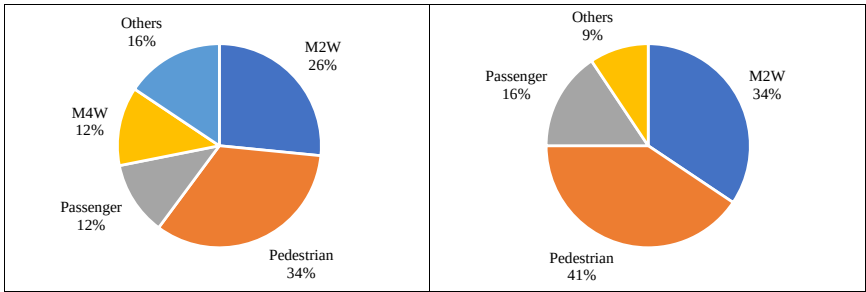
<i>Route No.</i>	<i>Origin</i>	<i>Destination</i>	<i>Fatal crashes</i>	<i>Total Crashes</i>
764	Najafgarh	Nehru Place	1	6
392	Mayapuri Depot	Noida Sector 62	2	5
971	Anand Vihar ISBT	Rohini Sector 1	2	5
234	Karampura Terminal	Shakti Nagar	1	4
427	Nizamuddin Railway Station	Mehrauli		4
33	Bhajanpura	Noida Sector43	1	3
347	ISBT Kashmere Gate	Noida Sector 34	1	3
423	Mori Gate Terminal	Ambedkar Nagar Terminal		3
8	Badarpur Border	Noida Phase 1	1	2
Outer Mudrika	Anand Vihar ISBT	Anand Vihar ISBT	1	1
Total			10 (out of 32)	36 (out of 128)

Source: Traffic Safety Cell, Delhi Transport Corporation.

Road traffic crashes always happen between two road user groups. Figure 9 shows the other user group involved in crashes with DTC buses in Delhi and majority collisions were with pedestrians, followed by motorised two-wheelers (M2W). The same user groups are also the most vulnerable road users as can be seen in the fatal crash description. Figure 10 shows a similar description of the overall bus crashes in Delhi (involving DTC buses and various other private/government buses). It indicates a similar trend where M2W occupants and pedestrians are the majority victims. The only exception is in the case of bus passengers which are more prone to fatal crashes in case of DTC buses. This might be due to the ridership behaviour of DTC drivers or poor safety standards in DTC buses.

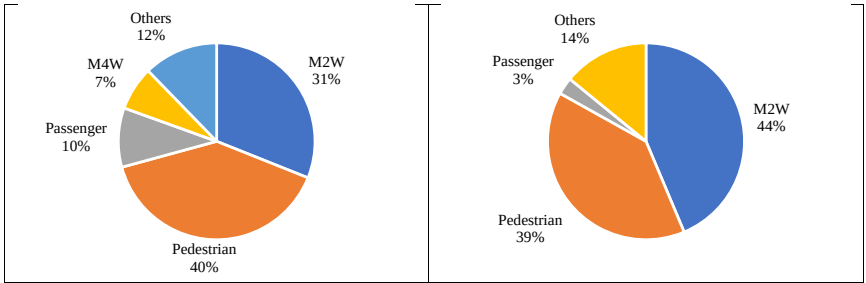
The likely reasons for all the crashes are supposed to be recorded while making the entry for the road traffic crash, but this practice is not followed well in Indian road safety ecosystem and thus useful datapoints

Fig. 9: Left side – Road user group involved in total DTC bus crashes. Right side – Road user group involved in fatal DTC bus crashes (2019)



Source: Traffic Safety Cell, Delhi Transport Corporation.

Fig. 10: Left side – Road user group involved in total bus crashes in Delhi Right side – Road user group involved in fatal bus crashes in Delhi



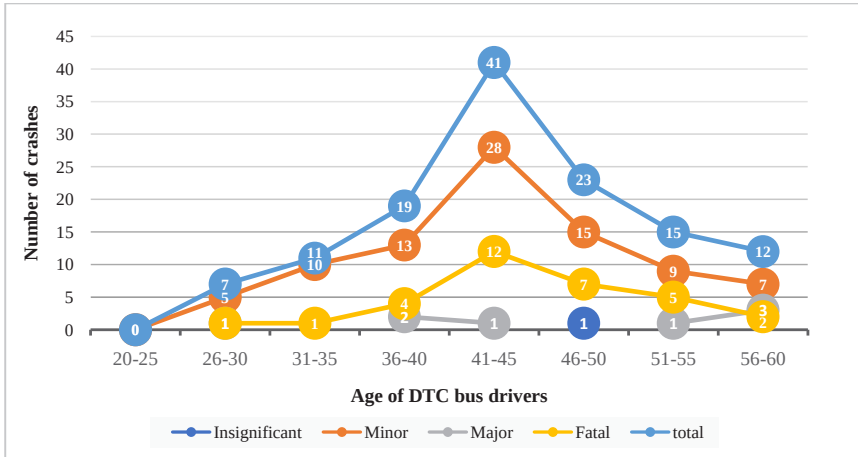
Source: Accident Research Cell, Delhi Traffic Police.

such as the causes of road traffic crashes and especially fatal crashes are mostly unknown. Few instances were recorded in the data obtained from DTC and it highlighted the causes of crashes such as rash and negligent driving, error of boarding/alighting passenger, mechanical failure etc. Figure 11 shows the age of drivers riding the buses and are involved in a crash. Interestingly, the age group of 35-50 years of drivers were more involved in the crashes. The road safety record for drivers on payroll against the drivers on contract showed almost same amount of crashes and fatalities.

KEY FINDINGS AND DISCUSSION

The case city of Delhi shows that the ratio of fatal crashes involving public buses is still not declining, despite a decrease in the total number of crashes. Thus, the crash severity might be on an increase and needs to be under check. This can be due to a variety of reasons like high speed driver behaviour, infrastructure design flaws, etc. Majority of the crashes are happening in an urban setting but the fatal crashes

Fig. 11: Age profile of the drivers of DTC buses in Delhi involved in road traffic crashes in 2019



Source: Traffic Safety Cell, Delhi Transport Corporation

are more concentrated towards the fringe areas of Delhi. The possible reasons include a lack of self-enforcement amongst drivers while driving through non-urban settings.

The fatalities in case of crash with a DTC bus is mainly of a pedestrian and motorised two-wheeler occupant. These can be high due to the nature of these road users of being at a higher risk (and high exposure). Various external factors are responsible for this vulnerability as well, especially in case of a pedestrian who are devoid of basic facilities such as footpaths, bus stops, level boarding facilities, etc. All these infrastructures required for the public transport needs to be planned, designed and implemented well. High speed on empty roads during mornings and inadequate lighting facilities during nights, might be some of the probable reasons for spikes in crashes in a day.

The case of Delhi's public buses found not performing good amongst the other major cities of India. A comparison of bus crashes between Indian context with the other developing and developed regions of world also comes out of this study as given in Table 5 below. It shows that the share of bus related crashes and fatalities in the developed nations such as USA, France and all countries of EU are very low as compared to India. Moreover, throughout the world, pedestrians emerge as the most impacted road user group to be affected by bus related crashes and thereby are the most vulnerable ones.

TABLE 5: COMPARISON OF BUS CRASHES OF INDIA VERSUS OTHER COUNTRIES

<i>Country/ Region</i>	<i>Developed/ Developing</i>	<i>Modal share of bus usage</i>	<i>Share of bus crashes out of total crashes</i>	<i>Share of fatal bus crashes out of total fatal crashes or share of fatalities</i>	<i>Major victims in bus crashes</i>
EU	Developed	8%	0.5%	3%	Car occupants and pedestrians
USA	Developed	2-3%	Less than 1%	Less than 1%	Other vehicle occupants and pedestrians
France	Developed	6-8%	1.5%	1.6%	Pedestrians and car occupants
Dhaka, Bangladesh	Developing	30%	42%	40%	Pedestrians and Cyclists
India	Developing	22%	5-10%	5-10%	Motorised two-wheeler occupants and Pedestrians

Source: Author.

CONCLUSION AND WAY FORWARD

Buses are still considered as a safe mode of transport and thus the attention on this subject seems to be unimportant. But as can be seen in the crash records shown in previous section, there is a need to focus on reducing the crashes and their severity because a life lost in any way is a life lost and the burden it leaves behind on the family of the deceased is immeasurable. Also, a collision by bus will always be more severe when compared to other modes of vehicles or road users. The occupancy of buses is also high and thus the threat to a greater number of lives at any given time is higher. Thus, considering attaining the Sustainable Development Goal (SDG3.6) towards reducing the number of global deaths and injuries from road traffic accidents by half, planning of safer public transport routes gets imperative. And to accomplish this task it is critical to assess the existing road safety levels of the public transport undertakings operating in the cities. The road traffic crashes

where buses are indirectly involved such as a road user being hit by any vehicle colliding with a bus and getting injured or even dying, are also not a part of the majority database and discussion on road traffic crashes involving buses. These indirect involvements of buses are not considered in formal police complaints or crash records as well (Brenac & Clabaux, 2005). Thus, there are various irregularities in capturing the status of safety of this specific target group and its associated injuries and fatalities.

At the global level statistics especially of the developed nations such as the EU countries and USA show that the traffic crashes involving transit buses varies from 0.5 to 1.6 per cent share among all other modes of transport. The statistics for these developed regions of the world include all types of buses i.e., school buses, transit buses, tour buses, private company buses, etc. So, the number of crashes and fatalities attributed to public buses in these countries are even lower. The literature review undertaken shows that none of the studies or reports highlights the safety records or safety issues involving buses and particularly city public transit buses. It is seen that the developed nations have maintained much better data set on the accidents related injuries and fatalities on buses which in turn helps in undertaking corrective measures to minimise crashes involving buses and also help plan safer bus routes. On the other hand, very poor information is being maintained as far as the developing nations such as Ghana, Bangladesh, and India etc. are concerned.

The road safety situation in India is grim. In India alone buses are involved in 5-10 per cent of the total crashes and fatal road traffic crashes as per the MoRTH's nationwide crash records. Although bus still remains as a major mode of transport in urban areas but still the share of public transport is witnessed to be on a declining trend. Amongst the major metro cities, Chennai has the highest number of total and fatal crashes involving public transport buses. However, looking at the severity Delhi has more percentage of fatal crashes involving public transport buses. The analysis of DTC buses operating in Delhi which was found to be not performing so good in case of crashes and fatalities related to buses, can be used to examine other such cities of India as well.

Such baseline scenario assessments are very necessary and critical so as to first have a realisation of the problem and then plan for the strategies to improve the overall road safety situation. Precise data on number of crashes and details on each of these crashes are the first step to solve this major issue. The details include reason for crash, type of collision (rear end, head on, side impact, roll on etc.), speed of vehicles, road design etc. Safety audits at collision spots can be carried out by

the transport department team or the transport undertaking which is operating the buses in the cities.

In order to improve the performance of bus services in Delhi in terms of road safety, several measures can be taken up. The bus crash details of the year 2019 discussed show that pedestrians and two-wheeler occupants are the most vulnerable road user groups in the crashes involving public buses. Thus, there must be some measures to create sensitivity towards these road user groups. The few crashes where the bus passengers were injured/killed while boarding/alighting can be easily prevented by ensuring level boarding at bus stops and by ensuring proper functioning of automatic doors in the buses (provided they are available).

The bus body specifications are also a case of concern when it comes to ensuring safety. Research has shown that low floor buses with maximum height of 550 mm from ground are suitable to prevent severe crashes and especially crashes involving running over by a bus (Kharola, Tiwari, & Mohan, Traffic Safety and City Public Transport System: Case Study of Bengaluru, India, 2010). Apart from the external design of the bus body, various internal safety mechanisms are also necessary to ensure safety. Such standards must be put in place at national level to direct manufacturing of vehicles and at the state/local level to direct purchase of standard buses.

The age group of the drivers, which is more prone to crashes needs to be investigated further for improving their performance while driving and subsequently reducing crashes and fatalities. They can be given special training sessions. Also, experienced drivers can be shifted to those routes where crashes are repeatedly happening (as shown in assessment). A monitoring mechanism of bus drivers and even conductors can be developed where on basis of their performance, they can be incentivised or disincentivised.

The time of the day when crashes are happening more must be further investigated. One of the reasons of increased crashes/fatal crashes during non-peak hours in a day is the increase in vehicle speeds and non-adherence to traffic rules. This is the responsibility of the transport undertaking or the bus agency to always maintain same driving discipline in a day. This can now very well be ensured using technology such as GPS, speed trackers, CCTV cameras, command centres, etc.

The Indian STUs operating in cities need to take cognizance of the matter and step up in their respective regions to improve their performance with respect to road safety of buses. There are few cities

such as Bengaluru where the STU i.e., BMTC carried out workplace alcohol prevention programme for bus drivers which is a progressive step. Mumbai's BEST Road safety awareness creation campaigns takes place yearly and are even organised by city bus organisations but more is needed to be done. BEST undertaking in Mumbai also went a step ahead and in partnership with Bloomberg and carried out a comprehensive plan involving measures such as crash investigation analysis, bus modifications, trainings by experts, online monitoring and even design changes in a terminal. This led to reduction of crashes by one-fourth and fatalities by one-third for the period of 2009-2016 in all bus related incidents. This can be carried out extensively with the support of government departments in all the urban buses. bus service organisations, with the primary aim to make bus transport safer for passengers and even other road users.

A comprehensive analysis of the best practices adopted across the globe have been briefed in this section. Globally, countries are adopting a zero-tolerance accident policy and modernising their urban and traffic infrastructures for safety. Numerous Western European and Asia-Pacific countries with substantial incomes have decreased their costs even further. Japan decreased its disease burden from road injuries by 42 per cent between 1990 and 2010, whereas Sweden reduced its disease burden by 30 per cent. For countries like India, case studies on interventions, policies, regulations, and institutional capacities to implement them in these high-achieving nations could provide invaluable lessons.

In the Netherlands the concept of Sustainable Safety has resulted in significant improvements (30 per cent reduced fatalities-2005) in vehicular safety. The Dutch "Sustainable Safety" idea of preventing human errors through good road planning, road design, and enhancing existing roads Three design tenets for road networks, roads, and streets are prioritised in this vision: functionality, homogeneity, and predictability. In the city of Paris, the Mayor has reduced the speed on all city roads to 30 kmph (2014). Sweden's Vision Zero road safety strategy prioritises safety over speed, with important measures including low urban speed limits, pedestrian zones, and barriers to separate automobiles and bikes. It suggested a 30 km/h speed limit and built 1,500 km of "2+1" highways where each lane of traffic takes turns using a centre lane for overtaking, saving many lives. It has built 12,600 safer crossings and implemented tough policing to reduce pedestrian deaths. It has also included the Traffic for an Attractive City recommendations for traffic safety and crime prevention (TRAST). Safety audit requirements are included in Swedish police guidelines.

In Europe, several measures are in place, including a reduction in

traffic speed, the isolation of vulnerable individuals from motorised traffic, the launch of awareness programmes, the addition of pedestrian crossings and the imposition of fines for violations of pedestrian areas. In the European Union, fines are mandated by law, either as part of a Road Traffic Act or pursuant to a particular legislative provision. In certain nations, police officers are permitted to determine the fine amount based on the specifics of the traffic incident. In Finland, Sweden, Norway, and Switzerland, the amount of a fine is determined by the offender's net income. In California, a new traffic law was implemented in September 2014, which minimised the state's high rates of bicycle accidents, injuries, and fatalities. Motorists were compelled to remain at least three feet away from cyclists when passing them on the road. In Oman in middle east region, the Royal Oman Police has installed both stationary and concealed speed cameras to monitor roadways. The number of fatalities on the road has decreased as a result of the implementation of harsher penalties for those who disregard traffic signals.

The Road Traffic Reduction Act gives London's authorities the power to restrict traffic volumes or the rate of expansion of traffic in specific locations in order to ease congestion and enhance air quality. The city of San Francisco has implemented something called the Better Street Policy. In order to better serve its citizens, New York City is investing in pedestrian infrastructure. Pedestrians have the right of way in Auckland via the Land Transport (Road users) Rule, which prohibits drivers from stopping or parking on a sidewalk. In the United Kingdom, reckless driving is punishable by a fine of up to £100 and the addition of points to the licence number. According to a department of transportation proposal, drivers who pass cyclists too closely will be subject to a UK £100 fine, a 25 kmph speed limit, and three penalty points. This is for a select few cities with high cycle traffic. In Germany, a computerised point system for traffic offences is in existence. If the violation endangers traffic safety, a driver may receive up to three points. The driver's licence is revoked after eight demerit points. The driver must pass a medical and mental assessment in order to regain their licence.

Apart from the various best practices mentioned above, an integrated approach is also a major requirement for reducing crashes and fatalities involving buses in our Indian cities. Apart from the bus operating agencies, equal responsibility rests in the hands of other city agencies to improve overall safety on roads. The road agencies need to plan, develop/modify their design criteria keeping in mind the importance of buses for cities and thus make necessary changes on roads, bus stops, bus bays, etc. to promote safety for all. The multiplicity of organisations dealing with urban transport as a subject is one of

the major causes for such high number of crashes and fatalities in our country and cities.

REFERENCES

1. Schepers, P., Lovegrove, G. and Helbich, M. (2019). Urban Form and Road Safety: Public and Active Transport Enables High Level of Road Safety. In M. Nieuwenhuijsen and H. Khreis, *Integrating Human Health into Urban and Transport Planning* (pp. 383-409). Springer International Publishing AG.
2. Truong, L. T. and Currie, G. (2019). Macroscopic road safety impacts of public transport: A case study of *Accident Analysis and Prevention*.
3. Sam, E. F., Daniels, S., Brijs, K., Brijs, T. and Wets, G., Modelling public bus/ minibus transport accident severity in Ghana. *Accident Analysis and Prevention*, 114-121, 2018.
4. Cafiso, S., Graziano, A. D. and Pappalardo, G., Road safety issues for bus transport management. *Accident Analysis and Prevention*, 324-333, 2013.
5. Barua, U. and Tay, R., Severity of urban transit bus crashes in Bangladesh. *Journal of Advanced Transportation*, 34-41, 2010.
6. Brenac, T. and Clabaux, N., The indirect involvement of buses in traffic accident processes. *Safety Science*, 835-843, 2005.
7. Tiwari, G. and Nishant. (2018). *Travel to Work in India: Current Patterns and Future Concerns*. Delhi: Transportation Research and Injury Prevention Programme (TRIPP), IIT Delhi.
8. Road Statistics Yearbook Report, Transport Research Wing-Ministry of Road Transport and Highways (MoRTH), 2017.
9. STUs Profile & Performance Report, Central Institute of Road Transport (2018-19).
10. Suman, H. K., Bolia, N. B. and Tiwari, G. (2017). Comparing public bus transport service attributes in Delhi and Mumbai: Policy implications for improving bus services in Delhi. *Transport Policy*, 63-74.
11. Dandona, R., Kumar, G. A., Ameer, M. A., Reddy, G. B. and Dandona, L., Under-reporting of road traffic injuries to the police: results from two data sources in urban India. *Injury Prevention*, 360-365, 2008.
12. Zhi Xie and Jun Yan, 2008, Kernel Density Estimation of traffic accidents in a network space. *Journal Computers, Environment and Urban Systems* Volume 32, Issue 5, September 2008, p. 396-406.
13. Seiji Hashimoto, Syuji Yoshiki, Ryoko Saeki, Yasuhiro Mimura (2016), Development and application of traffic accident density estimation models using kernel density estimation. *Journal of traffic and transportation engineering* (English edition); 3 (3): p. 262, 270.
14. Road Statistics Yearbook, 2017, Brussels: European Union Road Federation.

15. (2018). *Transportation Statistics Annual Report*. Washington D.C.: U.S. Department of Transportation, Bureau of Transportation Statistics.
16. Global Road Safety Report (GRSP) Report, 2018.
17. Brenac, T. and Clabaux, N., The indirect involvement of buses in traffic accident processes. *Safety Science*, 835-843, 2005.
18. Road Traffic accident Statistic 2015-2019 Road Safety Cell, Delhi Transport Corporation), 2020.
19. Bentama, A., Khatory, A. and Millot, M., Spatial analysis of bus accidents in France. *International Colloquium on Logistics and Supply Chain Management*. pp. 124-128. Morocco: IEEE, 2017.
20. Burrows, M., Burd, C. and McKenzie, B. *Commuting by Public Transportation in the United States: 2019*. United States Census Bureau, 2021.
21. Goel, R., Modelling of road traffic fatalities in India. *Accident Analysis and Prevention*, 105-115, 2018.
22. Hildebrand, E., Benchmarking Canadian, American Benchmarking Canadian, American. *Canadian Multidisciplinary Road Safety Conference XII*. London, Ontario, 2001.
23. Hoque, M., Ahsan, H. M., Barua, S. and Alam, D., BRT in Metro Dhaka: Towards Achieving a Sustainable Urban Public Transport System. *CODATU XV: The role of urban mobility in (re)shaping cities*. Addis Ababa, 2012.
24. Kharola, P. S., Tiwari, G. and Mohan, D., Traffic Safety and City Public Transport System: Case Study of Bengaluru, India. *Journal of Public Transportation*, 63-91, 2010.
25. Maniruzzaman, K. M. and Mitra, R., Road Accidents in Bangladesh. *IATSS Research* Volume 29 No. 2, 71-73, 2005.
26. Mohan, D., Tiwari, G. and Bhalla, K., Road Safety in India: Status Report 2016. New Delhi: Transportation Research and Injury Prevention Programme, IIT Delhi, 2016.

Comparison, Analysis and Way Forward of Various Parking Policies in Metro Cities of India

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ABSTRACT

Major parts of India are moving towards urbanisation leading to rise in population in cities, globalisation and increased motorisation. Rise in number of motor vehicles creates huge demand for parking in the cities, causing various problems like traffic congestions, pollution, etc. This paper focuses on review of parking policies for various Indian metro cities to understand the means adopted by such cities to deal with this emerging parking issue for our country at a policy level.

In this study parking policies of Surat, Bengaluru, Pune and Delhi are reviewed. As all the cities and towns are unique in nature and also the available resources change from city-to-city, a common toolkit is developed by ADB (Asian Development Bank) for Ministry of Urban Development (MoUD), Government of India, depicting objectives for the parking policies.

In this paper, the author suggests that as the directives are the means to achieve objectives, the objectives of parking policy need to be more focused.

INTRODUCTION

Parking Policy is gaining importance in India due to increasing urbanisation and vehicle population in cities. However, “the fact that cars typically spend 95 per cent of their lives parked somewhere means

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that finding a place to park a car is potentially of greater importance than concern over a lack of available road space to accommodate it while it is moving" (M Valleley & R Garland, 1997). This assumes, of course, that a car is used on average for only one hour a day despite, generally, being available for use at any time (D Palmer, C Ferris, 2010). Additionally, it is imperative to note that one vehicle requires at least two parking places – one at residence and another at work place; requirement at recreational place is in addition to the said two spots. Basis review of 11 cities across the world, parking also causes problems to dynamic (flowing traffic) as about 30 per cent of traffic is generated due to vehicles searching for parking spots (Parking Cash Out, 2005).

It is interesting to note that 80 per cent of time in a week vehicles are parked (Institution of Highways and Transportation, 2005); however, more research is focused on aspects related to vehicles in motion such as congestion, environmental and safety aspects. The application of parking pricing and supply restrictions is "the most widely accepted and readily accepted method" of limiting car use (Institution of Highways and Transportation, 2005) it is a topic that has received comparatively lesser focus in formulating policies for the future.

Parking Policy

Parking policies can permit one to optimise and facilitate the management of parking by implementing several strategies and functionalities in response to solve the various issues occurring by the parking. So, parking policies help to manage the traffic inside and outside the parking areas.

Provision and management of parking spaces initially emerged as "important but rather narrow concerns about safety and the obstruction of traffic flow on the streets" (Institution of Highways and Transportation, 2005). This resulted in development of policies and standards and to provide off-street public car parks. Well-designed parking policies, contribute to efficient usage of transport network, higher densities, lower emissions and inclusive urban design (Stubbs, 2002). While, poorly designed policies can act in the opposite direction.

The parking policies generally consist of few general elements like details and demography of the city, their urban structure, current issues and challenges of the city, availability of infrastructure and the need of city. Then the policy also consists of legal provisions, current Act and legislations, mobility plans, etc. It also talks about the aim and objectives to be achieved through various types of strategies.

Policy Objectives

A toolkit for urban transport development which was developed by Asian Development Bank (ADB) for Ministry of Urban Development, India (PADECO Co., Ltd., 2008). Objectives dictate framework of directives in Parking Policy and key objectives as identified in toolkit are mentioned in Table 1.

TABLE 1: POLICY OBJECTIVES IDENTIFIED IN ADB-MoUD TOOLKIT

<i>Objective</i>	<i>Strategies</i>
To discourage the use of private vehicles thereby encouraging public transport	Reduce private vehicles usage
To remove obstacles from carriageways thereby improving the steady flow of traffic and increasing carriageway capacity	Remove obstacles
To contribute to a city's economic activities by ensuring a 'turnover' of different vehicles rather than long stay vehicles in commercial areas	Continuous vehicle flow in commercial areas
To satisfy social objectives of supplying adequate parking space at certain locations for certain social groups, e.g. residents, mobility disadvantaged.	Supplying adequate parking space

Source: PADECO Co., Ltd., 2008 & Research Analysis.

So as per the ADB toolkit, the objectives are to discourage the use of private vehicles and encourage them to use public transport. Second objective was to remove the obstacles from the carriage way width by increasing traffic carrying capacity. Third objective was to ensure continuous vehicle flow or turnover in commercial areas. The fourth objective too was to supply adequate parking spaces at certain locations in the city for specific social groups. Each city will have a different policy objectives on the basis of characteristics and availability of existing infrastructure in a particular city.

In India, there are 53 cities having population of more than one million of which nine cities have population greater than four million which are considered for this study. These are namely - Delhi, Ahmedabad, Surat, Mumbai, Pune, Hyderabad, Bengaluru, Chennai and Kolkata. Of the mentioned nine cities, four cities were considered further for detailed study on the basis of availability of information and nearness of their characteristics. Hence, comparative study of parking policies has been undertaken for Surat (Surat Municipal Corporation, 2018), Bengaluru (Directorate of Urban Land Transport, 2020), Pune

(Pune Municipal Corporation, 2016) and Delhi (Transport Department, Government of National Capital Territory of Delhi, 2019).

Comparative summary of Parking Policy objectives of above mentioned four cities is mentioned in Table 2.

TABLE 2: COMPARATIVE SUMMARY OF PARKING POLICY OBJECTIVES

<i>City</i>	<i>Objectives</i>	<i>Category</i>
Surat	To manage demand through pricing and other means.	Demand pricing
	To reduce private vehicle usage and dependency through “Travel Demand Management (TDM)” strategies	Reduce private vehicles usage
	To support public transport use wherever possible.	Promote public transport
Bengaluru	Move from chaotic parking to well organised parking	Organised parking
	Move from free parking to paid parking	Paid parking
	Move from Government-driven parking supply to market-driven parking supply and management	Market-driven demand and supply management for parking
	Move from passive and weak enforcement of parking regulations to active management of parking demand	Strengthen enforcement and management
Pune	Achieving 80 per cent of motorised trips by public transport by 2031 as mentioned in comprehensive mobility plan of Pune, 2008 by encouraging use of public transport using public parking policy as a travel demand management tool.	Promote public transport
	Achieving at least 50 per cent reduction in total vehicle kilometre travelled (VKT) in Pune by year 2031 by creating effective parking management system.	Reduce private vehicles usage
	Transforming at least 10 per cent on street parking spaces to public open spaces or NMT infrastructure by rationalisation of parking spaces in the initial year of policy implementation.	Recreating street parking spaces
Delhi	(Not available as Objectives are not mentioned in parking policy)	-

Source: Surat Municipal Corporation, 2018; Directorate of Urban Land Transport, 2020; Pune Municipal Corporation, 2016; Transport Department, Government of National Capital Territory of Delhi, 2019 & Research Analysis.

In Surat city, first objective was to manage the demand through pricing. Second was to reduce the dependency on users of private vehicles through various strategies and third objective was to promote public transport.

While, in case of Bengaluru the objectives were defined a bit more in detail which comprised of having organised parking spaces, moving from free to paid parking, to promote market-driven demand and supply management for parking spaces and to strengthen enforcement and management of parking regulations.

In the case of Pune city, it can be observed that the policy objectives are not subjective in nature. First objective talks about achieving 80 per cent of motorised trips by public transport by the year 2031 that is directly quantifying their aim to promote and shift public from private to public transport. The second objective talks about a reduction of 50 per cent in total vehicle kilometres travelled by the year 2031. And the last objective talks about recreating street parking spaces by transforming at least 10 per cent of street parking spaces to public open spaces or Non-motorised Transport (NMT) infrastructure and that too in the initial years of policy implementation.

Comparative assessment of policy objectives for various cities is as mentioned in Table 3.

TABLE 3: COMPARATIVE ASSESSMENT OF POLICY OBJECTIVES FOR VARIOUS CITIES

<i>Objectives</i>	<i>UTD Toolkit</i>	<i>Surat</i>	<i>Pune</i>	<i>Bengaluru</i>	<i>Delhi</i>
Reduce private vehicle usage	■	■	■		Objectives not mentioned in Parking Policy
Remove / minimise obstacles	■				
Facilitating continuous vehicle flow in commercial areas	■				
Supplying adequate parking spaces / Organising parking spaces	■			■	
Demand pricing	■				
Promote Public Transport		■	■		

(contd.)

Recreating street parking spaces			■		
Moving to paid parking				■	
Market-driven demand & supply management				■	
Strengthen, Management & Enforcement				■	

Source: (PADECO Co., Ltd., 2008), (Surat Municipal Corporation, 2018), (Directorate of Urban Land Transport, 2020), (Pune Municipal Corporation, 2016), (Transport Department, Government of National Capital Territory of Delhi, 2019) & Research Analysis.

In case of Delhi’s parking policy it was directly focusing on directives; hence, policy objectives were not available for review. Most common objectives were to reduce private vehicle usage, supplying adequate parking spaces / organising parking spaces and promoting public transport. While, various other objectives were to remove / minimise obstacles, facilitating continuous vehicle flow in commercial areas, demand pricing for parking, recreating street parking spaces, moving to paid parking, market-driven demand and supply management and strengthen management & enforcement.

Policy Directives

Each city will have different sets of directives focusing on various aspects to achieve the objectives set forth in the parking policy. Policy Directives can be classified into three categories for comparative study as mentioned in Table 4.

TABLE 4: CLASSIFICATION OF POLICY DIRECTIVES

Category	Inclusions
Policy, Legal and Planning	Formulating policies, legislations, bye-laws and plans, so as to create a new framework or to strengthen the existing framework regulating various aspects of parking policy
Administrative	Formulating Implementation Cells, enforcement measures / responsibility and management aspects for implementing various directives. So this majorly deals with enforcement and management side.
Direct action	Action items which are well-formulated and fit for direct implementation with limited legislative and administrative actions

Source: Research Analysis.

Now we will discuss and compare each type of directive at a city parking policy level.

Policy, Legal and Planning Directives

There are about five different policy, planning and legal directives which were identified while reviewing parking policy for Surat, Pune, Bengaluru and Delhi. Same has been presented in Table 5.

TABLE 5: COMPARATIVE SUMMARY OF POLICY, LEGAL AND PLANNING DIRECTIVES

<i>Directive</i>	<i>Surat</i>	<i>Pune</i>	<i>Bengaluru</i>	<i>Delhi</i>
Parking bye-laws				
Area level parking plan		■	■	■
Proof of parking	■			■
Freight Management Plan	■			
Parking norms reconsideration	■		■	

Source: (Surat Municipal Corporation, 2018), (Directorate of Urban Land Transport, 2020), (Pune Municipal Corporation, 2016), (Transport Department, Government of National Capital Territory of Delhi, 2019) & Research Analysis.

- *Parking Byelaws*: This comprises of formulating specific byelaws for parking purposes in addition to building byelaws, and Development Control Regulations (DCRs). This directive is not present in any of the parking policies.
- *Area level Parking Plan*: This comprises of formulating a specific area level parking plan wherein the entire city will be divided into various zones and each zone will have a unique and an independent parking plan. This directive has been adopted across various cities like Pune, Bengaluru and Delhi.
- *Proof of parking*: This directive dictates that there should be proof regarding availability of parking prior to purchase of a vehicle. This had been a part of parking policies for Surat and Delhi.
- *Freight Management Plan*: Talks about formulating a specific plan for moment and parking of commercial vehicles in this city. This directive was witnessed specifically in Surat as it requires significant freight movement in city for textile related businesses.
- *Parking Norms*: These have been given consideration in Surat and Bengaluru. This comprises of revisiting and making

suitable amendment in norms relating to parking spaces that is General Development Control Regulations (GDCRs).

Administrative Directives

Administrative directives generally comprise four aspects relating to implementation, enforcement and management of various directives set forth in the parking policy. There are about four different administrative directives which were identified while reviewing parking policy for Surat, Pune, Bengaluru and Delhi. Same has been presented in Table 6.

TABLE 6: COMPARATIVE SUMMARY OF ADMINISTRATIVE DIRECTIVES

Directive	Surat	Pune	Bengaluru	Delhi
Implementation Cell		■		■
Enforcement	■	■	■	■
Management of public parking			■	
Parking revenue management		■	■	■

Source: Surat Municipal Corporation, 2018; Directorate of Urban Land Transport, 2020; Pune Municipal Corporation, 2016; Transport Department, Government of National Capital Territory of Delhi, 2019 & Research Analysis.

- *Implementation Cell*: This directive dictates establishment of an independent implementation cell for enforcing parking policy directives and managing parking aspects. This directive was highlighted in traffic policies for Pune and Delhi.
- *Enforcement*: It is a necessary measure for any policy to be effective and efficient. Hence administrative directives with regards to enforcement have been clearly brought out in traffic policy of all the cities namely Surat, Pune, Bengaluru and Delhi.
- *Management of public parking*: Talks about the framework surrounding public parking that is operated by some private agencies through a contract on, PPP mode or any other suitable framework for managing on street and off street parking spaces across the city. This measure has been noticed in Bengaluru only.
- *Parking revenue management*: It is an aspect dealing with usage of revenue which has been collected as parking charges or penalties or towing charges for upgrading parking and Non-Motorised Transport (NMT) infrastructure. This aspect has been talked in traffic policy for Pune, Bengaluru and Delhi.

Direct Action Directives

Direct action directives form majority of the directives mentioning the traffic policy. As we can see in this combined assessment, there were about five directives relating to policy, planning and legislations, four directives relating to administrative side; there are about 13 direct action directives as mentioned in Table 7.

- *On-street parking*: It identifies the specific location on the street as a parking space. This also talks in detail the necessary provisions and codes to be followed for on-street parking. This directive has been witnessed in various cities like Pune, Bengaluru and Delhi.
- *Parking pricing*: is one of the most talked about directive in all the traffic policies. This deals with suggestion to have a fair parking pricing along with necessary guidelines on deciding the parking charges. This has been talked about in all the cities under study.

TABLE 7: COMPARATIVE SUMMARY OF DIRECT ACTION DIRECTIVES

<i>Directive</i>	<i>Surat</i>	<i>Pune</i>	<i>Bengaluru</i>	<i>Delhi</i>
On-street parking		■	■	■
Parking pricing	■	■	■	■
Parking permits	■			
Park & Ride (incl. NMT)	■			■
Technology adoption		■	■	
Promote public transport				
Parking sharing	■			
Regulating Intermediate Public Transport System (IPTs) and transport vehicle parking	■		■	■
Off-street and multi-level parking		■	■	■
Residential on-street parking			■	■
Parking for differently abled persons				■
Charging facilities for electric vehicles				■
Junk vehicles				■

Source: Surat Municipal Corporation, 2018; Directorate of Urban Land Transport, 2020; Pune Municipal Corporation, 2016; Transport Department, Government of National Capital Territory of Delhi, 2019 & Research Analysis.

- *Parking permits*: It deals with issuing permits for a particular time duration to park a vehicle at a designated location. This directive has been discussed in traffic policy for Surat city only.
- *Park & Ride (incl. NMT)*: This directive aims to increase the usage of public transport by facilitating availability of adequate parking spaces around boarding or alighting points of respective modes of public transport. This also talks about promoting NMT in integration with public transport system. This has been talked in public policy for Surat and Delhi.
- *Technology adoption*: It mainly focuses on increased penetration of technology in parking management; so as to provide convenience to users and motivate them to park at designated locations only. This has been more in focus introduced in cities like Pune and Bengaluru.
- *Promoting public transport*: Its reference has been made in parking policies for several cities like Surat, Pune, Bengaluru and Delhi.
- *Parking Sharing*: It is a unique concept which is found in parking policy for various cities in Gujarat. This aims to share and utilise available urban spaces or unused parking spaces available in a particular area.
- *Regulation of Intermediate Public Transport System (IPTS) and transport vehicle parking*: Focuses on regulating IPTS and good carrier parking. This is critical because promoting public transport will lead to increased usage of IPTS, so in case proper regulations and parking management are not being done for the same then this would lead to increased chaotic situation. This aspect has been directly or indirectly talked in parking policy for cities like Surat, Bengaluru and Delhi.
- *Off-street and multi-level parking*: Directive deals with identification, development and management for such facilities. This has been given due importance in parking policies in all major Metro cities.
- *Residential on-street parking*: It is a typical issue faced almost in all the metro cities in older or already developed areas because at that particular point of time parking wasn't considered as a major attribute for development control regulations. However, managing residential on-street parking has been talked only in traffic policy for cities like Bengaluru and Delhi.

- *Parking for differently abled persons:* It is a unique and independent consideration made in traffic policy of Delhi. However this indirectly forms a part of on-street, off-street and multi-level parking development guidelines.
- *Charging facilities for electric vehicles:* It is a very critical aspect which needs focus on government's aim of gaining significant change in e-mobility by 2025 and 2030. Hence, parking infrastructure in all fronts, i.e., on-street, off-street and multi-level should give due importance to such aspects. Providing charging facilities has already been part of many Development Control Regulations (DCRs) but incorporating same in parking policy is need of the hour to promote increase in e-mobility. However, same has been talked about only in Delhi's parking policy.
- *Junk vehicles:* It is again an aspect which has been explicitly mentioned in Delhi's parking policy. It dictates directly in line with scrappage policy. Hence, national policy is to be followed by all states of Union of India; this can be considered to be indirectly addressed in all cities.

CONCLUSION

Urbanisation, higher incomes and enhancement in living standards – all these factors have led to an increase in number of personal transport vehicles. This has directly created pressure on available land as a resource for parking spaces. In order to tackle parking related issues in a better format, all major cities in India have started preparing and implementing parking policies.

Of the nine cities with population more than four million, parking policy of four cities namely Surat, Bengaluru, Pune and Delhi were studied in detail.

Parking policy comprises of two sections, viz. objectives and directives. Policy objectives are important as these set the tone for entire policy including directives and means for its implementation. It was found that objectives of parking policy lack clarity in majority of cities due to some inherent and city specific issues. Hence, formulation of policy objectives shall be more focused considering regional characteristics and city specific issues. This can be achieved by encouraging citizen participation at the start of the process. A participative survey of citizens should be undertaken to understand what are the key issues according to citizens, what are their requirements / expectations and what according to them are the means to achieve objectives and resolve the issues.

Further, the policy objectives in majority of the parking policies reviewed by the author were subjective in nature. Objectives of the parking policy should have quantitative aspects linked to it as in the case of Pune's parking policy.

Directives are the means to achieve objectives i.e., directives are actual actionable tasks. The author found that in certain cities few objectives had no directives and few directives were without any objectives. Objectives and strategies, i.e., means to achieve such objectives have to be interlinked and they cannot be independent in nature. This has been very well drafted in parking policy of Bengaluru by mapping the policy directives to objectives. Hence, the author suggests that each objective should have a set of directives which are explicitly mapped and brought out clearly in policy. This mapping can be optimally achieved by organising various brain storming sessions between policy makers, citizens and implementing authorities during policy formulation stage.

The article is concluded by suggesting the objectives of parking policy to be more focused considering local prevailing conditions in each city and to be quantifiable in nature. Further action items, i.e., directives for achieving each objective should be clearly mapped with each objective. Citizens and subject expert engagement is also necessary during formulation of policy. These are the essential ingredients for the parking policy to be implementable and successful in true spirit.

REFERENCES

1. D Palmer, C Ferris. (2010). *Parking Measures and Policies Research Review*. UK: Transport Research Laboratory.
2. Directorate of Urban Land Transport. (2020, December). *Parking Policy 2.0 for Bengaluru*. *Parking Policy 2.0 for Bengaluru*. Bengaluru, Karanataka, India: Urban Development Department, Government of Karnataka.
3. Institution of Highways and Transportation. (2005). *Parking Strategies and Management*. Essex: HQ Media Services Ltd.
4. M Valleley with R Garland, P. J. (1997). *Parking Perspectives: A Sourcebook for the Development of Parking Policy*. Landor Publications.
5. PADECO Co., Ltd. (2008). *Guidelines and Toolkits for Urban Transport Development in Medium Sized Cities in India*. Tokyo: Ministry of Urban Development & Asian Development Bank. (2005). *Parking Cash Out*. American Planning Association.
6. Pune Municipal Corporation. (2016). Pune Municipal Corporation. *Public Parking Policy*. Pune, Maharashtra, India: Pune Municipal Corporation.
7. Stubbs, M. (2002). Car parking and residential development: sustainability,

design and planning policy, and public perceptions of parking provision. *Journal of Urban Design*, 213-237.

8. Surat Municipal Corporation. (2018, December 05). Parking Policy for Surat City. *Parking Policy for Surat City*. Surat, Gujarat, India: Surat Municipal Corporation.
9. Transport Department, Government of National Capital Territory of Delhi. (2019, September 23). Parking Management Area Plan for National Capital Territory of Delhi: A Guidance Framework. *Parking Management Area Plan for National Capital Territory of Delhi: A Guidance Framework*. Delhi, Delhi, India: Transport Department, Government of National Capital Territory of Delhi.

Impacts of Urban Construction on Society: A Case of Elevated Road Project in Ajmer City

VRINDA PRAKASH*
HARSHITA UPADHYAYA**

ABSTRACT

A smart city is a new form of urban construction that has emerged gradually in the process of rapid urbanisation. The city of Ajmer is among 100 cities to be created as a smart city in India and to fulfil this mission, various construction projects are going-on in various parts of the city. Therefore, the case of elevated road project sanctioned under the Smart City Mission has been taken up in this paper as the conversion of earth's land surface to urban uses is one of the most irreversible human impacts on the biosphere.

This article attempts to evaluate the impacts of urban construction on the environment and how different segments of people in the city respond to such construction. To conduct the research, data have been collected from primary and secondary sources. Here, the data collected from the field survey shows dissatisfaction among people residing in the construction zone as it has affected the environment and caused various health problems.

Keywords: Urban Construction, Smart city Mission, Urban Expansion, Elevated Road Project, Sustainable Development

INTRODUCTION

Construction projects have unavoidable impacts on the surrounding environment, such as public safety, emergency response, noise and dust. These impacts are especially significant when construction projects are located in urban areas with little space and high population constraints. To solve traffic congestion, the Rajasthan Government has taken an initiative to build an elevated

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road in the heart of the Ajmer city. This will undoubtedly provide unprecedented convenience for the traffic of the city, but at the same time, a series of problems have cropped up and the solution has not kept up with the development and the related issues can be seen in the newspaper reports and city's news channels.

An elevated road is a controlled-access highway that is raised above grade for its entire length. Elevation is usually constructed as viaducts, typically a long pier bridge. Technically, the entire highway is a single bridge which improves transport efficiency. An overpass is the solution to improve traffic flow or a more effective way to road intersection traffic congestion. But with its development, the drawbacks are progressively exposed.

This study analyses the current situation of urban construction in the city and the response of people regarding the same.

Study Area

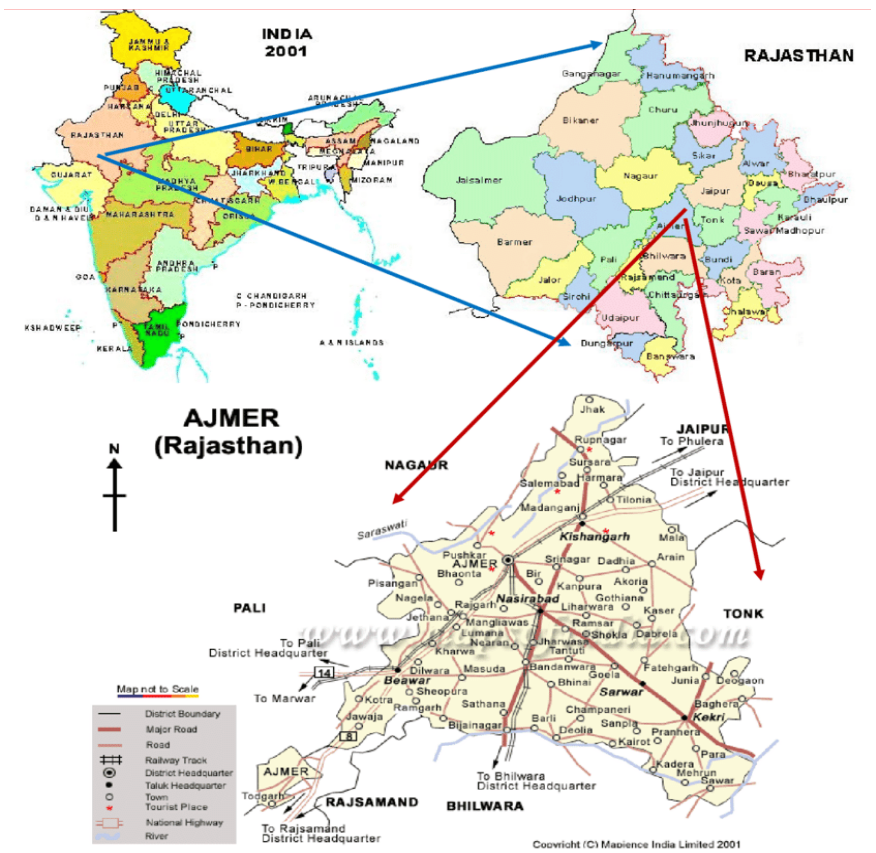
Ajmer district is located at 26° 27' N and 74° 44' E and is surrounded by the Aravali Hills. Situated in the centre of the state of Rajasthan on the lower slopes of Taragarh hill, the district is spread across an area of 8481 sq km. Nagpahar hills separates Ajmer from the Thar Desert which is the divisional headquarters of Rajasthan and includes three other districts namely Bhilwara, Nagaur and Tonk. To the north, its boundaries touch Nagaur; Tonk and Jaipur districts lie on the eastern side; Pali is located on its western boundaries, while Rajsamand is situated on the south. Map 1 shows the location map of the study area.

The climate of Ajmer can be placed under the semi-arid category with an average annual rainfall of 556.4 mm. Summers are long, hot and dry and start from the last week of March and continue till the end of June and winters are mildly cool and start from November and continue till the end of February. The temperature ranges between 22° C to 8° C in winter and 45° C to 25° C in summer and the monsoon season is from June to September.

According to the 2011 census, Ajmer has a population of around 551,360 in its urban agglomeration and 542,580 in the city (Figure 1). In average literacy, Ajmer occupies the 8th position among districts of Rajasthan. It has male literacy rate of 82.4 per cent and the female literacy rate of 55.7 per cent to have a combined rate of 69.3 per cent. Within the district, there are 12 subdivisions which are further subdivided into 16 Tehsils and nine Panchayat Samities.

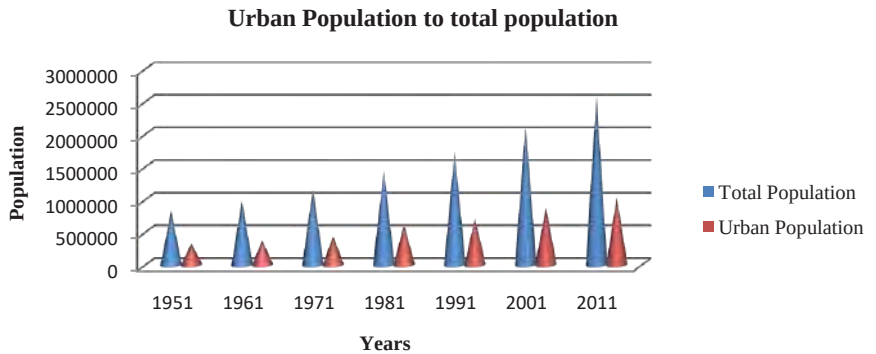
The city has a population density of 305 persons per sq km. During

Map 1: Location Map of the study area



Source: Pingale, S., Khare, D., Jat, M., and Adamowski, J., (2016).

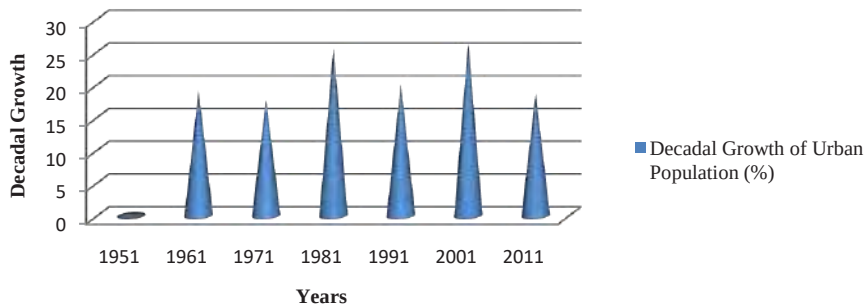
Fig. 1: Urban population to total population of
Ajmer district (1951 to 2011)



Source: District Census and Statistical Handbook, Ajmer (2011).

the decade 2001-2011 the population growth rate of the district was 18.40 per cent as shown in Figure 2.

Fig. 2: Decadal growth of urban population Ajmer district (1951 to 2011)
Decadal growth of urban population (%)



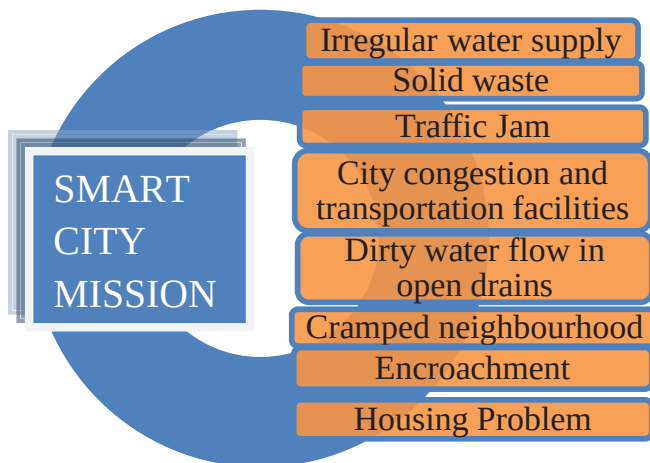
Source: District Census and Statistical Handbook, Ajmer (2011).

Elevated Road Project

This project which comes under the Smart City Mission focuses on how to shape future internet- based services and provide solution to the problems (Figure 3).

Construction work on an elevated road project in Ajmer under Smart City Mission was proposed in 4th Board meeting of Ajmer Smart City Limited (ASCL) held on November 30, 2017. After this Ajmer has become the third city in the state to have an elevated road. Map 2 shows a map constructed with the help of ArcGIS Online of the Ajmer City indicating the location of the elevated road. The total length of the road

Fig. 3: Smart City Mission and the Related Issues



Source: The Author.

Map 2: A map of Ajmer city indicating the location of the elevated road



Source: ArcGIS Online.

proposed is 2945 metres (2.9 km) and the total cost sanctioned by the government is 252 crores. The time given by the Rajasthan Government to complete the construction is 36 months. Out of 91 pillars of the elevated road, almost 75 per cent pillars are ready and steel bearings will be installed in eight to 10 months.

The elevated road will be of Y shape constructed in two phases (Figure 4):

- **4 lanes-** from Martindale bridge to Gandhi Bhawan and from

Fig. 4: Outlay of Elevated Road Project in Ajmer



Source: Head Office, Ajmer Smart City Limited.

Gandhi Bhawan to Agra Gate (length- 1.6 km and width- 19 to 25 metres).

- **2 lanes-** from old RPSC to Gandhi Bhawan and from Agra Gate to Mahavir Circle (length- 1.10 km and width- 12 to 22 metres).

Objectives of the Paper

1. To understand the demographic structure of Ajmer city from 1951 to 2011.
2. To study the shortcomings of the ongoing construction in the city;
3. To analyse the impacts of urban construction on society; and
4. To study the response of the population of Ajmer city on urban construction.

Methodology

Both primary and secondary data was collected from various agencies involved in the project like Ajmer Development Authority, Rajasthan State Road Development and Construction Corporation and Ajmer Smart City Limited with the help of a questionnaire and interview method. The data was also taken from the Census of Rajasthan and handbook of Ajmer district to analyse the demographic structure of the study area for the past 60 years. A field survey was conducted to study the response of the citizens regarding the construction and the respondents were selected through random sampling. The sample was taken from four areas in Ajmer. Out of four, three areas were selected where the construction has been going on that is Kutchery road, near railway station and Mahaveer circle and the selected fourth area was out of construction zone that is the locality of Panchsheel Nagar.

The survey was conducted in two phases and 50 respondents were selected for the study from each area making a total sample of 200. To carry out the first phase of the survey, respondents that have their shops in the area of the construction of elevated road were selected and for the second phase, respondents who do not reside in the area of the elevated road construction were selected to make a comparative study between the two. Issues related to satisfaction with the construction, expectations from the project, rising air pollution due to construction and related health problems, problem of traffic congestion, etc. were asked from the respondents and the result is represented in the form of pie charts.

Results and Discussion

The elevated road project in Ajmer has been under construction for more than a year now, affecting the markets as well as the traffic in the city. Shortcomings observed during the field survey are as follows:

1. Arrangement of utility shifting: sewerage lines, water supply lines, electrical and telephone lines.
2. Inefficient traffic management.
3. No provision for removal of encroachment and land acquisition around Martindale Bridge.
4. No ground utility and less manpower onsite.
5. There was no provision of protective gears for onsite workers provided by the contractor like safety helmets, shoes, jackets, safety belts, etc.

The first phase of the survey covered the area where elevated road project has been carried out (Figure 5). The primary data analysis has shown that maximum people residing in that area or have shops around that area were dissatisfied with the project stating that their business has gone down and are facing many respiratory problems due to the construction.

The second phase of the survey covered the area where the elevated road will not be built. The primary data analysis has shown that the maximum number of people residing in the area were very much satisfied with the project stating that this will boost the urbanisation in the city and solve many problems regarding traffic in the city centre (Figure 6).

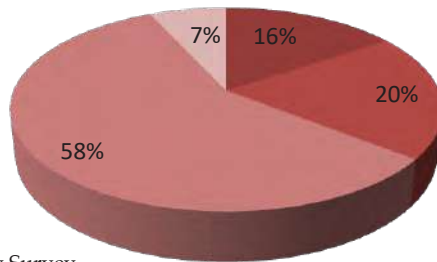
Fig. 5: 3D Model of Elevated Road Project



Source: Head Office, Ajmer Smart City Limited.

Fig. 6: Satisfaction level among people residing in the area of elevated road

Satisfaction level with the construction and its progress- Phase I
■ Very Satisfied ■ Satisfied ■ Dissatisfied ■ Very Dissatisfied

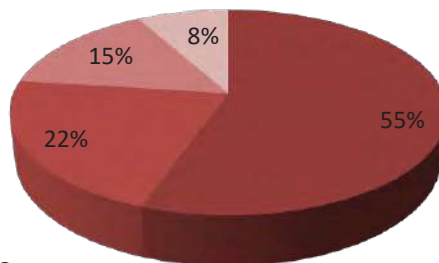


Source: Primary Survey.

The primary data analysis in Figure 7 shows that 92 per cent respondents agreed to the fact that road construction has caused damage to the environment at a large scale whereas eight per cent did not agree.

Fig. 7: Satisfaction level among people not residing in the area of elevated road

Satisfaction level with the construction and its progress- Phase II
■ Very Satisfied ■ Satisfied ■ Dissatisfied ■ Very Dissatisfied



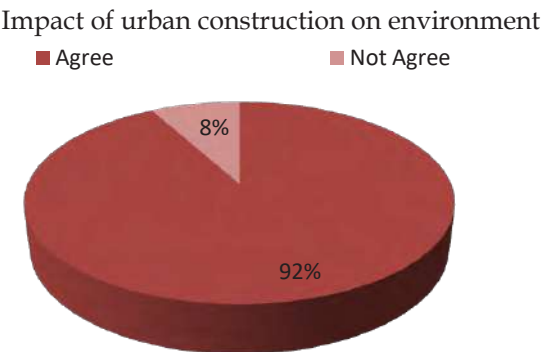
Source: Primary Survey.

CONCLUSION

The smart city is the new trend of urban construction and development. In the process of urban modernisation, the pressure on the city is increasing. The following study helps to understand the perception of the people of Ajmer city regarding the urban developments in the name of the Smart City Mission and result analysis shows that majority of population specifically living near the construction site is facing environmental and health problems (Figure 8).

The elevated road project has created difficulties for the people because of the restricted movement. The same has been observed and the continuous delaying has added an extra burden and has given a negative

Fig. 8: People agreeing to the fact that urban construction impacts the environment



Source: Primary Survey.

Pictures 1 & 2: Difficulties faced by people during construction



Source: Field visit.

connotation in the minds of people. Pictures 1 and 2 show the difficulties faced by the people of Ajmer city due to the construction work. This project will facilitate an overall development of urban transportation, infrastructure development and public service. Additionally, if the project aims for sustainable development as well then it can prove even more profitable for the region.

BIBLIOGRAPHY

1. Census of Rajasthan (2011). Directorate of Census Operations, Rajasthan, Ministry of Home Affairs, Government of India.
2. Census of Rajasthan (2000). Directorate of Census Operations, Rajasthan, Ministry of Home Affairs, Government of India.
3. Census of Rajasthan (1991). Directorate of Census Operations, Rajasthan, Ministry of Home Affairs, Government of India.
4. Census of Rajasthan (1981). Directorate of Census Operations, Rajasthan, Ministry of Home Affairs, Government of India.

5. Census of Rajasthan (1971). Directorate of Census Operations, Rajasthan, Ministry of Home Affairs, Government of India.
6. Census of Rajasthan (1961). Directorate of Census Operations, Rajasthan, Ministry of Home Affairs, Government of India.
7. Census of Rajasthan (1951). Directorate of Census Operations, Rajasthan, Ministry of Home Affairs, Government of India.
8. Endut, I.R., Akintoye, A. and Kelly, J. (2009). Cost and Time Overruns of Projects in Malaysia, in Fifth International Conference on Construction in the 21st Century (CITC-V) Collaboration and Integration in Engineering, Management and Technology, May 20-22, 2009, Istanbul, Turkey.
9. Jat, M.K. and Garg, P.K. (2008). Modelling of Urban Growth using Spatial Analysis Techniques: A Case Study of Ajmer City (India). *International Journal of Remote Sensing*, 29 (2), 543-567.
10. Leje, M, I., Shansulhadi, B., Fadhlin, A. and Jamil, A. (2020). Impacts of Skilled Workers in Sustainable Construction Practices. *International Journal of Scientific and Technology Research*, 9 (3), 6700- 6706, ISSN 2277- 8616.
11. Liu, L. and Zhu, K. (2007). Improving cost estimates of construction projects using phased cost factors. *Journal of Construction Engineering and Management*, 133 (1), 91-95.
12. Master Development Plan- Ajmer Region (2033). Ajmer Development Authority (2021) Government of Rajasthan.
13. Memon, A, H., Rahman, I. and Abdullah, M. (2011). Time Overrun in Construction Projects from the Perspective of Project Management Consultant (PMC). *Journal of Surveying, Construction and Property*, 2(1), 54-66, ISSN 1985-7527.
14. Prakash, V. and Sharma, S. (2018). A Pioneer Step in Making Ajmer a Smart City: An Evaluation of Challenges and Responsibilities, *IOSR-JHSS*, 23(9), ISSN- 2279-0837.
15. Prasad, H., Bhalla, P. and Palria, S. (2014). Site Suitability Analysis of Water Harvesting Structures Using Remote Sensing and GIS- A Case Study of Pisangan Watershed, Ajmer Distric, Rajasthan. *The International Archivess of the Photogrammetry, Rmote Sensing and Spatial Information Science*, XL-8, 1471-1482.
16. Roberts B., Schwartz, H., Carline, J., King, L., Orange, P., Cumming, P. et al. (2006). Global Good Practices in Sustainable Urban Region Development, *Urbanization and Sustainability in Asia*, Asian Development Bank; Washington, D.C.
17. Sharma, K., Sharma, S. and Mathur, P (2016). Calculation and Analysis of the Urban Ecological Footprint: A Case Study of Ajmer City, India, *Indian Journal of Ecology*, 43(1).
18. Sharma, A. and Yadawar, R (2015). Ajmer as a Smart City: An Assessment of Challenges and Responsibilities, *IJIRSSC*, 1(2), ISSN 2395-4335.

19. Upadhyaya, H (2014). Variability of Rainfall in Rajasthan (1960-2009), *International Journal of Innovative Research and Review*, 2(1), pg- 17-19.
20. Xing, Y., Horner, M., El-Haram, M. and Bebbington, J. (2009). A framework model for assessing sustainability impacts of urban development, *Accounting Forum*, 33 (3), Pages 209-224, ISSN 0155-9982.

REFERENCES

1. District Census Handbook- Ajmer, (2011). Directorate of Census Operations, Rajasthan, Ministry of Home Affairs and Government of India.
2. Pingale, S., Khare and D., Jat, M. and Adamowski, J. (2016) Trend Analysis of Climatic Variables in an Arid and Semi- Arid Region of the Ajmer District, Rajasthan, India. *Journal of Water and Development*, 28 (I-III), 3-18, ISSN 1429-7426.

BOOK REVIEW

Architecture: Past, Present and Future, A.K. Jain, 2022, Delta Book World, New Delhi, ISBN 978-81-955519-2-7, Rs. 3500/-, p. xiii + 357

Architecture is a unique blend of technical, artistic, economic and socio-cultural developments. Spanning both art and science, it is closely linked with urbanism, ecology, micro-climate, environment, natural resources, water, energy and public health. According to RIBA Gold Medallist and Pritzker Award winner B. V. Doshi *"we cannot look at architecture as merely a product because it is not what one calls a passive space, form or structure. Architecture is an extension of our body. It's not outside of me, it is a part of me and we live within it. When you think it is part of yourself then the questions are the food you eat, the life you live, the people you meet and the world in which we live. It is an understanding of culture, aesthetics, climate and space. That's how I understood Corbusier. He would talk about behaviour, attitudes and about climate. He spoke about the relationship between people and the building, about the space. And I think because of that my whole understanding of architecture is different"*.

The book 'Architecture: Past, Present and Future' by A.K. Jain provides a comprehensive understanding of the evolution and concepts of architecture, which include green building, climatology, building resources, parametric and morphotectonics and infrastructure services.

The author starts with the first chapter on the elements of architecture. According to him there are three kinds of people – visual, auditory and kinaesthetic. Beautiful experience is their fundamental emotion and a cradle of design. Design elements are the visual units of aesthetics. These include the form, functions, materials, envelop, façade, openings, size, scale, proportion, contrast, hierarchy, emphasis, etc. The architects not only have to deal with the hard technical aspects but also with the soft, innovative concepts by lateral thinking.

As Le Corbusier looked at the buildings beyond their practical physical form and utility: *"You employ stone, wood and concrete, and with these materials you build houses and palaces. That is construction. Ingenuity is at work. My house is practical. I thank you, as I might thank railway engineers, or the telephone service. You have not touched my heart. But suddenly you touch my heart, you do me good, I am happy, and I say: 'This is beautiful.' That is architecture. Art enters in"*.

The author in the second chapter traces the evolution of architecture and the manifestation of geographic, economic, political, cultural, social, technology and building resources. As such, architecture bears the stamp of human endeavours and thoughts.

Moving further, in the next chapter the author states that the cities and buildings keep alive the memories. They are not just the material remains of contemporary society, but the living things of the people, their economy, knowledge, arts, faiths, morals and customs. They provide lessons how the builders, architects and the society addressed the issues of dichotomy between urban and rural, and between the natural and built form. The author outlines the evolution of the classical architecture and the principles of design, proportions, orders and structural systems. The classical styles were followed by the Renaissance, Neo-Classicism, Modern and Post-modern, and now by the new parametric style. It depicts complex forms by digital design, animation, simulation, tectonic logics, seamless fluidity and modulation. Parametricism is the new wave of spatial design. The parametric design is inspired by the quasi-scientific fields of plant and animal morphology, a new 'organicity'. The computer has emerged as a tool for simulating the generation of biological forms and morphological simulations.

The fifth chapter deals with the pandemic, pollution and morphotectonic strategies. Covid-19 has caused massive disruption to the economy and the livelihoods, especially of those living in the slums and working in informal sector as domestic servants, labour, vendors, and construction workers. Their income sources have vanished. Most of them live in the slums which lack space, sun, air, clean water and sanitation. The Covid pandemic has exposed them to the epidemiological, transitional, and control measures vulnerabilities. The chapter underlines the need to adopt a bottom-up approach rather than top-down approach.

In continuity, the next chapter focuses upon the sustainable habitats and green buildings, and their relationship with natural environment and societies.

In the next chapter, the author explains the process of design with climate. According to him, the basic purpose of architecture is to design a building where changing phenomenon of heat, temperature, radiation, sunlight, humidity, rain precipitation, wind and diseases can be mitigated.

In the eighth chapter, the author dwells upon the subject of housing. According to him shelter is a direct manifestation of poverty and lack of it is a major cause of inequalities. In 2012, in India there was a housing shortage of 18.78 million units, of which 96 percent pertained to Economically Weaker Sections (EWS) and Low-Income Groups (LIG). Besides various housing programmes undertaken during last 75 years of Independence, the author provides a detailed study of the Pradhan Mantri Awas Yojana (PMAY), launched in 2015. This is

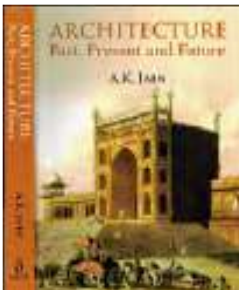
one of the largest housing programmes ever undertaken. The Global Housing Technology Challenge- India (GHTC) has mainstreamed new technologies for affordable housing.

The author further moves to the last chapter of the book, 'Sustainable Infrastructure Services'. This covers the Energy Systems, Plumbing, Water Supply, Sewage, Sanitation and Drainage, Environmental Services, Pollution Control, Liquid and Solid Waste Disposal, Fire Safety, Security Systems, Telecommunication, Wi-Fi, CCTV, etc.

According to the author, the pillar of sustainable architecture is to think of the buildings, services, energy, water and materials in a closed circular loop. It involves an eco-system approach towards design, materials and construction. Adoption of circular models for the building design and construction involves formulating mandatory recycling guidelines, valuing material flows, their emissions and footprint, environmental impact and lifetime scenarios. The basic approach of circular construction is zero emissions and wastes.

The author concludes that architecture manifests a continual dialectic between the building and nature, the inside and outside and construction and resources. The fascination of design lies in the interplay between the infinite ideas and resources, which include light, sun, air, rain, climate, nature, building materials, budget and time. The purpose of the design is to give an identity to the space. There has always been a search for emotional and human relationship with the space and the built environment. This is not just physical, but also psychological and emotional, beyond the functional, tangible and material aspects of design. As the human emotions are amorphous, an architect has to search for the relationship between consciousness and space in order to create emotionally responsive space.

Written in a simple language and with more than 300 illustrations, the book provides an interesting and wide panorama of the past, present and future. The book by its practical examples and graphics is engaging.



JDS Sodhi
Ex Director (Planning) DDA

National Convention on People-Centric Urban Governance in India*

Centre for Urban Studies, IIPA organized a two-day National Convention on People-Centric Urban Governance (PCUG) on December 6-7, 2022 in New Delhi. The convention was organized in view of role of urban governance to realise national vision of making India @ 2047 as a developed nation.

The two-day convention provided a platform to practitioners and professionals to interact on respective issues and prepare a seventy-five-point AMRIT KAL DECLARATION based on even number of papers. These papers were covered under plenary session and ten parallel / breakaway sessions on specific themes namely: (i) Urban Governance, (ii) E-Governance for People Centricity, (iii) Urban Services & Climate Change, (iv) Urban Poverty Alleviation & Street Vendor, (v) Smart City, (vi) Urban Infrastructure and mobility, (vii) Waste Management, (viii) Urban Planning and Land Management, (ix) Urban Housing and Slums, and (x) Urban Finance and Economy. The structure and programme along with curtain raiser covering Abstracts from papers is available on IIPA website (<https://www.iipa.org.in/cms/public/page/centre-for-urban-studies>).

The programme was inaugurated by Shri Manoj Joshi (IAS), Secretary, Ministry of Housing and Urban Affairs (MoHUA) and Professor Om Prakash Mathur, Non- resident Senior Fellow, Global Cities Institute, University of Toronto delivered the key note address whereas Shi S.N. Tripathi (IAS-r), Director General, IIPA also extended his opening remarks. Shri Tripathi cited the changing urban scenario and uniqueness of urban problems from one city to other. He said that the administrative solutions and governance have to address the cities accordingly. Prof. Mathur identified three areas of attention and actions such as Growth (balanced), Inclusion (across the urban areas) and Sustainability. The role of local governments is critical to achieve balance between urbanisation and inclusive regional development. Shri Joshi spoke on (i) evolution of urban centres as part of economic growth, (ii) constitutional provision of ULBs (Urban Local Bodies) and the powers assigned and (iii) programmes and scheme. He also indicated need to consider the three in a logical sequence for assessment of urban sector in India.

*Organised by CUS, IIPA on December 6-7, 2022.



Release of Monograph on Waste Management by
Shri Manoj Joshi (IAS) Secretary, MoHUA

The plenary session had five key speakers and Ms. D. Thara as Chair to moderate the session which set the tone and tenor of the convention. These include Ms. Parul Agarwala, Country Program Manager, UN HABITAT, Ms. Roopa Mishra (IAS), Joint Secretary (SBM 2.0), MoHUA, Shri V. Suresh, Former Chairman and Managing Director, HUDCO, Prof. Chetan Vaidya, Former Director, School of Planning & Architecture (SPA), New Delhi and National Institute of Urban Affairs (NIUA), and Shri Hitesh Vaidya, Director, NIUA, New Delhi. The presentations made by sector experts included global urban agenda, Swachh Bharat Mission 2.0 and Urban Sanitation, Housing and Habitat Development, Municipal Capacity and reforms in Kerala and Urban Agenda of Government of India.



Ms. D. Thara (IAS) Addl. Sec. MoHUA
along with other Sector Experts during Plenary Session

The breakaway/parallel sessions covered a host of subject areas as indicated earlier in the second para. Seventy five papers presented in the convention evoked keen interest among participants.



Glimpses of Ten Parallel/Breakaway Sessions

Valedictory Session of the convention had presidential address by Hon'ble Union Minister Dr. Jitender Singh and remarks by Special Guest Shri Bharat Lal, Director General, NCGG (National Centre for Good Governance). In addition to presentation of Amrit Kal Declaration, special remarks were also given by Shri S.N. Tripathi, Director General, IIPA. Shri Tripathi gave a brief of two-day convention. He said the convention has evoked wider interest from professionals and practitioners with 75 papers including papers by faculty of IIPA. Shri Tripathi said, reminds: *Dag Dag Ujaala, Sara Dag Sahar, Ye vo Sahar to nahi, Jiski iltiza thi hume*. This means there is always scope of improvement and our quest to improve city should continue with for Good Governance initiatives. He also recalled Hon'ble Minister's words that government should be recognised with its influence over citizens (*Dabav*), need (*Abhav*) and Impact (*Prabhav*). Shri Tripathi accordingly indicated the need for good governance and making cities a centre for productivity. He also mentioned the complex nature of urban development in India with cities of different levels of achievements which need due cognizance and follow-up. This should also be used to restructure cities as per national objectives.

Shri Bharat Lal Ji cited the excellent efforts by India on economic front during last one decade with a reference to 60 years to reach one trillion \$ economy, seven years to two trillion \$ economy and five years to three trillion \$ economy. With the Government of India resolve to achieve status of a developed nation it is also essential to ensure good

quality of life. The progress achieved by the state of Gujarat in this regard is a benchmark. At the same time, the governance has to include speed, scale and skills.



Release of Nagarlok (Issue 3, 2022) and Monograph on HRIDAY by Hon'ble Union Minister & Chairman EC, IIPA, Dr. Jitendra Singh

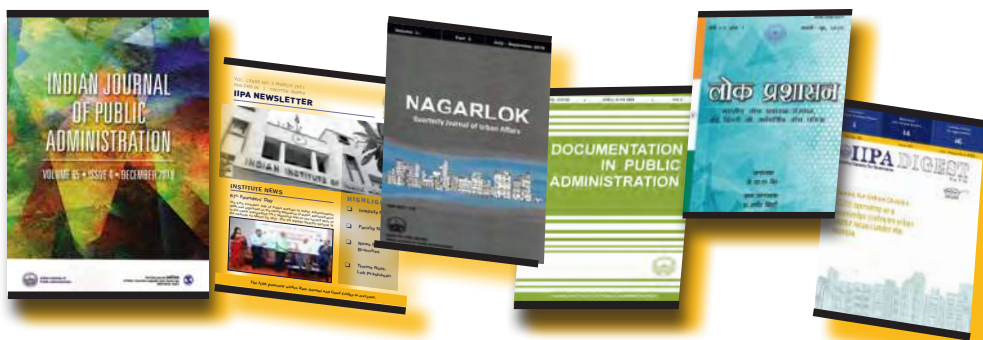
Seventy-five-point Amrit Kal Declaration was presented which included specific actions on IT enabled, faceless, contactless and mobile governance, cost effective, transparent and accountable service delivery, disaster management, targeted subsidies, credit worthiness of ULBs, road safety, environmental, energy and safety audit, affordable housing and slum improvement and expansion of urban missions.

Hon'ble Union Minister Dr. Jitendra Singh delivered valedictory address. Dr. Singh said that this convention is an extension of the role of IIPA to develop a resource pool on strategies and innovation on public administration. Dr. Singh revealed that there is no bad governance but improving and raising the levels of governance is good governance. It has to be in line with changing parameters/yardsticks. Last two decades, Dr. Singh said, have seen a Modi Model which demonstrates increasing (not diminishing) returns, become stronger with each challenge with inherent and inbuilt resilience in the model. It is based on citizen centricity and accountability in the administration to respond to aspiration of people with changing technology in the area of infrastructure, life style and its health implications.

This Modi Model, Dr. Singh Said, is equally true for urban governance and efforts should continue to bridge the gap between governance system and grassroots level. This should be bridged with

unexplored resources with instruments like community or cluster outsourcing. Science & Technology has provided various instruments for suitable adaptation in the people-centric governance. Finally, Dr. Singh complimented Director General, IIPA and his team for initiating this two-day event on governance reforms.

The convention was conducted by CUS team consisting of Prof. K.K. Pandey, Dr. Kusum Lata, Dr. Sachin Chowdhry and Dr. Amit Kr. Singh with the professional support from Shri Anand Singh, Shri Vikas Kumar, Shri Harish Kumar and Ms Mansi Bhasin . IIPA administration and finance under the leadership of Shri Amitabh Ranjan, Registrar, IIPA provided valuable support at each stage of convention. The publication section of IIPA also gave full support on the matters related to documentation.



PUBLICATIONS

The Institute disseminates information, analyses, viewpoints and knowledge related to public administration, governance, policy and development through its regular publications viz., monthly digital editions of IIPA e-Newsletters, quarterly editions of Indian Journal of Public Administration (IJPA) in association with Sage Publications, quarterly editions of Nagarlok, quarterly editions of Documentation in Public Administration (DPA), biannual editions of Lok Prashashan (Hindi Journal) and quarterly editions of IIPA Digest.

So far IIPA has published more than 500 books, monographs, reports, working papers, and compendiums in spheres of governance and public administration. A few of the books authored by renowned authors including IIPA faculty members are also available for purchase.

INDIAN JOURNAL OF PUBLIC ADMINISTRATION (IJPA)

(Quarterly since 1955)

Flagship refereed UGC CARE listed journal of IIPA, IJPA in collaboration with SAGE Publications publishes manuscripts covering topics related to Public Administration, Public Policy, Good Governance, Bureaucracy, Leadership, Environment, Law, Social Welfare, etc. Research articles, case studies, book reviews, essays, notes and documents related to themes authored by experts are regularly featured in IJPA. The author of the best article every year is conferred with the prestigious late Shri TN Chaturvedi Award by the Hon'ble Vice President of India.

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Lok Prashasan is IIPA's only Hindi journal published with an aim to promote Hindi language and encourage Hindi literature in the field of public administration. Articles and research papers related to Public Administration, Public Policy, Good Governance, Bureaucracy, Leadership, Environment, Law, Social Welfare, etc., are regularly published in this journal.

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The magazine covers news, stories and features related to latest initiatives and trends of government.

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