"A CRITICAL STUDY OF TRAFFIC INCIDENT MANAGEMENT AND REGULATION: EVALUATION OF ENFORCEMENT APPROACH BY MUMBAI TRAFFIC CONTROL UNIT."

Section A-Research paper

"A CRITICAL STUDY OF TRAFFIC INCIDENT MANAGEMENT AND REGULATION: EVALUATION OF ENFORCEMENT APPROACH BY MUMBAI TRAFFIC CONTROL UNIT."

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Abstract:

Mumbai city is among top world mega metropolitan cities, which is a leading business capital hub with a complex network of interconnected roads and alike others it has robust 'City Surveillance System' for various purposes.

Therefore besides traffic management enforcing law, providing timely, smooth and safe transportation becomes dedicated duty to 'Mumbai Traffic Control Branch'. They also face challenges of minimal availability of roads due to on-going high impact infrastructural projects, repairs works carried by costal road, metro rail, municipal works, gas lines, electricity supply, telephone and internet connectivity services. In addition to that frequent traffic congestion due to accidents, green corridors, natural disasters, VVIP duties, law and order issues, jaywalking, encroachments, privet functions, etc. makes the situation more challenging.

Mumbai is spread in 438 Km^2 area with presently working 94 police stations (5 regions, 12 zones) and 41 traffic police divisions (1 region, 4 zones). Through 5838 different CCTV cameras (phase I) and over 5500 CCTV cameras (phase II) installed under 'Mumbai City Surveillance Project' (MCSP) different category wise 'alerts' are generated since year 2016.

Since inception Mumbai Traffic Control Branch was using CCTV for managing road traffic but meticulously started generating traffic division wise 'Incident Reports' (IR) through MCSP (classified as high / medium / low) to response, decongest and resolve road traffic issue within timeline from since 21st

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October 2021. Total 3869 IR's are generated till 29th March 2022 with result projecting improvement in eliminating the cause at ground level and with ability to develop prediction.

These IR's are strenuously reported, monitored, reviewed and analysed for severity, time, response, and rescue by the dedicated team.

The paper provides empirical insights about how multidimensional core aspects related to incident reports are managed through MCSP with optimistic results affecting society at large in Mumbai city.

Keywords :-

Traffic Incident Management, Urban Transport, Mumbai Traffic Police, Traffic Control Branch, City Surveillance System, Mumbai Metropolitan City, India.

Introduction :-

Government of India is aspiring and executing to establish hundred smart cities in India through systematic progressive plan. Inter and intra road connectivity is one of the important aspect of the same having efficient, smooth, safe, short distance, modern, facilitative, etc. for road users. Following the paradigm shift according to globalisation, industrialisation, law and order, emergencies like - essential services, medical, commodities, disaster management, etc. to fulfil all over day to day requirements is a daily challenge for police department and local authorities especially for metropolitan cities.

Mumbai metropolitan city is among top world megacities, which is a leading business capital hub with a complex network of interconnected roads supported by railway, ferry and other public transport. Alike others Mumbai has robust 'City Surveillance System' for various purposes. Therefore besides urban road traffic management enforcing law, providing timely, smooth and safe transportation becomes rededicated duty to 'Mumbai Traffic Police'; along with challenges of minimal availability of roads due to on-going high impact infrastructural projects / repairs works carried by costal road, metro rail, municipal works with frequent traffic congestions, accidents, green corridors, natural disasters, VVIP duties, law and order issues, etc.

Mumbai Traffic Police Control Branch, Municipal Corporation of Greater Mumbai (MCGM), Mumbai Metropolitan Region Development Authority (MMRDA), Motor Transport Department (RTO), Maharashtra State Road Development Corporation (MSRDC), Brihanmumbai Electric Supply and Transport (BEST) are some premier organisations / agencies which are putting common efforts for road traffic.

Mumbai is spread in 438 Km^2 areas with presently working 94 police stations (5 regions, 12 zones) and 41 traffic police divisions (1 region, 4 zones). At present Mumbai City have 41.5 lakh vehicle counts.[i] Some important arterial roads in Mumbai City are Lady Jamshedji Road, Dr.Anni Besant Road, Pedder Road, Link Road, N.S. Bose Road, Dr. B.A. Road, Md. Ali Road, Dadabhai Naoroji Road, Linking Road, Goregaon - Mulund Link Road, Jogeshwari - Vikhroli Link Road, Andheri - Ghatkopar Link Road, Santacruz - Chembur Link Road, Eastern freeway, Eastern express highway, Western Express Highway, Bandra - Worli Sea Link, etc.

MCGM vide DCPR 2034, regulation no. 51 has constituted the 'Mumbai Parking Authority' to regulate and manage all on street parking & public parking places under the jurisdiction of Greater Mumbai, since 2019. Mumbai City has over 49,000 number of public parking availability for vehicles.

The record shows Mumbai Metropolitan City has approximately 1914.15 Km Road, 75 lakh daily local trains passengers, 33 lakh 'BEST' Bus passengers, 11 lakh privet 4 wheelers, 22 lakh privet 2 wheelers, 1

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lakh Taxis, 2 lakh Autos Rickshaws, 1250 important junctions, about 614 signalled junctions. Due to barricading done at various roads makes present roads more narrower for road users due to on-going construction / reconstruction works of Mumbai Metro Rail Corporation, Coastal Road, Storm Water Drain Works, Flyover, Underpass, FOB / ROB Bridges, etc.

Mumbai Traffic Police Control Branch, Specialised Branches / Units and local police stations are using 'Mumbai City Surveillance Project' (MCSP) which was stared since year 2016. Since then different category wise 'alerts' are generated which are further processed, verified, action, response, rescue, review according to situations. This is achieved through 5838 different CCTV cameras (phase I) and over 5500 CCTV cameras (phase II) installed at important junctions, every nook and corner of the city every under MCSP. Some of the MCSP features are Closed Circuit Television (CCTV), Vehicle Tracking System (VTS), Command - Command Center (CCC), Video Conferencing (VC), Data Centres (DC), Network (N/W), Collaborative Monitoring (CM), Other Viewing Center (OVC), Helpdesk (HD), etc. Since inception Mumbai Traffic Control Branch was using CCTV for managing road traffic but meticulously started generating traffic division wise 'Incident Reports' (IR) through MCSP to manage give response, decongest and resolve road traffic issue for effective enforcement within timeline since 21st October 2021.

Aim and Objective of the Study:-

The study aims to expand the domain of effective road traffic management and enforcement related aspects than is normally found in the literature. The object of the present paper is to explore interdisciplinary multidimensional core aspects of 'Traffic Incident Report Management' by Mumbai Traffic Control Branch of Mumbai Police to clarify how road traffic is effectively managed by using existing manpower and robust 'Mumbai City Surveillance Project' setup.

Hypothesis:-

Mumbai the economic capital city of India is daily adversely affected by the various traffic incidents and for responding, decongesting, and timely resolving road traffic obstruction issues there is need for Effective Incident Report Management by Mumbai Traffic Control Branch on daily basis.

Need of Study:-

In bigger cities like Mumbai with the increase in population, vehicles, traffic congestions and accidents; in order to make roads decongested, commutable and safe as an important enforcement factor by Traffic Police on daily basis study of Incident Report Management is very needful.

Discussion / Explanation of Important Terms:-

The regulations on traffic in India are governed by the Motor Vehicles Act, 1988 and the rules framed under it. Some key regulations include:

1) Licensing: All drivers must have a valid driving license and follow the rules of the road.
2) Vehicle registration: All vehicles must be registered with the Regional Transport Office and have a valid registration certificate.
3) Helmet usage: All two-wheeler riders must wear helmets while driving.
4) Seat belt usage: All vehicle occupants must wear seat belts while driving.
5) Drunk driving: Driving under the influence of alcohol is prohibited and can result in imprisonment and/or a fine.
6) Overloading: Overloading of vehicles is prohibited and can result in fines and/or imprisonment.

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7) Speed limits: All vehicles must adhere to the specified speed limits, overspeeding can result in fines and/or imprisonment.

8) Lane discipline: All vehicles must follow lane discipline and stay within their designated lanes while driving.

9) Right of way: Pedestrians, bicycles and two-wheelers have the right of way at intersections and pedestrian crossings.

10) Pollution control: All vehicles must comply with the specified emission standards and undergo periodic pollution checks.

11) These regulations are regularly updated and enforced by the Traffic Police and other law enforcement agencies in India.

Literature Review:-

US Department of Transportation (Federal Highway Administration) explains 'Traffic Incident Management' as integrative, organised, and collaborative work which involves activities like to ascertain, monitor, counter, secure, safety, rescue, remove, streamline, re-establish road traffic as fast as possible. [ii]

In Europe, Steenbruggen, et al. (2012) found rational effect of 'Traffic Incident Management' (TIM) and evaluated it as the best practices. They have studied the expected response time for European and OECD countries e.g. Belgium - Flanders, Denmark, England, Germany Netherlands, and USA; have TIM response time under different circumstances ranging from 15 to 90 minutes. They have also found countries to use TIM to cope up with needs of road users with affordable by policy users. [iii]

In Indonesia, (Enggarsasi and Sa'diyah, 2018) have observed remarkable 51% decrease of criminal activities due to effective use of CCTV by Traffic police. [iv]

In India, (Prasad and Rao, 2018) elaborated 5G connectivity will prove vitality of smart city projects for becoming victorious and achieving multidimensional goals of transportation through ICT and IoT. [v]

In India, Samal, et al., (2020) studied time based urban highways during pick hours and found that traffic congestion is a challenging issue to resolve using available resources with less road availability for diversified transportation along with lack of lane discipline within short possible time. They found adequate results of buffer time index in heterogeneous traffic indices and traffic jams could be reduced by strict road enforcement, creating many CBD's, providing parking and availability of road, footpath.[vi]

In Sultanate of Oman, S.G. Farrag, et al., (2020) performed a study at 'Muscat Expressway' explained that, road traffic jams are diversely affecting ecology and road users safety, efficiency which could be a solution by using 'Traffic Incident Management' (TIM) and 'Internet of things' (IoT) after conducting proper examination. They emphasised to use 'Car2X Communication' through 'Simulation Platform' as a solution which resulted positively into reduction by "6% travel time, 9% stop delay, 27% vehicle stop and 16% CO emission and fuel consumption". [vii]

Rajasekaran (2020) reported that in India one hundred and sixty four cities are using CCTV for road traffic enforcement and management with significant distinction. 'The Motor Vehicle (Amendment) Act 2019' has provided to use of automated enforcement for road traffic management. Actual and precise inputs are collected through ITMS to minimise traffic jams. Therefore Government MORTH has come with road safety - thirteen point kit for achieving uniformity in India. [viii]

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"13th Regional Environmentally Sustainable Transport (EST) Forum in Asia" (2021) with over forty three participant countries has resolved to evolve and execute sustainable plans related to transport with respect to 'Declaration – 2030'. They come up with master plan for reducing transport distance and unwanted travel with target having six goals i.e. safe roads; sustainable – economy, environment; Connectivity- National, Urban, Rural. [ix]

In India, (Kothari, et al., 2021) observed government is working on streamlining road traffic after cleanliness for smart city project. The authors also found that modern technology will boost every fields including Internet of things (IoT) with more than 28% annual compound growth rate (2015-2020) and present IoT equipment will be four time more by the year 2021; through six components i.e. Device connection, Data sensing, Communication, Data analytics, Data value and Human value. [x]

In Norway, (Gohar and Nencioni, 2021) described data is gathered through different sensors and electronic ways using 5th generation (5G) connectivity for ITS and ICT for achieving overall growth in smart cities. [xi]

In India, BPR&D through its report explored that today in Mumbai and other metro cities Traffic Police are held accountable for traffic jams irrespective improper urban planning, existence of unreasonable quantity of vehicles, less availability of road, etc. For overcoming this Government of India has proposed to use 'Automated Traffic Monitoring System' (ATMS) through National Police Mission (Micro Mission – 03) and gave preference on traffic enforcement. This system is in force since 50 + years in foreign countries. [xii]

Research Methodology:–

The researchers empirically use the primary technical data from MTP (MSCP) and secondary data from other open sources to decompose the various facets of Traffic Incident Report Management.

Stage I	–	Problem, Aim and Objective.
Stage II	–	Literature Review.
Stage III	–	Research Design.
Stage IV	–	Research Execution.
Stage V	–	Data Analysis, Interpretations.
Stage VI	–	Implications, Limitations, Future Scope, Originality / Value, Acknowledgement, Funding.
Stage VII	–	Conclusion.
Stage VIII	–	Report.

Data Presentation: -

Primary data collected from Mumbai Police (MCSP) to find out category wise incident reports according to the jurisdiction of concerned DCP offices of Mumbai Traffic Control Branch; was further processed and represented as follows:

The number of incidents reports with all the parameters like Parking, Accident, Crowding, fire, law and order, miscellaneous accidents, vehicle stoppage, traffic violations in Mumbai Police according to the office of Deputy Commissioner of Police (Region wise) is represented in tabular form as follows:

I) Traffic Incident Report (DCP wise) – Low Category

*Source: MTP (MCSP)

Region	Parking	Accident	Crowding	Fire	L&O	Misc. Accidents	Stop Vehicle	Traffic Violation	Traffic Jam
DCP Central	4	2	0	2	5	0	2	23	203
DCP	24	2	4	0	3	1	1	29	306

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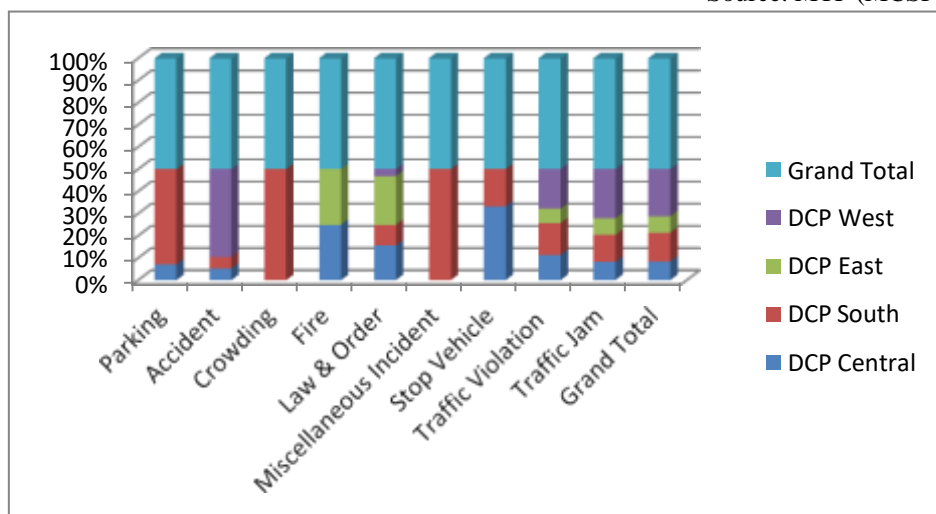| Region	Parking	Accident	Crowding	Fire	L&O	Misc. Accidents	Stop Vehicle	Traffic Violation	Traffic Jam
South									
DCP East	0	0	0	2	7	0	0	13	187
DCP West	0	15	0	0	1	0	0	36	554
Total	28	19	4	4	16	1	3	101	1250

Table 1: Traffic Incident Report (DCP wise) – Normal Category

II) Traffic Incident Report (DCP wise) – Medium Category.

*Source: MTP (MCSP)

Region	Parking	Accident	Crowding	Fire	L&O	Misc. Accidents	Stop Vehicle	Traffic Violation	Traffic Jam
DCP Central	0	14	0	0	1	0	0	50	259
DCP South	1	7	0	6	2	1	0	87	322
DCP East	0	14	0	2	4	0	0	30	338
DCP West	0	31	1	2	0	1	0	87	1170
Total	1	66	1	10	7	2	0	254	2089

Table 2: Traffic Incident Report (DCP wise) – Medium Category

III) Traffic Incident Report (DCP wise) – High Category.

*Source : MTP (MCSP)

Region	Parking	Accident	Crowding	Fire	L&O	Misc. Accidents	Stop Vehicle	Traffic Violation	Traffic Jam
DCP Central	0	3	0	0	0	0	0	0	0
DCP South	0	1	0	1	0	0	0	0	0
DCP East	0	3	0	0	0	0	0	0	0
DCP West	0	2	0	1	0	0	0	0	2
Total	0	9	0	2	0	0	0	0	2

Table 3: Traffic Incident Report (DCP wise) – High Category

IV) Traffic Incident Report (DCP wise) – Total (Normal + Meduim + High) Category.

*Source: MTP (MCSP)

Region	Parking	Accident	Crowding	Fire	L&O	Misc. Accidents	Stop Vehicle	Traffic Violation	Traffic Jam
DCP Central	4	19	0	2	6	0	2	73	462
DCP South	25	10	4	7	5	2	1	116	628

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DCP East	0	17	0	4	11	0	0	43	525
DCP West	0	48	1	3	1	1	0	123	1726
Total	29	94	5	16	23	3	3	355	3341

Table 4: Traffic Incident Report (DCP wise) – Total (Normal + Medium + High) Category

Data Analysis:-

Obtained results incidents reports are analysed and represented in the chart form as follows:

I) Traffic Incident Report (DCP wise) – Low Category.

*Source: MTP (MCSP)

Fig. 1 : Traffic Incident Report (DCP wise) – Normal Category

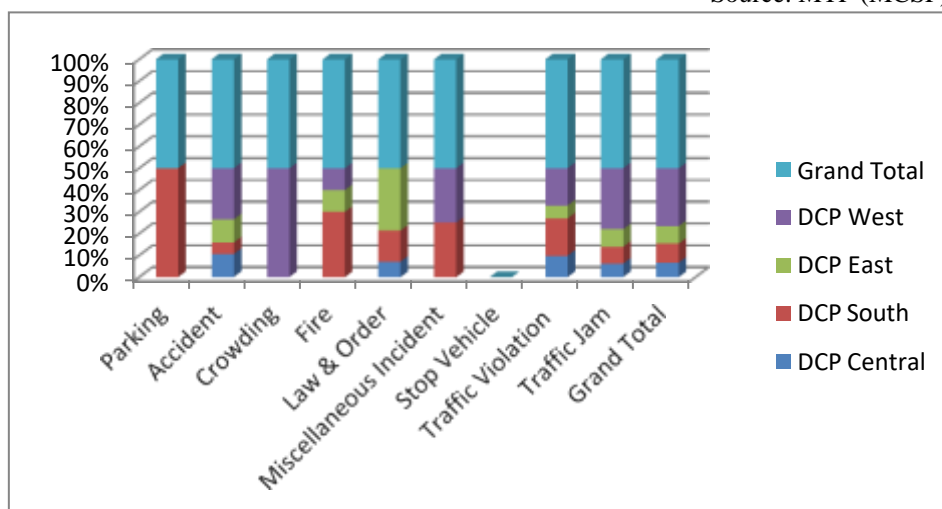**II) Traffic Incident Report (DCP wise) – Medium Category.**

*Source: MTP (MCSP)

Fig. 2: Traffic Incident Report (DCP wise) – Medium Category

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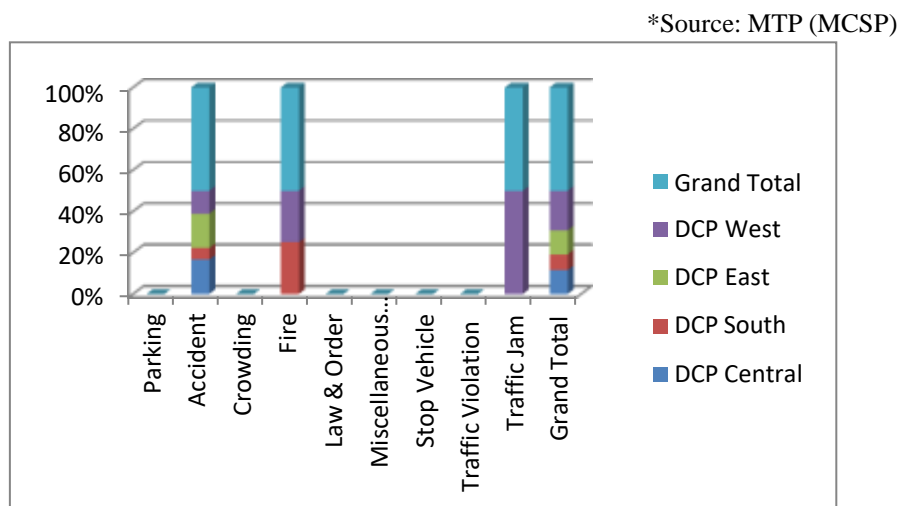## III) Traffic Incident Report (DCP wise) – High Category.

*Source: MTP (MCSP)

Fig. 3: Traffic Incident Report (DCP wise) – High Category

IV) Traffic Incident Report (DCP wise) – Total (Normal + Meduim + High) Category.

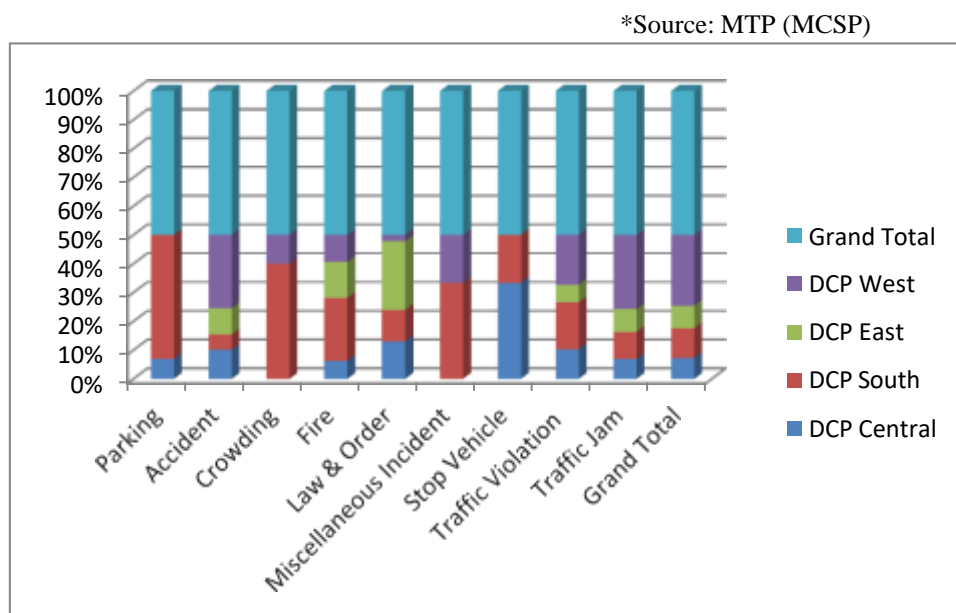*Source: MTP (MCSP)

Fig. 3: Traffic Incident Report (DCP wise) – Total (Normal + Meduim + High) Category

Presentations:-

Following procedures are adopted for successful for 'Traffic Incident Management' (TIM):

1. Timely Detection and Response :-
   a) At Traffic Control Branch Control Room, on duty CCTV operator detects incident and records its two minutes video. He creates detailed 'Traffic Incident' (IR) with system generated unique ID and forward the IR to on duty CCTV Supervisor.
   b) On duty CCTV Supervisor check, review and classify the IR for Fire, Fatal Accidents, Law and Order, Parking, Natural Disaster, Miscellaneous Accidents, Traffic Jam, Parking, Crowding, Traffic

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Violation, etc. (according to High, Medium and Normal category). After confirmation said IR is forwarded to the Officer In-charge of Control Room (CRO)

c) Officer In-charge of Control Room again cross check the IR and after confirmation forwards to the concerned 'Traffic Division' (TD), Officer In-charge office of TD, and the supervising Officers. CRO also send the detailed report in 'WhatsApp group' of all rank officers from Traffic Police (including the Joint Commissioner of Police, the Additional Commissioner of Police, the Deputy Commissioners of Police, the Assistant Commissioners of Police, the Senior Inspectors of Police, the Inspectors of Police, the Control Room officer, and CCTV).

d) Concerned TD immediately respond to the incident and send their officers, constabulary staff, motorcycle riders, towing vans, etc. according to the requirement. (If required they also creates road clearing for ambulances and emergency vehicles, etc.)

2. Geographical location, severity and hazards :-
   a) Concerned TD immediately reaches to the proper geographical location.
   b) According to the severity of the IR takes necessary action, relief, rescue, and remove the hazards.

3. Scene protection and safety :-
   a) Concerned TD after removing the problem informs to the Traffic Police Control Room.

4. Collaborative response with SOP's :-
   a) If required collaborative works are carried out with local Police Station, MCGM, hospitals, NGOs, Disaster management teams, etc. and regularise the traffic in short time as short as they can.
   b) Standard Operating Procedures (SOP) are used by all the agencies,

5. Road clearance :-
   a) If the incident / problem / cause is of high category and requires more time for clearance; then concerned TD arrange short possible alternate route and for the traffic diversion.

6. Communications and publicity :-
   a) If the incident / problem / cause is of high category and requires more time for clearance; then concerned TD arrange short possible alternate route and for the traffic diversion. Concerned Officer In-charge of TD immediately inform the Officer In-charge of Multimedia Cell of Traffic Police for broadcasting and publication of the incident and traffic diversion by FM Radio, Twitter, VMS boards, etc.

7. Backup services :-
   a) If the IR is caused due to natural disaster of accident comprising too many vehicles then back up plan is activated in collaboration with other agencies.

8. Training and Mock Drills :-
   a) Regular training is given to all the staff and on week end days mock drills are organised for practice.

9. Monitoring, performance assessment and feedback :-
   a) The CRO after re-verification closes the IR.
   b) on duty CCTV operator again records all the detailed data for IR closure report.
   c) The CRO forwards again forwards the to the 'WhatsApp group' of all rank officers from Traffic Police.
   d) Senior Supervising officers takes daily, weekly, monthly review of the IR for performance assessment.
   e) Concerned Officer In-charge of TD are asked to file written feedback is unnecessary time is taken for streamlining the road traffic.

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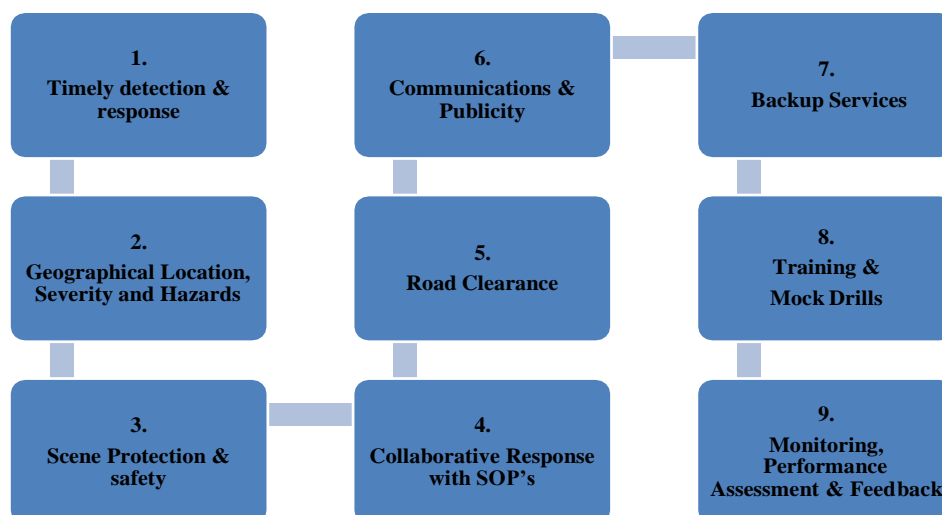**Traffic Incident Management Activity Flow Chart:**

Fig. 5 : Traffic Incident Management (TIM)
*Source : Author

Implications of the Study:-

The outcome of the study suggests a relationship between road traffic congestions and incident management by Mumbai Traffic Control Branch for utmost enforcement.

Limitations of the Study:-

The data analysis is derived from last five months data from Mumbai Traffic Police.

Future Scope of the Study:-

The future scope for the study is that similar or full-fledged research of 'Traffic Incident Management' may be conducted in other metropolitan cities having CCTV surveillance projects by Traffic Police. Next six months and followed by year wise study may need to be performed in future.

Originality / Value of the study:-

The present research paper fulfils an identified study requirement of how effective road traffic is management and enforcement can be enabledusing Traffic Incident Management by Mumbai Traffic Police.

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Conclusion:-

Today due to globalisation, modernisation, up-gradation and contemporary changing fashionable lifestyle and other reasons, increase in number of vehicles on roads are seen. Infrastructural projects are requisite to become sustainable to cope with high demand from all sectors, in particular for urban and metropolitan cities. Lack of driver discipline, time mismanagement, inoperative road engineering designs, road conditions, awareness, accidents, lack of vehicle service / fitness, lack of open roads along with footpaths, lack of education, natural disasters, poor traffic management and enforcement are some of the major problems for traffic congestions.

Mumbai Traffic Control Branch has recorded total different 3869 incident reports (1426 – normal, 2430 – medium, 13 - high) within five months (from 21st October 2021 to 21th March 2022); which results in utmost coordination and projected improvement in eliminating the root cause within timeline.

In metropolitan cities the model of 'Traffic Incident Management' using existing CCTV surveillance cameras is beneficial and capable in addressing the traffic congestions issues as effective enforcement.

Recommendations: -

More aggression in championing strategies to address the road traffic safety and congestion by transportation and enforcement community is need of the hour.

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