# The Use of Facial Recognition Technology for Policing in Delhi

**An Empirical Study of Potential Discrimination**

**Working Paper | August 2021**

V | D H | Centre for Legal Policy

This working paper is an independent, non-commissioned piece of work by the Vidhi Centre for Legal Policy, an independent think-tank doing legal research to help make better laws.

# About the Author

Jai Vipra is a Senior Resident Fellow at the Centre for Applied Law and Technology Research (ALTR), Vidhi Centre for Legal Policy. Jai's focus areas include the digital economy, data commons, algorithmic regulation, digital trade and fintech.

ALTR is Vidhi's interdisciplinary policy initiative to leverage technology for the public good in the Global South.

# Table of Contents

# I. Executive Summary

Facial recognition technology (FRT) uses machine learning or other techniques to match or identify faces. These techniques usually require large troves of images of faces compiled into what is called a training database. The software uses this training database to "learn" how to match or identify faces.

The increasing use of FRT by the police in India is set to expand further over the next few years. However, FRT is not an error-free technology. If the training database of FRT has an over-representation of certain types of faces, the technology tends to be better at identifying such faces. Even if it does not have a training bias, the technology is rarely completely accurate and can easily misidentify faces. This means that there are chances of innocent people being wrongly identified as criminals or suspects. The use of FRT may also result in the disproportionate targeting through surveillance of certain activities like loitering, which become easier for the police to monitor. This paper shows that two factors in particular - the uneven distribution of police stations across space, and the uneven distribution of closed-circuit television (CCTV) cameras across space – are likely to result in a surveillance bias against certain sections of society more than others in Delhi.

There are a few biases inherent in policing, including that policing disproportionately targets some groups of people. Such a bias creates a skewed spatial distribution of policing, which can intensify the disproportionate targeting. This bias remains when new technology is applied to such a system. The victims of the shortcomings of policing technology will more likely be these disproportionately targeted groups.

In Delhi, our data reveals that two kinds of areas are much more policed than others: (1) areas housing government and diplomatic offices i.e., Central Delhi; and (2) areas with a proportionally higher Muslim population. These areas have a higher proportion of police stations compared to their relatively lower population. Technology, especially that of predictive policing, constitutes an intensification of policing in this form and can disproportionately target Muslims in Delhi.

FRT in policing in Delhi is likely to employ data used from CCTV cameras across the city. This would mean that areas with relatively more CCTV cameras would be over-surveilled, over-policed and thus subject to more errors than other areas. We were able to obtain preliminary and incomplete data on the distribution of CCTV cameras across Delhi. The limited data we have obtained shows that the distribution of CCTV cameras is highly uneven across different districts.

The evident over-policing of Muslim areas can result in the use of FRT in policing in Delhi disproportionately targeting Muslims. This does not discount the ability of the technology to discriminate against women, people from marginalised castes, industrial workers and the poor. This paper accordingly finds that the use of FRT in policing poses serious challenges to the right to equality and should be avoided until a public determination is made on these dangers.

# II. Introduction

It was in the 1970s that historical research on the origins of policing began in earnest.[1] By the 1980s, historians and sociologists in Europe had increasingly begun to theorise that the use of force was central to the police as an institution.[2] In the United States, policing grew along with industrialisation, and played a central role in the suppression of peaceful labour strikes.[3] The original function of the police in the United States - even though it has seen modifications since - was not solving crime but instead was disciplining of newly free workers and the poor in the new cities.[4] A large part of the world was introduced to modern policing through colonisation, even though pre-modern policing institutions existed. In turn, colonisation itself affected the development of policing in colonising countries.[5] In recent years, many writers have pointed out that the conduct of the police in their respective contexts continues to have fidelity to the institution's origins.[6]

Policing bias is one such result of the historical development of the institution of policing. In addition to the class dimension - the use of force against labour - policing contains biases based on race, ethnicity, caste and so on. Some examples are police bias against indigenous people in Canada[7], Black people in the United States[8] and South Africa[9], people from oppressed castes or tribes[10] and Muslims in India.[11]

What happens when a new technology is added to an institution that is authorised to use violence and contains biases in its functioning? We might reasonably assume that the technology will interact with these biases, either intensifying or diminishing them. Further, the technology itself is likely to have some biases, which will interact with the institution of policing and accordingly intensify or diminish. This paper tries to understand how the interaction of FRT with policing in Delhi affects the biases of both the police and the technology. It attempts an empirical analysis through the mapping of police stations and CCTV cameras to understand the manner in which FRT may be used, and the harmful consequences from such use.

For ease of reading, we have structured the paper as follows: the following section describes the methodology we used in the paper to understand which areas were over-policed. The section after presents a review of the literature to provide the appropriate analytical context for the results, which follow. Finally, after a discussion of the results and limitations of the analysis, we conclude with a few recommendations.

---

[1] Clive Elmsley. Theories and Origins of the Modern Police. Introduction. Routledge, 2017.

[2] Clive Elmsley, ibid.

[3] Alex Gourevitch. Police work: The centrality of labor repression in American political history. Perspectives on Politics, 13(3), pp. 762-773. 2015.

[4] Alex Gourevitch, ibid.

[5] Mike Brogden. The emergence of the police—the colonial dimension. The British Journal of Criminology, 27(1), 4-14. 1987.

[6] Francis D. Boateng & Isaac N. Darko. Our past: The effect of colonialism on policing in Ghana. International journal of police science & management, 18(1), 13-20. 2016.

[7] Melissa Gorelick. Discrimination of Aboriginals on Native Lands in Canada. United Nations Chronicle. Available at: https://www.un.org/en/chronicle/article/discrimination-aboriginals-native-lands-canada

[8] Alex S. Vitale. The End of Policing. Verso Books, 2017.

[9] Christopher McMichael. Police wars and state repression in South Africa. Journal of Asian and African studies, 51(1), 3-16. 2016.

[10] Milind Bokil. De-notified and nomadic tribes: A perspective. Economic and Political Weekly, 148-154. 2002.

[11] Farrukh B. Hakeem, M. R. Haberfeld & Arvind Verma. Policing the Muslim Community in India. In: Policing Muslim Communities. Springer, 2012.

# III. Methodology

## For the spatial distribution of policing

One way to compare the degree of policing across areas is to see the number of police personnel per unit of population. But such data is not available in a granular enough form. For our study we were only able to find police personnel data district-wise, which is presented in Table 1 below:

*Table 1: District-wise police stations and police personnel in Delhi. Source: Praja, 2019[12]*

| District | No. of police stations | Police personnel working | Average police personnel per station (rounded) |
|---|---|---|---|
| *Central District* | *15* | *2814* | *188* |
| *West District* | *12* | *2309* | *192* |
| *East District* | *10* | *1971* | *197* |
| *Outer District* | *10* | *2225* | *223* |
| *Shahdara* | *10* | *2269* | *227* |
| *Rohini* | *11* | *2922* | *266* |
| *Dwarka* | *10* | *2097* | *210* |
| *New Delhi District* | *9* | *2184* | *243* |
| *North District* | *13* | *2683* | *206* |
| *North East District* | *12* | *2567* | *214* |
| *North West District* | *14* | *2877* | *206* |
| *South District* | *15* | *3347* | *223* |
| *South East District* | *13* | *2856* | *220* |
| *South West District* | *9* | *1779* | *198* |
| *Airport* | *2* | *478* | *239* |

Looking at average personnel per police station can be misleading as this does not show us the distribution of policing within districts, and populations tend to be segmented at a sub-district level at least.

Thus, we decided to focus on the jurisdictions of police stations themselves, and to understand whether there was a skew in the population per jurisdiction across the city. Apart from the unavailability of data, another good reason to study police stations instead of personnel is that police stations themselves serve as a visible arm of the state. This conception of police stations is borne out in the police's own thinking. In January 2019, the addition of 15 new police stations was announced in Delhi. In the words of the then Police Commissioner Amulya Patnaik,

---

[12] Praja and IC Centre for Governance. State of Policing and Law & Order in Delhi. White Paper. February 2019. Available at: https://www.praja.org/praja_docs/praja_downloads/Delhi%20Crime%20White%20Paper%202018.pdf

*"Certain areas of Delhi were very big, jurisdiction-wise. With the creation of the new police stations, the visibility and presence of the police will be better."[13]*

We obtained shapefiles for the ward-wise population data of Delhi from Hindustan Times' Github repository.[14] Shapefiles for police station jurisdiction boundaries were obtained from a Datameet forum, based on Delhi Police data released under the "Know Your Police Station" initiative.[15] To produce the map, we used built area data from the Global Human Settlement Layer from the European Commission.[16]

We then mapped the ward-wise population of Delhi from 2017 on top of police station jurisdiction boundaries. Different levels of population-per-jurisdiction would indicate different levels of policing in the concerned areas. Areas with less population-per-jurisdiction would be over-policed as they would have more police stations per resident. Areas with more population-per-jurisdiction would be relatively under-policed as they would have fewer police stations per person.

We then examined every police station jurisdiction that had fewer than 46,000 people (the lowest quintile) to see the factors that distinguished it from other areas. As data on religion was not available either ward-wise or by police station jurisdiction, we had to estimate it by matching the police station jurisdiction to the corresponding ward, and then using the population data from the sub-district of that ward. The religion data is from Census 2011. We used Census 2011 categories to match wards to sub-districts.[17] In some cases, wards were part of more than one sub-district, but the population share of Muslims did not differ significantly among the concerned sub-districts, so we did not need to refine this further.

The segregation of castes around Delhi tends to be block-wise, and thus will not show up in our data which is segmented by police jurisdictions.[18]

In short, we have mapped police jurisdictions in Delhi and colour-coded them according to the population of the jurisdiction. We have then examined the demographic characteristics of the jurisdictions with the lowest populations, which means the most policed jurisdictions.

# For the spatial distribution of CCTV cameras

We filed Right To Information (RTI) applications with all 14 police districts in Delhi. The RTIs asked:

1. Please provide us the number of CCTV cameras installed area-wise or by police station jurisdiction in the [district name] police district.
2. Please also provide us details about the installing entity for these CCTV cameras.

A sample RTI response has been provided in Annex-2.

We received data from only 8 districts, i.e.:

1. Central District
2. Dwarka
3. Shahdara
4. New Delhi
5. East District
6. Outer District
7. North West District
8. West District

The remaining six districts either did not respond to our RTIs or cited an exception under the RTI Act. For instance, Rohini District declined to provide the area-wise distribution of CCTV cameras under Section 8(1) of the RTI Act, citing a security exception. Our RTI appeals also did not yield results, or in some cases, were never responded to. Given the paucity of time and resources, we did not pursue appeals beyond the first appellate authority.

After excluding the 10 mandated CCTV cameras installed in every police station, we mapped the data we received along different police station jurisdictions. We then analysed whether there were any factors that distinguished the areas that had relatively more CCTV cameras.

---

[13] HT Correspondent. Delhi gets 15 new police stations, one new police district from January 1. Hindustan Times. January 1, 2019. Available at: https://www.hindustantimes.com/delhi-news/delhi-gets-15-new-police-stations-one-new-police-district-from-january-1/story-OMZbSaNFyYWiJ88vTY82uL.html

[14] Shapefiles, Hindustan Times Labs. August 22, 2020. Available at: https://github.com/HindustanTimesLabs/shapefiles/tree/master/city/delhi A shapefile stores the location and shape of geographic features.

[15] Some shapefiles for Delhi, Datameet. May 13, 2014. Available at: https://groups.google.com/g/datameet/c/G3EQ5ggZkKc/m/A5IHsj1AvXkJ?pli=1

[16] Global Human Settlements Layer, European Commission. Available at: https://ghsl.jrc.ec.europa.eu/download.php?ds=buS2

[17] Delhi Population Census 2011 - 2021. Scroll down to find DMC wards list: https://www.census2011.co.in/data/town/800441-north-delhi-municipal-corporation-delhi.html

[18] Sriti Ganguly. Socio-spatial stigma and segregation. Economic & Political Weekly, 53(50), 51. 2018.

# An additional note on RTIs

We initially planned to undertake this project for three cities and one state, i.e., Delhi, Hyderabad, Mumbai and Punjab. These areas were selected based on extensive news coverage about the use of FRT by the respective police department. We filed RTI applications with all these police departments asking for data on CCTV cameras and separately about the procedure used to implement FRT systems in the concerned jurisdiction.

We received either evasive replies or did not receive replies at all. As explained above, only certain districts in Delhi responded with data about CCTV cameras, and therefore we decided to restrict the scope of this project to Delhi.

# IV. Literature Review

In order to understand the interaction between space, policing and technology, we needed to consult literature from various streams. One stream includes studies on the spatial distribution of crime and policing (Bottoms and Wiles, 1992; Braga et. al., 2014, Clarke, 2012). This includes the study of crime "hotspots", i.e. areas considered to have a greater rate of crime. Another stream is the study of police discrimination, beginning from the origin of policing, and including its manifestations in Delhi (Nijhar, 2015; Tambe, 2009; Sen, 2004; Sonavana, Bokil and Beg, 2021). Lastly, we also needed to understand the working of facial recognition technology, its existing biases and errors, and its application by Delhi Police (Buolamwini and Gebru, 2018; Crumpler, 2020).

## Spatial distribution of policing

There is no dearth of literature on the spatial distribution of crime. Studies from at least the 1930s onwards have shown the disparity in inner city and suburban area crime rates in the US.[19] Recent literature has shown that the skewed spatial distribution of policing itself might spur more crime in over-policed areas. For instance, the presence of police officers in American schools drives drug use and criminalisation of poor and non-White children. This is due to the punitive measures taken towards children and the diversion of resources from solving social issues like bullying, mental illness, and poverty.[20] During the years after the September 11 attacks, the American Federal Bureau of Investigation lured young Muslims into fake terror plots, even providing the target, ideology and funding for these plots.[21] It is clear that over-targeting of a demographic by the police can result in manufactured crime.

Skewed spatial distribution of policing includes the increased policing of crime "hotspots". One meta-analysis of studies conducted in the US, Argentina and Australia finds that policing hotspots causes a small reduction in crime. However, focusing on problem-oriented policing (changing underlying conditions leading to crime) within these hotspots produces much larger effects than using traditional methods like increased searches and seizures or zero tolerance policing. The authors of this meta-analysis also caution that short-term gains in criminal activity might hide long-term victimisation of minorities in these so-called hotspots.[22]

What determines the spatial distribution of policing in an area, city or country? Race, ethnicity and socio-economic status seem to be obvious factors, given the origins of modern policing in colonialism and controlling industrial workers. As stated before, a belief that certain groups of people have a "disposition towards crime" leads to over-policing of these groups and possibly the perpetuation of crime.[23] Globally, border areas have also seen criminalisation and over-policing.[24]

A similarly uneven distribution of policing in Delhi would imply that a deployment of FRT over this uneven system would perpetuate this unevenness. But we first need to understand police bias and spatial distribution in India in general and Delhi in particular.

## Policing and police targets in India

Policing in India exhibits both continuities and discontinuities with its colonial and pre-colonial legacy.[25] It has had, and continues to have, biases in its approach and practice. For example, there is ample evidence of sex workers being disproportionately targeted by the police during colonial times. Even today, the spectacle of the police targeting "bar dancers" persists.[26] Another demographic that has been disproportionately targeted since colonial times both in England and India, is the children of the working poor and homeless children. The attitude of the administration towards these children has been informed by the idea of incorrigibility - the notion that there was something in the nature of these children that led to activities defined as crime, and that they could not be "reformed".[27]

Contemporary policing in India is sustained by casteist and patriarchal notions and practices.[28] The Criminal Tribes Act, 1871 deemed certain communities as having criminal proclivities and over-policed them. While the Act has been repealed, its biases persist in the form of lists of "habitual

[19] Anthony Bottoms & Paul Wiles. Explanations of crime and place. Crime, policing and place: Essays in environmental criminology, pp. 11-35. 1992.

[20] Alex S. Vitale, The End of Policing. Verso Books, 2017.

[21] Paul Harris. Fake terror plots, paid informants: the tactics of FBI 'entrapment' questioned. The Guardian. November 16, 2011. Available at: https://www.theguardian.com/world/2011/nov/16/fbi-entrapment-fake-terror-plots

[22] Anthony A. Braga, Andrew V. Papachristos, and David M. Hureau. The Effects of Hot Spots Policing on Crime: An Updated Systematic Review and Meta-Analysis. Justice Quarterly, 31(4), pp. 633-663. 2014.

[23] Ronald V. G. Clarke. 'Situational' Crime Prevention: Theory and Practice. Classics in Environmental Criminology. Routledge, pp. 465-476. 2010.

[24] Jude McCulloch and Sharon Pickering. 'Introduction', in McCulloch, J. & Pickering, S. (eds.) Borders and Crime: Pre-Crime, Mobility and Serious Harm in an Age of Globalization. Palgrave Macmillan, pp. 1–14. 2012.

[25] Preeti Nijhar. Law and imperialism: criminality and constitution in Colonial India and Victorian England. Routledge, 2015.

[26] Ashwini Tambe. Codes of Misconduct: Regulating prostitution in late colonial Bombay. University of Minnesota Press, 2009.

[27] Satadru Sen. A Separate Punishment: Juvenile offenders in colonial India. The Journal of Asian Studies, 63.1., pp. 81-104. 2004. Available at: http://www.jstor.com/stable/4133295

[28] Nikita Sonavane, Ameya Bokil and Srujana Beg. The Anxious State. Economic and Political Weekly, Vol. 56, No. 5. January 30, 2021. Available at: https://www.epw.in/journal/2021/5/comment/anxious-state.html

offenders" maintained by the police. A person can be listed as a habitual offender and subjected to harassment even without a conviction.[29] Data on imprisonment shows that most prisoners are illiterate or have studied below a Class 10 level.[30] 70% of India's prisoners are undertrials, and most undertrials are from marginalised castes. Muslims constitute 14.2% of India's population (Census 2011) and 21.5% of India's undertrials.[31] In addition, police authority has been routinely used to suppress uprisings of peasants and workers. Egregious examples include the fatal shooting of five protesting farmers in Mandsaur, Madhya Pradesh in 2017 and the shooting of daily wage construction workers at a labour chowk in Dehradun in 2013.[32]

One important study is an ethnographic analysis of the institutional and legal background to the Crime Mapping, Analysis and Predictive System (CMAPS) of Delhi Police, which undertakes a live spatial hotspot mapping of crime.[33] The authors found that with the use of technology by the police, three kinds of biases spring up: historical biases towards vulnerable people, representation biases in policing data, as marginalised people use police services less, and measurement biases because police find it difficult to map informal settlements like slums. Outright bias and arbitrariness can also get "hard-coded" into technological systems. Space and technology can interact to create unequal outcomes in policing.[34]

These biases in policing have implications on the spatial distribution of policing, which can subsequently increase victimisation of police targets through the use of technology. The next section examines the literature on the spatial distribution of policing in Delhi.

# Policing and space in Delhi

The above-mentioned biases have played out in Delhi as well, again from colonial times. They have had effects on the very spatial constitution of the city. For instance, the Indian Cantonment Act of 1864 divided the regulation of sex work in Delhi in cantonment and non-cantonment areas.[35] Different regulations existed for sex work inside the cantonment. Sex workers inside cantonments were provided medical facilities and subjected to surveillance including registration and house inspections. Later, the Suppression of Immoral Traffic Act, passed in Delhi in 1939, enabled the clearing of sex workers from markets in the old city's centre.[36] This example is presented as an instance of differential policing standards for different areas in the capital, and how these standards give the city its current spatial characteristics. In a similar vein, slums were moved out of the centre of Delhi through a combination of government action and middle-class activism.[37]

As a city, Delhi shows segmentation across socio-economic lines. Muslims in Delhi are relegated to exclusionary spaces. Their seclusion has been engineered from colonial times and continued due to issues like a fear of communal violence and discrimination by the state.[38] Rental discrimination against Muslims in Delhi is systemic - property owners do not rent their homes to Muslims, brokers steer Muslims towards Muslim-concentrated areas, and many Muslims themselves avoid a home search in some areas to avoid humiliation.[39] In today's world the enclosure of Muslims achieves not only communal segmentation of the city, but also labour market segmentation, where Muslims in areas like Seelampur perform manufacturing work at the lowest rungs of global value chains.[40] Communal segmentation also makes Muslims in Delhi more vulnerable to retributive violence.[41]

Analysis of Census 2001 data revealed that Delhi is segmented on caste lines as well. It was found that 31.9% of the SC/ST population of Delhi would have to move to different areas to produce an even distribution of caste across the city. The major cities that show a more skewed distribution than Delhi by caste are Kolkata (36.4) and Ahmedabad (32.5). This degree of segregation is much larger than the degree of segregation by socio-economic status (SES) - 13.7% lower SES-status people would have to move to produce an even distribution of SES around Delhi.[42] In the context of the

[29] Nikita Sonavane, Ameya Bokil and Srujana Beg. Ibid.

[30] PTI. India's 27.37% prison inmates 'illiterate', over 5,600 techies: Government data. Livemint. February 14, 2021. Available at: https://www.livemint.com/news/india/indias-27-37-prison-inmates-illiterate-over-5-600-techies-government-data-11613310918872.html

[31] Shreehari Paliath. India's Jail Stats: 7 In 10 Undertrials, 1 In 3 Dalit/Adivasi. September 7, 2020. Available at: https://www.indiaspend.com/indias-jail-stats-7-in-10-undertrials-1-in-3-dalit-adivasi/

[32] PTI. 5 Mandsaur farmers killed in police firing, Shivraj Singh Chouhan govt confirms. Hindustan Times. June 8, 2017. Available at: https://www.hindustantimes.com/india-news/5-mandsaur-farmers-killed-in-police-firing-shivraj-singh-chouhan-govt-confirms/story-jVNVERPwbjJBqxnkU5WMZI.html and Shankar Gopalakrishnan and Trepan Singh Chauhan. A struggle over class and space in an Indian city. Economic and Political Weekly, Vol. 49, Nos. 26-27. June 28, 2014. Available at: https://www.epw.in/journal/2014/26-27/commentary/struggle-over-class-and-space-indian-city.html

[33] Vidhushi Marda & Shivangi Narayan. Data in New Delhi's Predictive Policing System. Conference: FAT* '20: Conference on Fairness, Accountability, and Transparency. 2020.

[34] Vidhushi Marda & Shivangi Narayan. Ibid.

[35] Stephen Legg, Governing Prostitution In Colonial Delhi: from cantonment regulations to international hygiene (1864–1939). Social History 34.4, pp. 447-467. 2009.

[36] Stephen Legg, ibid.

[37] Diya Mehra. Jangpura Triptych. Economic and Political Weekly, 55(51). December 26, 2020. Available at: https://www.epw.in/journal/2020/51/review-urban-affairs/jangpura-triptych.html

[38] Ghazala Jamil. Accumulation by Segregation: Muslim Localities in Delhi. Oxford University Press. 2017. Accessed from Oxford Scholarship Online. Introduction, pp. 12-34

[39] Mohsin Alam Bhat. Segregated minds, segregated markets: The nature of rental discrimination against Muslims in Delhi and Mumbai. June 12, 2020. India Housing Report. Available at: https://indiahousingreport.in/outputs/opinion/segregated-minds-segregated-markets-the-nature-of-rental-discrimination-against-muslims-in-delhi-and-mumbai/

[40] Ghazala Jamil, ibid. Materiality of Culture and Identity, pp. 35-62.

[41] Ghazala Jamil, ibid. Introduction, pp. 12-34

[42] Trina Vitayathil and Gayatri Singh. Spaces of Discrimination: residential segregation in Indian cities. Economic and Political Weekly, pp. 60-66. 2012. Available at: https://www.epw.in/system/files/pdf/2012_47/37/Spaces%20of%20Discrimination.pdf The authors use male literacy as a proxy for

literature on the caste bias of policing referred to earlier, we can see how the spatial distribution of castes might also have implications for the spatial distribution of policing.

# FRT, bias and errors

FRT systems can have errors arising from different causes. A bias in the system is one kind of error. The bias can arise due to a biased training dataset that over- or under-represents some groups of people, as explained in the Introduction. It can also arise due to the biases of technologists, who may not think to correct for certain errors or may mislabel certain images.[43]

An FRT system can be called biased when it has different levels of inaccuracy for different groups of people.[44] Many FRT systems are less correct at identifying or matching women, young people and people of colour. One study found that FRT that classifies gender is most likely to misclassify darker-skinned women, and least likely to misclassify lighter-skinned men.[45]

FRT is also prone to general inaccuracy, even though the error rate is reducing as technological improvements occur. It can produce both false negatives and false positives.[46] A false positive occurs, for example, when a person's face is wrongly matched to a criminal's face from an existing database. A false negative occurs, for example, when a person's face is not matched to his own face in an existing database. Such errors can occur not just in matching faces, but also in identifying, classifying or verifying them.

What does this mean for FRT in policing? Crucially, innocent people can be misidentified as criminals. In addition, studies have shown that people trust technology to be honest and accurate even when it does not warrant such trust.[47] Together these factors can cause people to be convicted under law for a crime they did not commit. Further, if this technology is deployed more in certain areas than in others due to the presence of more police resources and cameras there, it means that more innocent people from those areas will find themselves enmeshed in these errors. If the technology itself has biases in mis-identifying the people who tend to live in these areas, this is a triple-bind. What we anticipate is a likely intensification of already existing policing biases.

# FRT in policing in India

FRT has been deployed for policing in many states or cities. The National Crime Records Bureau has also put out a request for proposals for a national-level Automated Facial Recognition System (AFRS). In July 2020, it revised its request to clarify that the deployment of AFRS would not include CCTV camera data.[48]

This does not mean that CCTVs are out of the picture for FRT. The use of CCTVs for FRT is not prohibited under law and can be introduced at the national level at any time. In fact, given the lack of an overarching law for FRT, nothing prevents state police from using CCTV data even today, and indeed they often do use it.

For instance - after a pogrom ravaged North-East Delhi in February 2020, a further victimisation of Muslims followed, with arbitrary arrests and police harassment.[49] Delhi Police claimed that 137 of the 1800 arrests connected to this violence were made using FRT. They also claimed that "the accused were arrested mainly on the basis of CCTV footage and open-source videos", and that identification took place using FRT.[50] The Chennai police has used CCTV cameras with FRT to identify persons with a criminal history in real time in crowded areas during festivals.[51] The Punjab Police also uses CCTV footage with FRT to conduct investigations and monitor areas in real time.[52]

socio-economic status.

[43] David Leslie. Understanding bias in facial recognition technology: an explainer. The Alan Turing Institute. 2020. Available at: https://www.turing.ac.uk/sites/default/files/2020-10/understanding_bias_in_facial_recognition_technology.pdf

[44] William Crumpler. The Problem of Bias in Facial Recognition. Center for Strategic & International Studies. May 1, 2020. Available at: https://www.csis.org/blogs/technology-policy-blog/problem-bias-facial-recognition

[45] Joy Buolamwini and Timnit Gebru. Gender Shades: Intersectional Accuracy Disparities. Commercial Gender Classification. Conference on Fairness, Accountability and Transparency. 2018. Available at: http://proceedings.mlr.press/v81/buolamwini18a/buolamwini18a.pdf

[46] William Crumpler. How Accurate are Facial Recognition Systems – and Why Does It Matter? Center for Strategic & International Studies. April 14, 2020. Available at: https://www.csis.org/blogs/technology-policy-blog/how-accurate-are-facial-recognition-systems-%E2%80%93-and-why-does-it-matter

[47] Francesco Contini. Artificial Intelligence: A New Trojan Horse for Undue Influence on Judiciaries? UNODC. Available at: https://www.unodc.org/dohadeclaration/en/news/2019/06/artificial-intelligence_-a-new-trojan-horse-for-undue-influence-on-judiciaries.html and Mark LaCour, Norma G. Cantú, & Tyler Davis. When calculators lie: A demonstration of uncritical calculator usage among college students and factors that improve performance. PloS one, 14(10), 2019. Available at: https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0223736 and Patricia L. Hardré. When, how, and why do we trust technology too much?. In Emotions, Technology, and Behaviors, pp. 85-106. 2016.

[48] Soumyarendra Barik. NCRB Drops CCTV Integration Clause From Updated Facial Recognition Tender, Eases Bid Qualification Criteria For Vendors. Medianama. July 2, 2020. Available at: https://www.medianama.com/2020/07/223-afrs-revised-tender-ncrb/

[49] Sagar. Detentions, arrests, interrogations: Fear reigns in Muslim neighbourhoods of northeast Delhi. The Caravan. March 11, 2020. Available at: https://caravanmagazine.in/conflict/detentions-delhi-violence-northeast-muslim-arrests-riots-police-crime-branch

[50] Jignasa Sinha. Face recognition software used in 137 of 1,800 arrests in Northeast Delhi riots, says Police. Indian Express. February 20, 2021. Available at: https://indianexpress.com/article/cities/delhi/delhi-riots-police-cctv-7196291/

[51] Anand Murali. The Big Eye: The tech is all ready for mass surveillance in India. August 13, 2018. Factor Daily. Available at: https://archive.factordaily.com/face-recognition-mass-surveillance-in-india/

[52] Anand Murali, ibid.

# V. Results

## For the spatial distribution of policing

The maps of police station jurisdictions by population and of all labelled jurisdictions are presented on the next two pages.

Please note that all the greyed-out areas fall in the lowest quintile of population along with the purple areas. Visually, it is clear that:

1. **Police stations are spread unevenly across the city**. Some police station jurisdictions are far more sparsely populated than others.
2. **The central areas and Old Delhi are more policed than other areas**. They have relatively smaller police jurisdiction populations.
3. Among the lowest quintile of police station jurisdictions (34), 14 are areas that have low civilian populations or house important government or diplomatic buildings. These include areas like Parliament Street and Connaught Place. If we disregard these areas, **nearly half of the remaining over-policed areas are estimated to have a significant Muslim presence** (defined as more than that of Delhi's average share of Muslim population - 12.86%). For a full list of the areas in the lowest quintile and estimated share of Muslim population, please see Annex-1.

An important point to note here is that we are not trying to prove that the placement of police stations in Delhi is intentionally designed to over-police Muslim areas. That assertion cannot be proved with this data. However, given the fact that Muslims are represented more than the city average in the over-policed areas, and recognising historical systemic biases in policing Muslim communities, in India in general and in Delhi in particular, we can reasonably state that any technological intervention that intensifies policing in Delhi will also aggravate this bias. The use of FRT in policing in Delhi will almost inevitably disproportionately affect Muslims, particularly those living in over-policed areas like Old Delhi or Nizamuddin.

# Population in Delhi Police Jurisdictions



**METHODOLOGY**
Delhi's ward populations (2017) were matched against European Commission Global Human Settlements Built Area data. This allowed us to estimate population living in a pixel. Overlaying police jurisdiction boundaries on top of this helped estimate approximate population.

**SOURCE**

Municipal Boundaries of Delhi (Hindustan Times Github and Datameet); Police Jurisdictions Boundaries (Datameet); Roads, Rails, and River boundaries (OpenStreetMap)

**LEGEND**

- Lowest quintile (<46,000 people)
- 2nd quintile (46,000 - 79,000)
- 3rd quintile (79,000 - 1,10,000)
- 4th quintile (1,10,000 - 1,37,000)
- Highest quintile (1,37,000 - 3,80,000)
- ○ Police station
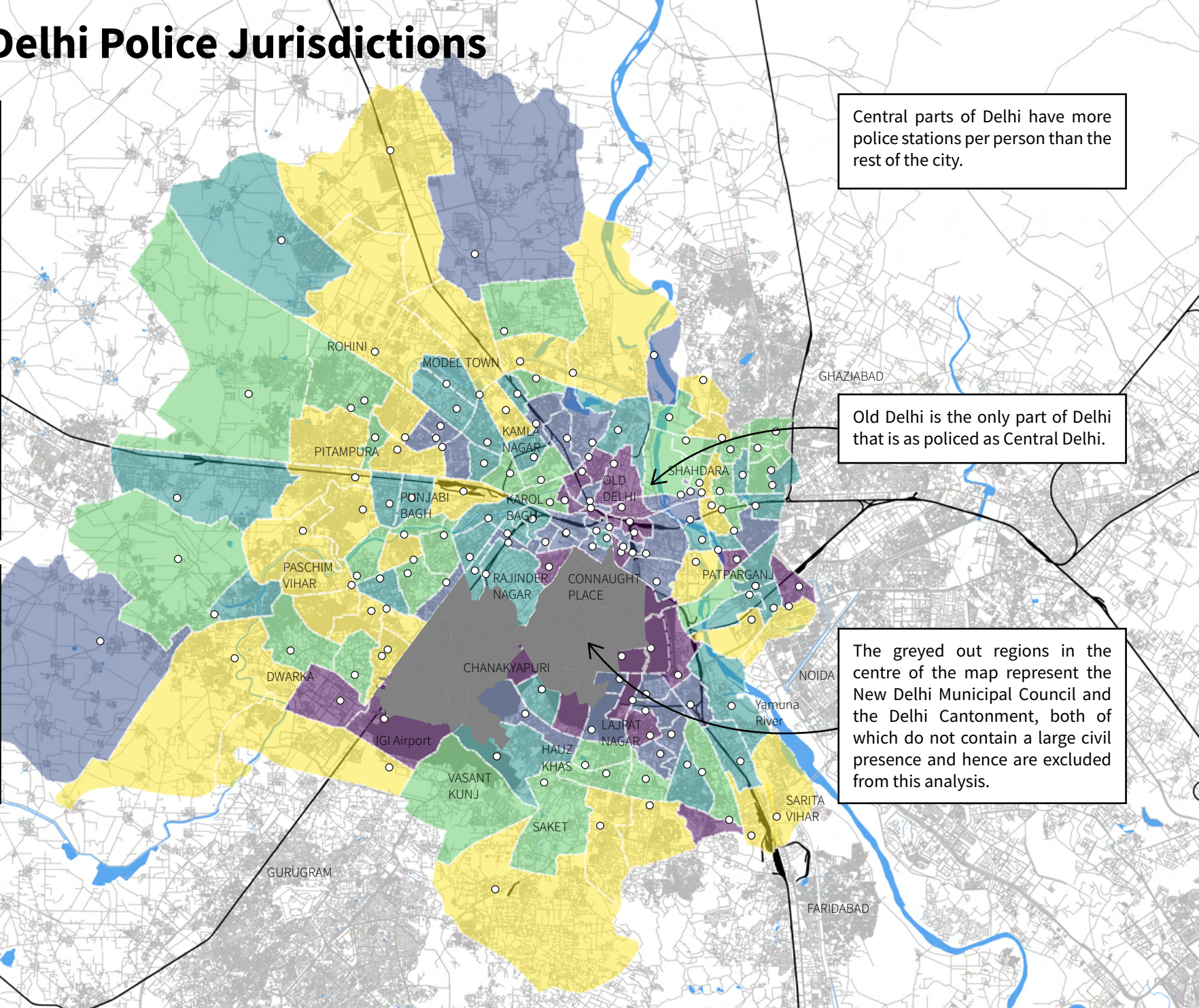
Central parts of Delhi have more police stations per person than the rest of the city.

Old Delhi is the only part of Delhi that is as policed as Central Delhi.

The greyed out regions in the centre of the map represent the New Delhi Municipal Council and the Delhi Cantonment, both of which do not contain a large civil presence and hence are excluded from this analysis.

ROHINI
MODEL TOWN
GHAZIABAD
KAMLA NAGAR
PITAMPURA
OLD DELHI
SHAHDARA
PONJABI BAGH
KAROL BAGH
PASCHIM VIHAR
RAJINDER NAGAR
CONNAUGHT PLACE
PATPARGANJ
DWARKA
CHANAKYAPURI
NOIDA
Yamuna River
IGI Airport
LAJPAT NAGAR
VASANT KUNJ
HAUZ KHAS
SARITA VIHAR
SAKET
GURUGRAM
FARIDABAD
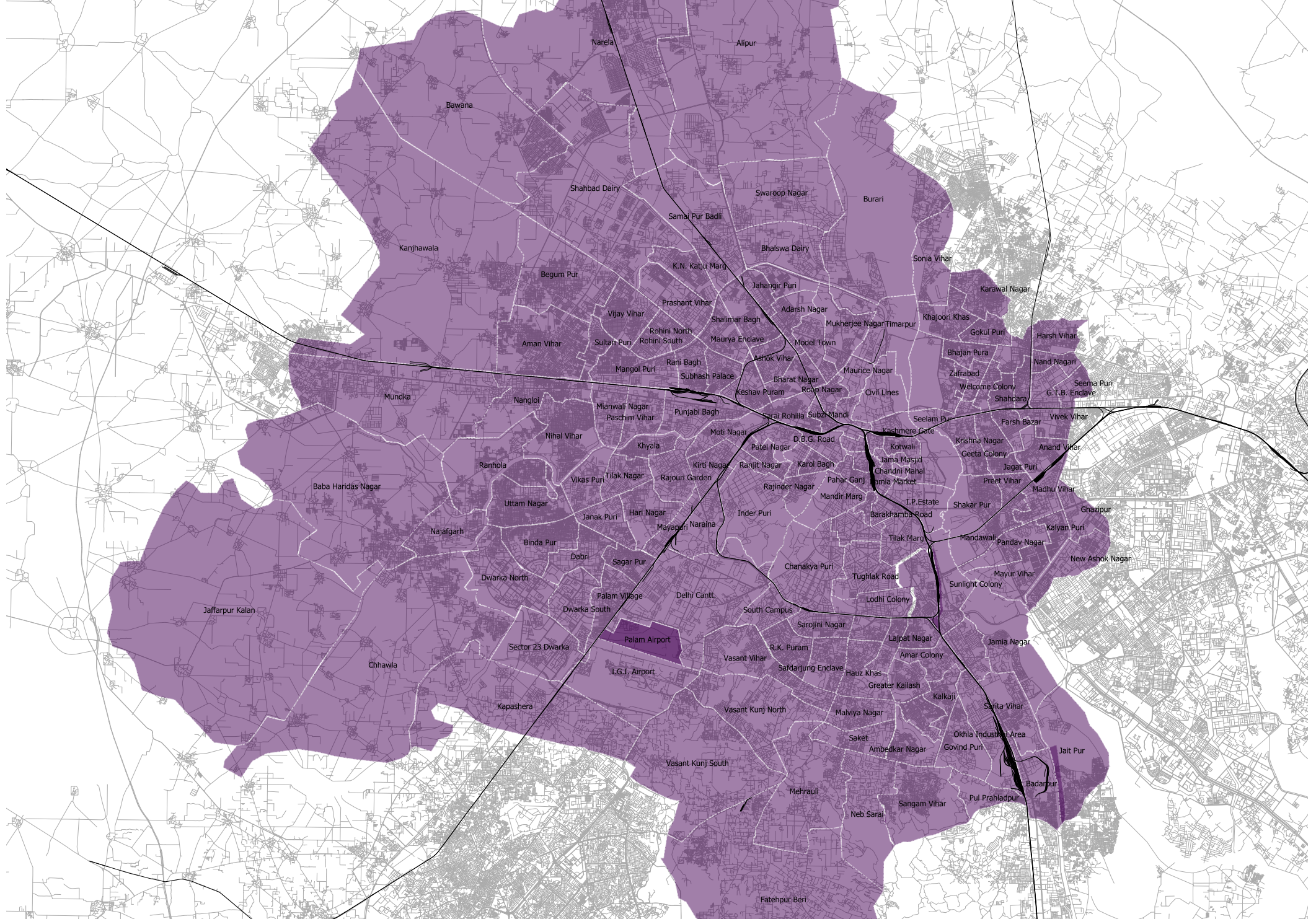
# For the spatial distribution of CCTV cameras

The map of CCTV cameras by police station jurisdiction is presented on the next page.

The only conclusive statement we can make based on this data is that **the distribution of CCTV cameras across Delhi is not uniform**. However, because of the incompleteness of the dataset, we were unable to determine whether this unevenness was due to any bias. Some of the areas that have a higher number of CCTV cameras relative to their district are commercial market areas, such as Gandhi Nagar, Tilak Nagar and Nabi Karim. But Gandhi Nagar also has a relatively high Muslim population, Nabi Karim has a relatively high Balmiki population, and so on.[53] On the other hand, Dwarka South is the area in our dataset that has the most number of CCTV cameras. It is a decidedly residential area that also flanks the Haryana border. It is difficult to discern an obvious pattern among these areas.

Further, not all these CCTV cameras are functional. A CAG audit showed that between 2018-19, only about 55-68 per cent of the cameras installed by the Delhi Police were functional.

Due to these factors, it is not possible to comment on the nature of the unevenness of CCTV camera placement across Delhi.

---

[53] Sriti Ganguly, ibid.

# CCTV Cameras in Police Jurisdictions

**METHODOLOGY**

RTIs asking the number of CCTV cameras within Police station limits were filed with the respective District Police offices. Only a few districts responded. Therefore this is not a complete sample. It is also unclear how many of these CCTV Cameras are functional or not. This analysis also excludes the mandated 10 CCTV cameras installed inside every police station.
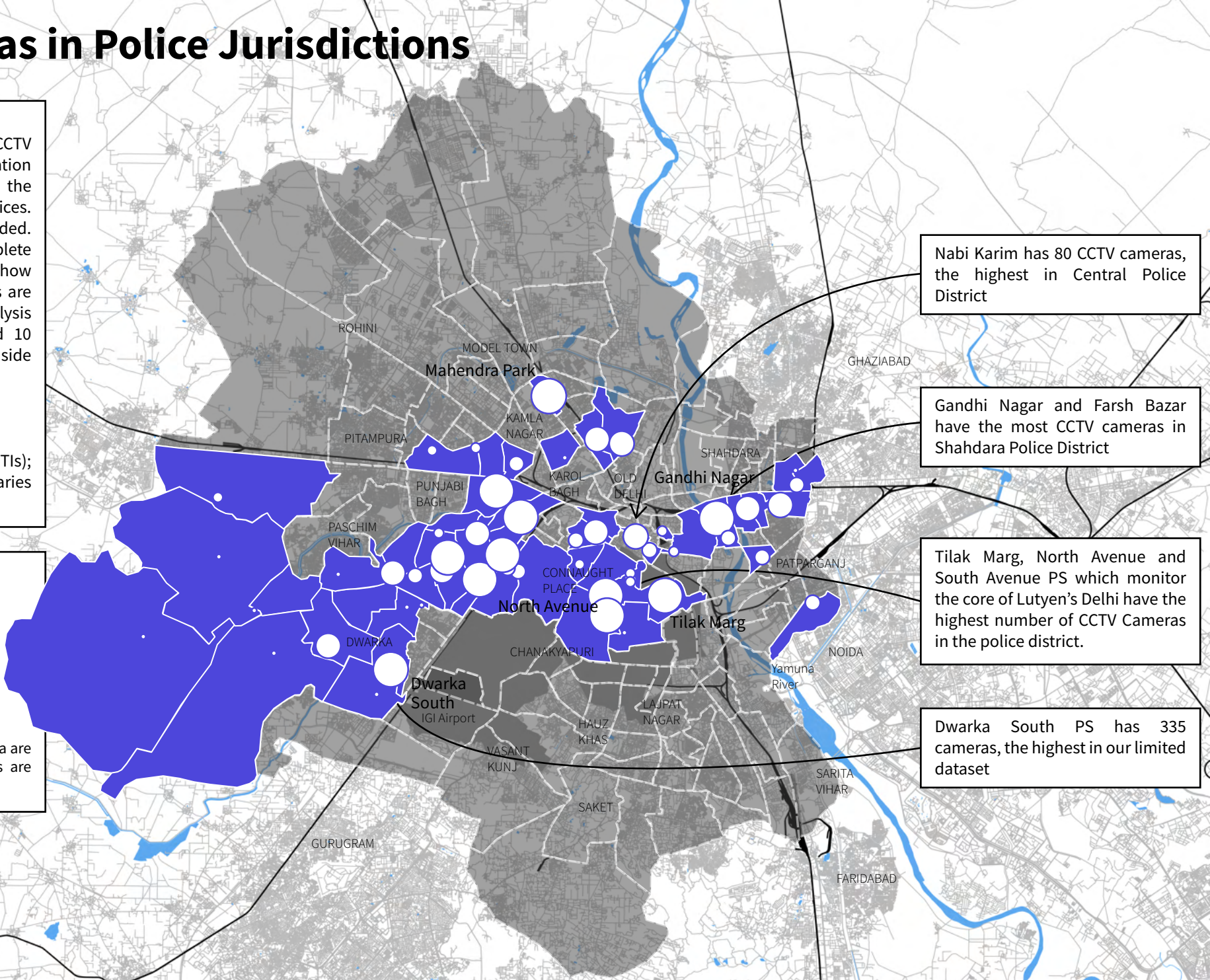
**SOURCE**

Number of CCTV Cameras (RTIs); Police Jurisdiction Boundaries (Datameet);

**LEGEND**

- Lowest quintile (< 19 CCTVs)
- 2nd quintile (19 - 33)
- 3rd quintile (33 - 56)
- 4th quintile (56 - 82)
- Highest quintile (77 - 335)

Police stations that provided data are marked in blue and the others are greyed out.



Nabi Karim has 80 CCTV cameras, the highest in Central Police District

Gandhi Nagar and Farsh Bazar have the most CCTV cameras in Shahdara Police District

Tilak Marg, North Avenue and South Avenue PS which monitor the core of Lutyen's Delhi have the highest number of CCTV Cameras in the police district.

Dwarka South PS has 335 cameras, the highest in our limited dataset

# VI. Limitations

This work has two noteworthy limitations: one, that the data is a few years old, and two, that it does not take into account the possibility that FRT may be deployed only in a few areas or unevenly across the city.

1. **Our datasets are not current**: Our religion data is from Census 2011. Our ward population data is from 2017. Our data on police station jurisdiction boundaries is from 2015-16. It might be the case that this data is outdated.

   However, we did not find any reports of a change in religious composition of Delhi's neighbourhoods apart from some reports on Muslims being made to move out of Shiv Vihar in Northeast Delhi after the 2020 pogrom.[54] We therefore do not expect the religious composition to have dramatically changed in the areas under study.

   A few police stations were created after 2015, for which we do not have boundary data, but we do not expect this to significantly distort our data. The 15 new police stations created in 2019 are in the Outer North district, and the new capacity is meant for industrial areas and borders.[55] If a new hypothesis were to be formed on the basis of the new police stations, it would be that of the over-policing of industrial workers and border areas.

2. **FRT deployment may not be uniform**: There may not be even deployment of facial recognition technology in all police stations or areas. We have not tackled the aspect of deployment bias in this paper. Similarly, the number of police personnel varies across police stations. This can be a confounding variable, but again, we do not expect the variation to be major and as explained above, the presence of a police station by itself is an indicator of the amount of policing.

A serious comparison of policing in Muslim and non-Muslim areas still remains to be carried out. This paper provides a general overview rather than granular numerical insight. Further, policing can vary within jurisdictions as well, and this type of study may not be suited to understanding such a phenomenon.

---

[54] Flavia Lopes. A Year After Delhi Riots, Muslim Families Are Selling Homes and Moving Out. The Wire. April 7, 2021. Available at: https://thewire.in/communalism/a-year-after-delhi-riots-muslim-families-are-selling-homes-and-moving-out

[55] HT Correspondent. Delhi gets 15 new police stations, one new police district from January 1. Hindustan Times. January 1, 2019. Available at: https://www.hindustantimes.com/delhi-news/delhi-gets-15-new-police-stations-one-new-police-district-from-january-1/story-OMZbSaNFyYWiJ88vTY82uL.html

# VII. Conclusion

FRT has inherent limitations. In the past, errors in FRT have led to innocent people being arrested.[56] We have seen that policing can be a biased institution. It is reasonable to conclude that in the hands of the police, FRT can be a tool for harassment and subjugation, especially of the vulnerable masses.

The spatial peculiarities of policing – which are really a reflection of the social biases of policing – can play out with the use of FRT as well. Areas considered "criminal", such as slums, can be over-surveilled and over-policed. Policing approaches that treat small crimes with overwhelming responses could be strengthened with the use of precise surveillance tools like FRT.[57]

We have shown that in Delhi, the use of FRT by the police is likely to disproportionately affect Muslims because of the over-policing of some areas with significant Muslim populations, combined with police biases. In general, the use of FRT by Delhi Police is likely to have uneven impacts on different populations due to spatial skew, CCTV placement skew, and biases. Such disproportionate impacts would pose serious challenges to the right to equality, and we therefore recommend that the use of FRT by the police in Delhi be halted until the questions of equality and over-policing are examined by the public and public representatives.

Police biases related to caste, homelessness and sex work can also have implications on the spatial distribution of technology-enabled policing. While we have not explored these questions in this paper, the implications of FRT and other technologies on policing these groups is an important area for further analysis.

It is also not the case that an equal and unbiased deployment of FRT by the police will necessarily benefit the public. The use of FRT in policing can impact privacy and liberty of people independently of bias as well, and therefore the effects of such general deployment should also be examined.

---

[56] Reuters. Facial recognition leads to first wrongful U.S. arrest, activists say. NBC News. June 24, 2020. Available at:
https://www.nbcnews.com/tech/security/facial-recognition-leads-first-wrongful-u-s-arrests-activists-say-n1231971

[57] Bernard E. Harcourt. Illusion of order: The false promise of broken windows policing. Harvard University Press, 2009.

# Annex – 1

*Police station jurisdictions in Delhi in the lowest quintile of population*

| Police Station | Population | Code | Estimated Muslim population percentage | Ward number | Sub district |
|---|---|---|---|---|---|
| Bara Hindu Rao | 25456 | O | 2.37 | 90 | Karol Bagh |
| Rajinder Nagar | 41230 | O | 3.94 | 149 | Delhi Cantonment |
| Sector 23 Dwarka | 45953 | O | 4.61 | 135 | Najafgarh |
| Maurice Nagar | 22459 | O | 5.07 | 10 | Civil Lines |
| Kamla Market | 41611 | O | 5.07 | 69 | Civil Lines |
| South Campus | 26004 | O | 5.99 | 168 | Vasant Vihar |
| Safdarjung Enclave | 32936 | L | 5.99 | 163 | Vasant Vihar |
| Preet Vihar | 36263 | O | 10.86 | 228 | Preet Vihar |
| Ghazipur | 37499 | O | 10.86 | 227 | Preet Vihar |
| Roop Nagar | 39192 | O | 11.29 | 70 | Model Town |
| Pul Prahladpur | 40392 | O | 12.2 | NA (Census Town) | Pul Pehladpur |
| Greater Kailash | 37559 | O | 12.39 | 192 | Kalkaji |
| Defence Colony | 39109 | S | 29.27 | | Defence Colony |
| Sunlight Colony | 41177 | S | 29.27 | 156 | Defence Colony |
| Hazrat Nizamuddin | 43627 | S | 29.27 | 154 | Defence Colony |
| Kotla Mubarakpur | 46056 | S | 29.27 | 157 | Defence Colony |
| Lahori Gate | 21756 | S | 34.75 | 80 | Kotwali |
| Kashmere Gate | 21815 | S | 34.75 | 77 | Kotwali |
| Kotwali | 38358 | S | 34.75 | NA | Kotwali |
| Gulabi Bagh | 39140 | S | 46.75 | NA | Sadar Bazaar |
| Jama Masjid | 40498 | S | 64.73 | 79 | Darya Ganj |

| | | | | | |
|---|---|---|---|---|---|
| Parliament Street | 0 | L | --- | --- | --- |
| Connaught Place | 0 | L | --- | --- | --- |
| Palam Airport | 0 | L | --- | --- | --- |
| Chanakya Puri | 127 | L | --- | --- | --- |
| Barakhamba Road | 209 | L | --- | --- | --- |
| Delhi Cantt. | 492 | L | --- | --- | --- |
| Mandir Marg | 2393 | L | --- | --- | --- |
| Tughlak Road | 3008 | L | --- | --- | --- |
| Sarojini Nagar | 5157 | L | --- | --- | --- |
| Tilak Marg | 15350 | L | --- | --- | --- |
| I.G.I. Airport | 26527 | L | --- | --- | --- |
| Lodhi Colony | 32804 | L | --- | --- | --- |
| Civil Lines | 43643 | L | --- | --- | --- |

O - Other

S - Significant Muslim presence (higher than the city average of 12.86%)

L - Low civilian population/government or diplomatic buildings

# Annex – 2

*Sample RTI response from North district, Delhi Police*

**OFFICE OF THE PUBLIC INFORMATION OFFICER, NORTH DISTRICT
CIVIL LINES, DELHI-110054.**

No......1816..../ID-180/2021/RTI Cell, North District, Delhi   dated......25/2./2021.

To

      Sh. Jai Vipra,
      R/o A-232, Defence Colony,
      New Delhi-110024.

**Subject: -   Regarding seeking information under RTI Act-2005.**

      With reference to your RTI application dated 22.01.2021, received in this office 27.01.2021, addressed to the undersigned, seeking information under Right to Information Act-2005.

      The reply, based on the reports received from all ACsP/Sub-Divisions, North District, Delhi is as under:-

1.      Total 508 CCTV cameras installed in total 14 Police Station of North District, Delhi. Hence, more information can not be provided due to exemption under section 8(i) (g) of RTI Act-2005, information as sought cannot be disclosed to any public person in the interest of the life or physical safety of any person or identify the source of information or assistance given in confidence for law enforcement or security purposes.

2.      M/S ECIL.

      As per section 19 of the Right to Information Act-2005, if you are not satisfied with the reply of this office, you may file an appeal to the First Appellate Authority within 30 days from the date of issue of this reply. The particulars of First Appellate Authority, North District, Delhi are given below:-

| Sh. Anto Alphonse, IPS, Deputy Commissioner of Police, North District, Civil Lines, Delhi- 110054. |
| --- |

**(JAIPAL SINGH)**
ASSTT. PUBLIC INFORMATION OFFICER,
ASSTT. COMMISSIONER OF POLICE,
NORTH DISTRICT, DELHI