



# **SAC**

## **Social Analytics of Crime**

# **Monitoring Crime involving Children through Data Integration**

Presented by

**Team RECON**

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External Mentor: Mr. Manish Thakre

# Issue Identified

City	Relative ranking based on Crime Rate (source: NCRB)	Relative ranking based on Ease of Living Index (source: MoHUA)
Delhi	1	7
Jaipur	2	4
Kochi	3	6
Patna	4	9
Indore	5	1
Lucknow	6	8
Surat	7	2
Ahmedabad	8	3
Nagpur	9	5

*Note: Indore is highlighted as a 'Better performing city' in both rankings.*

Non synchronised performance

Between safety indicators and the socio economic indicators

Socio-Economic conditions on crime rate

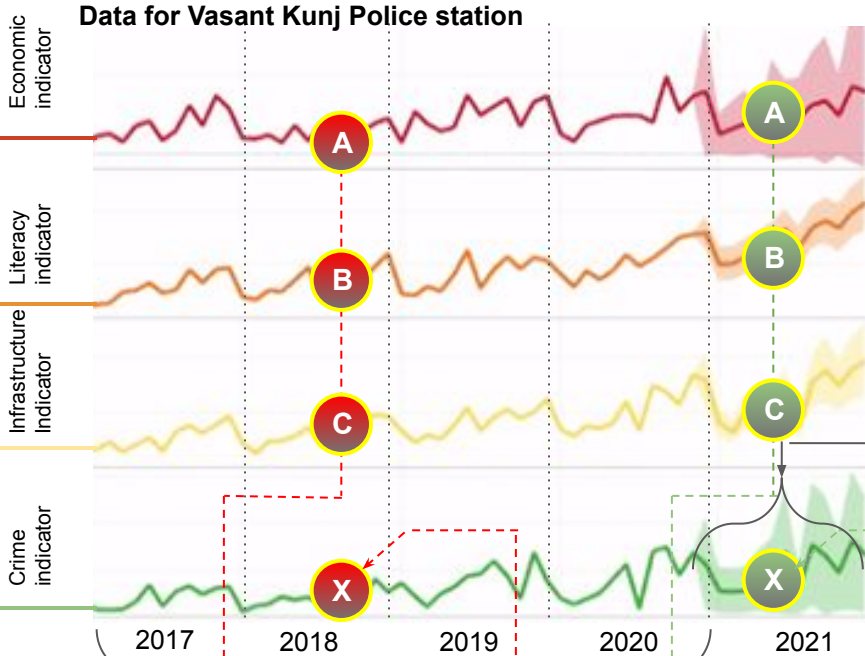
Well Recognized

Various research has been conducted

Absence of tool that compare

Socio-Economic parameters with crime

# Proposed solution



Generating **mathematical model** between different variables, i.e. **social indicators** and **crime rate**.

The same relationship can be used to predict crime rates in future, and generate **report** and **alert** based on that.

Values predicted are based on "Exponential Smoothing" independent of other variables

**Mathematical Model**  
example:  $X = a'A + b'B + c'C + d'$  ( $a'$ ,  $b'$ ,  $c'$ ,  $d'$  are constants)



# Outcome

## S.A.C. Social Analytics of Crime

### **Spatial Visualization of crime**

- Mapping of socio-economic factors and crime rates together to generate hotspot map (police station areas as unit of spatial visualization)

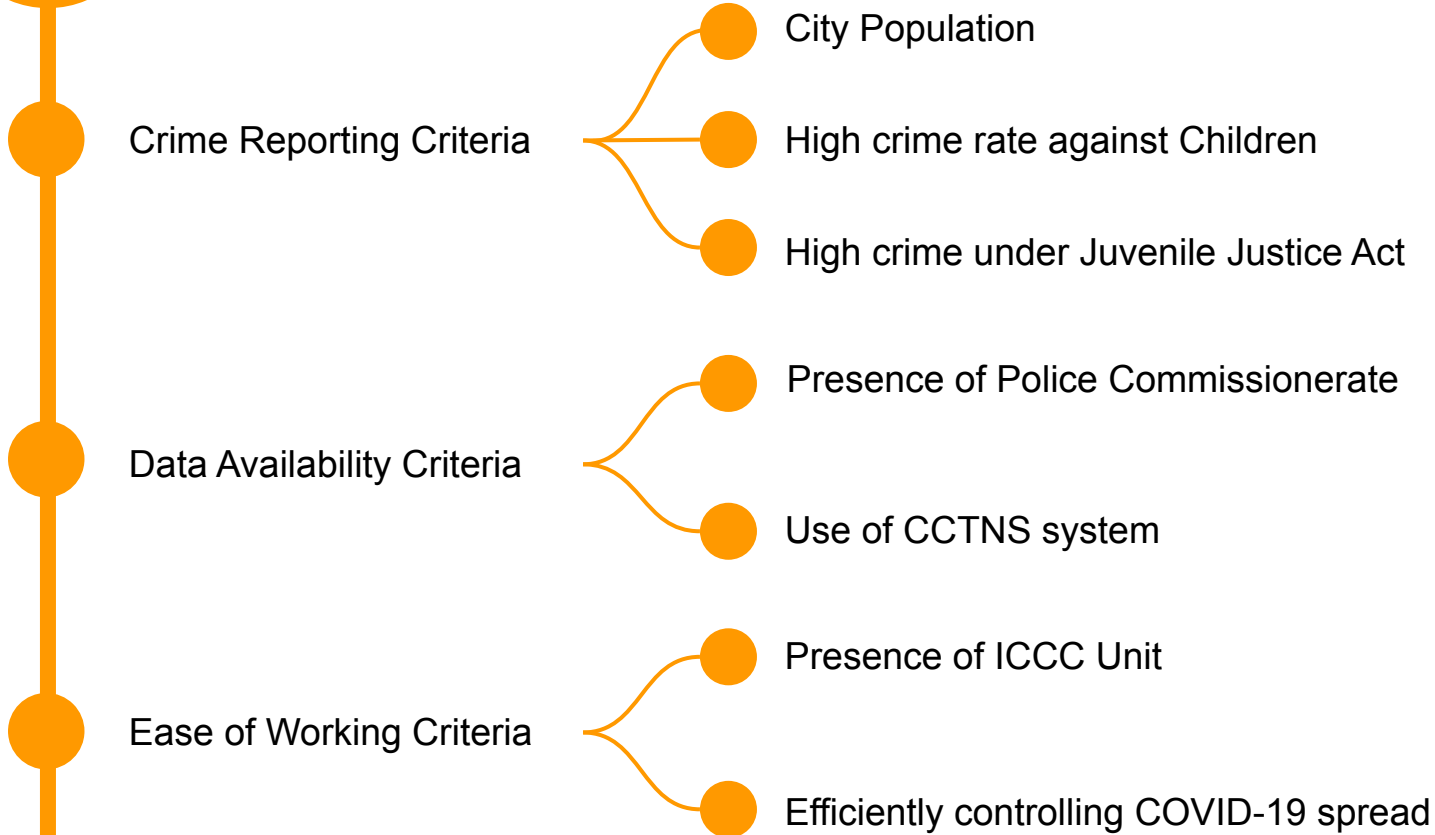
### **Identify relation and Generate Report**

- Highlight critical socio economic factors responsible for crime hotspots
- Highlight administrative boundaries considered for each socio economic factors
- Alert the ULB based on the prediction of crime hotspots
- In the way forward when integrated with Smart City MIS data than it can also compare total monetary investments in each sector

### **Predictive modeling of crime:**

- This tool is integrated with machine learning based data mining software(Weka) which generates mathematical model to calculate values of crime rate

# City selection Criteria



# City selection

**Crime Rate:** Crime per 1 Lakh Population of Children (0-18) years

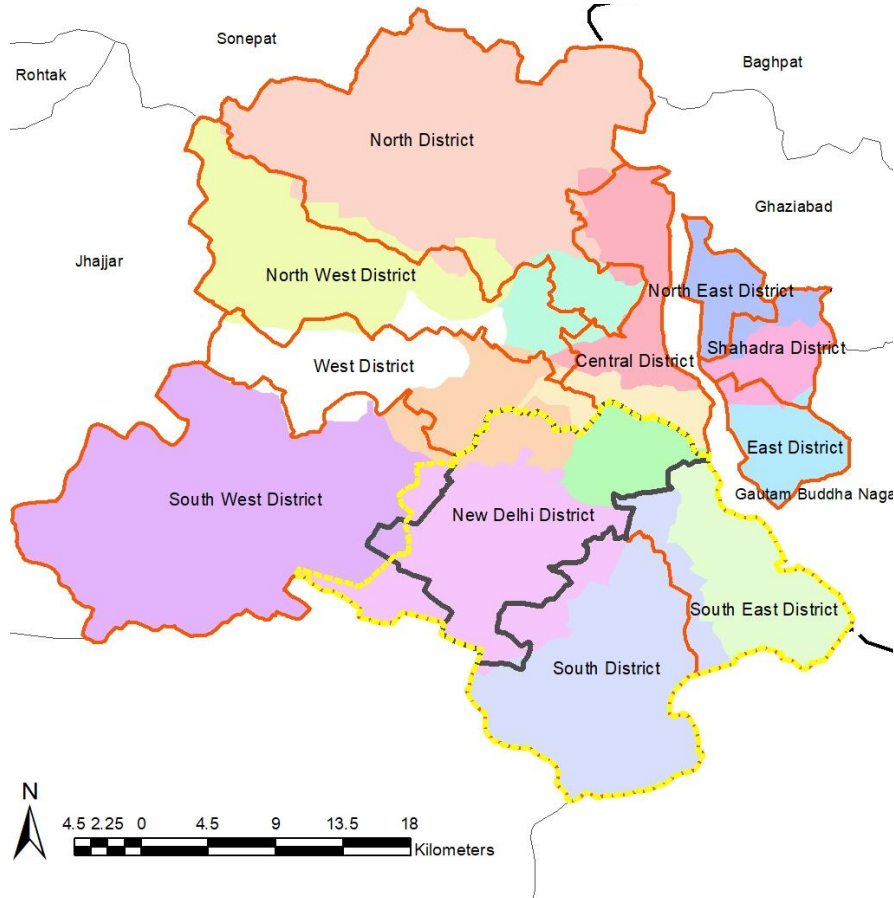
City	Normalized Score: Population 2011	Normalized Score: Crime Rate Against Children - Weighted Mean (2011-2018)	Normalized Score: Crime Rate under Juvenile Justice Act - Weighted	Presence of ICCU Unit	Presence of Police Commission erate	Normalized Score: CCTNS sync to SDC (Feb, 2020)	Normalized Score: 5 days Moving Average of Covid Case (10th Sep)	Crime Reporting Application for Citizen (Child)	Cumulative Score
Delhi	0.871794872	1	0.932730489	1	1	1	0.894196622	1	5.910328739
Nagpur	0.028693529	0.362485248	0.767230666	1	1	1	0.329320052	0	3.829089391
Chennai	0.407203907	0.050886852	0.529609013	1	1	1	0.176180165	0	3.811519608
Pune	0.184371184	0.44575281	1	1	1	1	1	0	3.630123994
Ahmedabad	0.263736264	0.087697591	0.250952708	1	1	1	0	0	3.602386563
Jaipur	0.063492063	0.208856125	0.340889491	1	1	1	0.032135123	0	3.581102556
Surat	0.155677656	0.090720758	0.318415908	1	1	1	0.023256821	0	3.541557501

## Probable Cities

(In the order of priority as per Cumulative Score)

1. Delhi
2. Nagpur
3. Chennai
4. Pune
5. Ahmedabad

# Pilot Area New Delhi, South, South East & South West Delhi



## Legend

- Pilot\_Area\_1
- New Delhi District
- Revenue\_District
- Police Districts**
- Central District
- Dwarka District
- East District
- New Delhi District
- North District
- North East District
- North West District
- Other District
- Outer North District
- Rohini District
- Shahadara District
- South District
- South East District
- South West District
- West District

# Ideation Stages

July

## Safety Project

- Neighborhood Enclosure
- Land Use Regulation
- Safety Index
- **Crime Visualization and Analytics Platform**



- Armchair Research
- Consultation with academicians in the field of **Criminology and Urban Management**

- Armchair Research
- Mentors Guidance
- Consultations with selected SPVs Officials



## Refining & Realignment

- Focus on Property Theft.
- Focus on Public Property Theft
- Asset Management System

August

September

## Monitoring Crime involving Children

Digital Crime Data Aggregation and Visualization Platform

Re-oriented Crime Involving Children

- Recommendation of Mentors

- Consultation with NDMC Smart City
- Armchair Research
- Mentors Guidance



## Project Modification

Incorporation of Social Parameters (To sort relevance of project to ULB)

November



# December

- Data Availability
- Technical Feasibility
- Usability to Urban Local Body and Line Departments

## Monitoring Crime involving Children

Analytical Tool

## S.A.C. Social Analytics of Crime

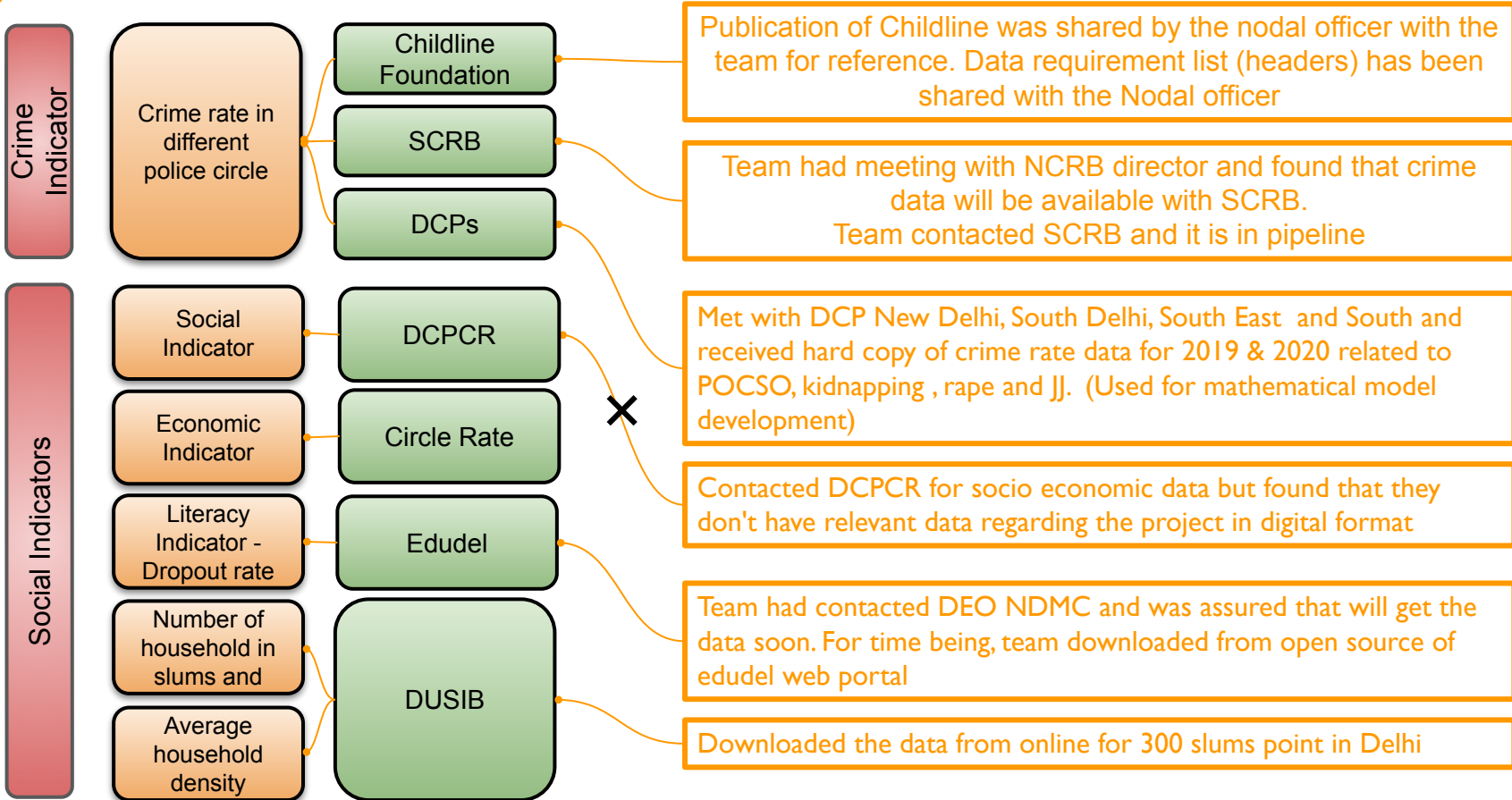
**Social Analytics of Crime is a tool to identify the correlation between Socio-Economic indicators and Crime Incidences**

**The tool can predict future trends of the crime occurrences based on historic trends**

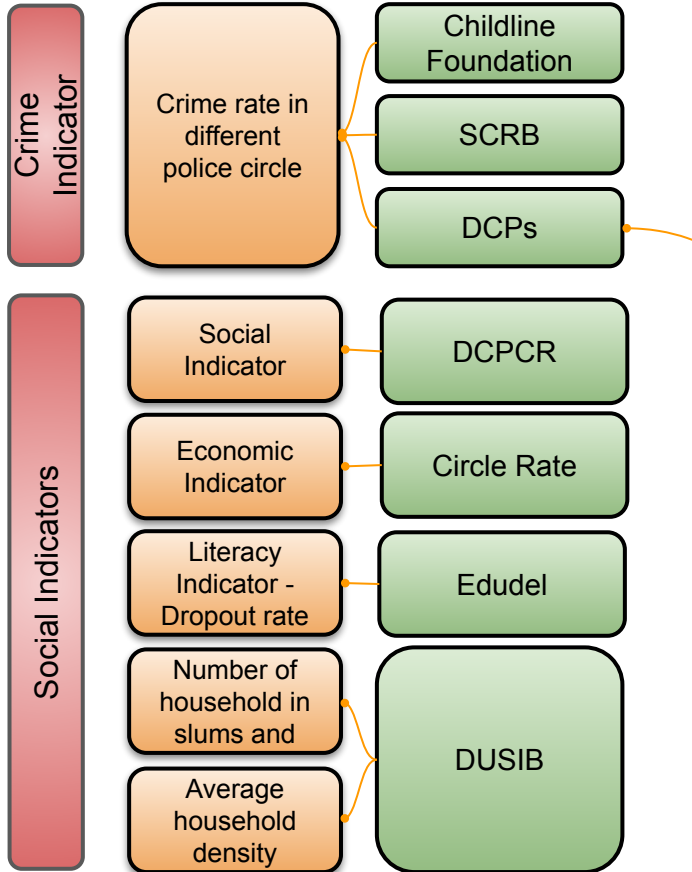
## Product

**Analytical Tool** which helps **Decision Makers** to decide the focus for the **Policy** and city level intervention

# Project Development Data Collection

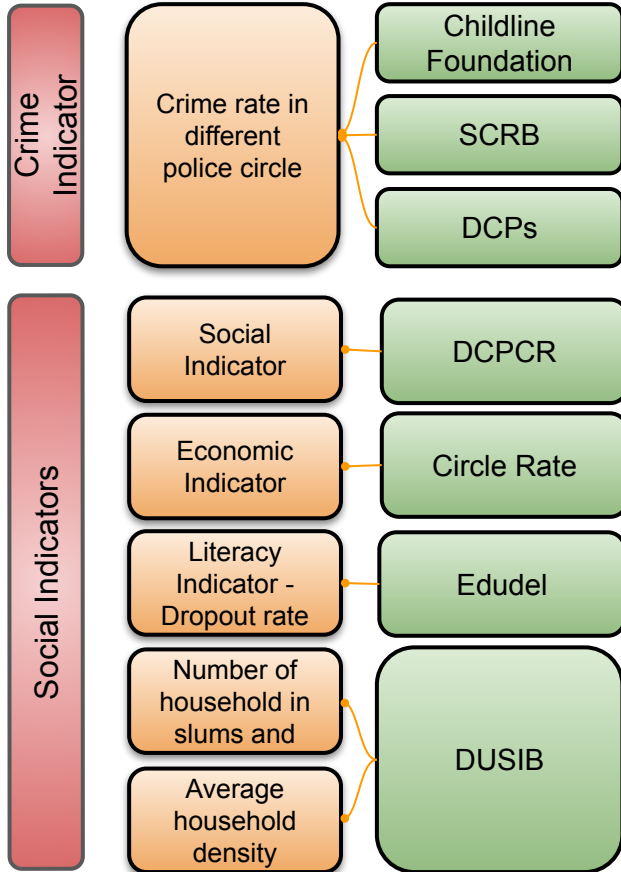


# Project Development Data Collection



Meeting with DCP South West District New Delhi

# Project Development Data Collection



Progress meeting with CEO NDMC

# Project Development Data Standardization

**EduDel**

Data Frame of ULB agency (Ex. Education Department) (API Available)

Old headers available with data frame of ULB (not suitable for Analysis in application 2)

Date	Address/ Name of the School	Dropout rate

Mapping of data (instructions to be provided by data Provider)

<b>Name of the fields in data frame</b> (to be typed by data provider)	<b>Data type of the column</b> (to be selected from dropdown list)	<b>Select format</b> (Drop down list will change based on data type selected by data provider in the previous column)
<b>Step 1</b>	<b>Step 2</b>	<b>Step 3</b>
Date	date	DD.MM.YYYY/ Weekly data/ monthly data/ yearly data
Address/Name of the school	Location	Address line/ pin no/ ward no/ police station no/ Latitude & Longitude/ Shape files link
Attendance rate	Indicator	percentage/ Normalized Unit

Data source: Attendance report of EDUDeI

Date	Location	Indicator

Data set

**Data accumulator portal**

New headers assigned to data sets as per predefined options, (can be understood by for application 2 Analysis)

# Project Development Coterminous Data

Normalized data assuming Homogeneous distribution

Police station 1:  
30% of Edu. Dept. Zone A (score 65)+ 40% of Edu. Dept. Zone B (score 35)+30% of Edu. Dept. Zone C (score 23)=  
total score **40.40**



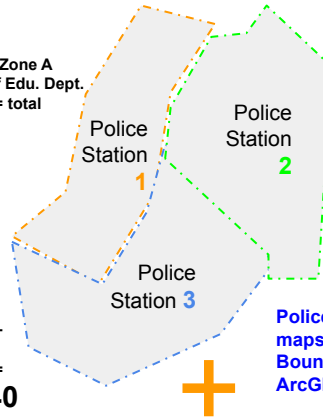
Literacy indicator


Data set 2

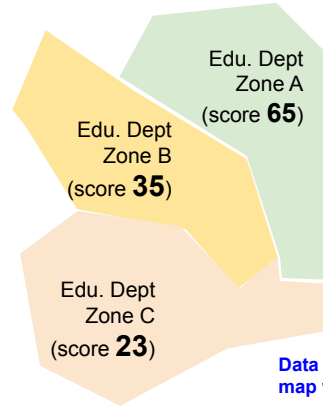
Output:  
Coterminous Data

Police station 2:  
83% of Edu. Dept. Zone A (score 65)+ 17% of Edu. Dept. Zone B (score 35)= total  
score **59.90**

Police station 3:  
80% of Edu. Dept. Zone C (score 23)+ 20% of Edu. Dept. Zone B (score 35)=  
total score **25.40**



Police Station maps (tools unit Boundary) overlaid on ArcGIS map



Data plotted on ArcGIS map with score

Literacy indicator

Date	Location	Indicator

Data set

Data source:  
Attendance report of EDUDeI



ArcGIS



**ArcGIS Dependency**  
For Datasets sourced from agencies with well defined jurisdiction boundaries or datasets with **Polygonal Shapefiles**

# Project Development Predictive Modeling

Data collected from different agencies showing correlation coefficient used as indicators. Ex. attendance data from edudel



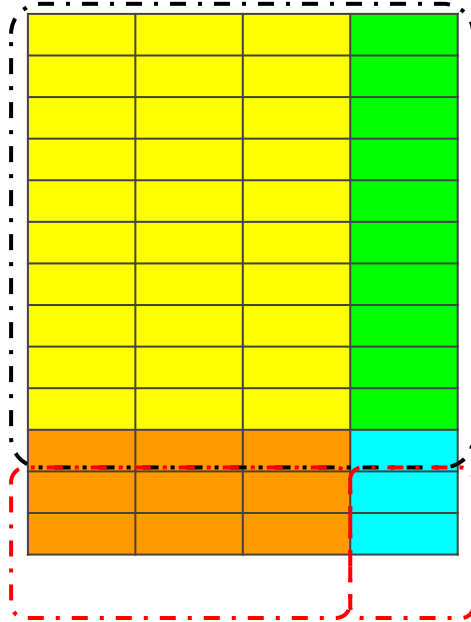
**ArcGIS**

Coterminous data, i.e, data collected on same time duration and same geographical boundary Arcgis dependency

Future trends of indicators are forecasted, based on exponential smoothing method individually for each values

social indicator 1  
social indicator 2  
social indicator 3  
**Crime indicator**

Crime rate data collected from SCRB & Childline report data



Realtime data used in weka to create mathematical model



Weka ML based Data mining tool

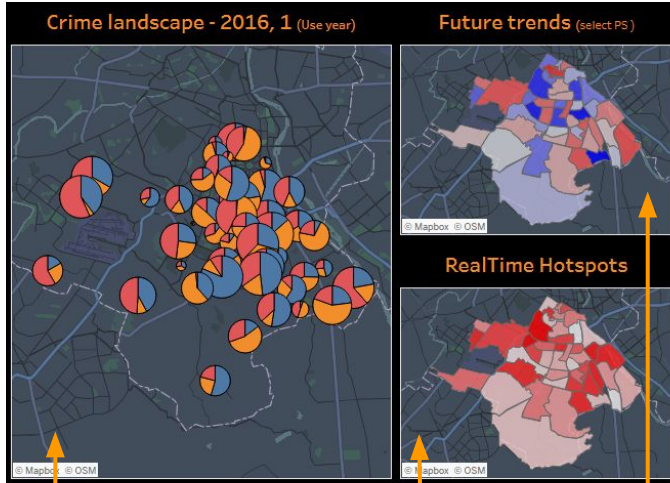
Prediction of crime indicator

Mathematical model created by weka

Predicted values to be tested on weka's mathematical model to predict crime indicator for same geographical boundary

# Project Development

## Spatial Visualization



Radius of pie depict crime rate, and its division define type of crimes

Real time hotspot is generated through crime data analysis

Spatial visualization of future trend analysis through Weka modeling

## Infographics Visualization

Ward - District - Socio Economic Parameter



Other associated administrative boundaries

Plotted graph of Socio economic indicators with Crime data



# Project Development Web Application

- Team RECON

Finalisation of GUI Design and Backend process

Dummy Dashboard prepared in Tableau open source platform

FRD and concept document

Technical requirement document

- NDMC Intervention

CEO of Delhi Smart City

IT Department of NDMC

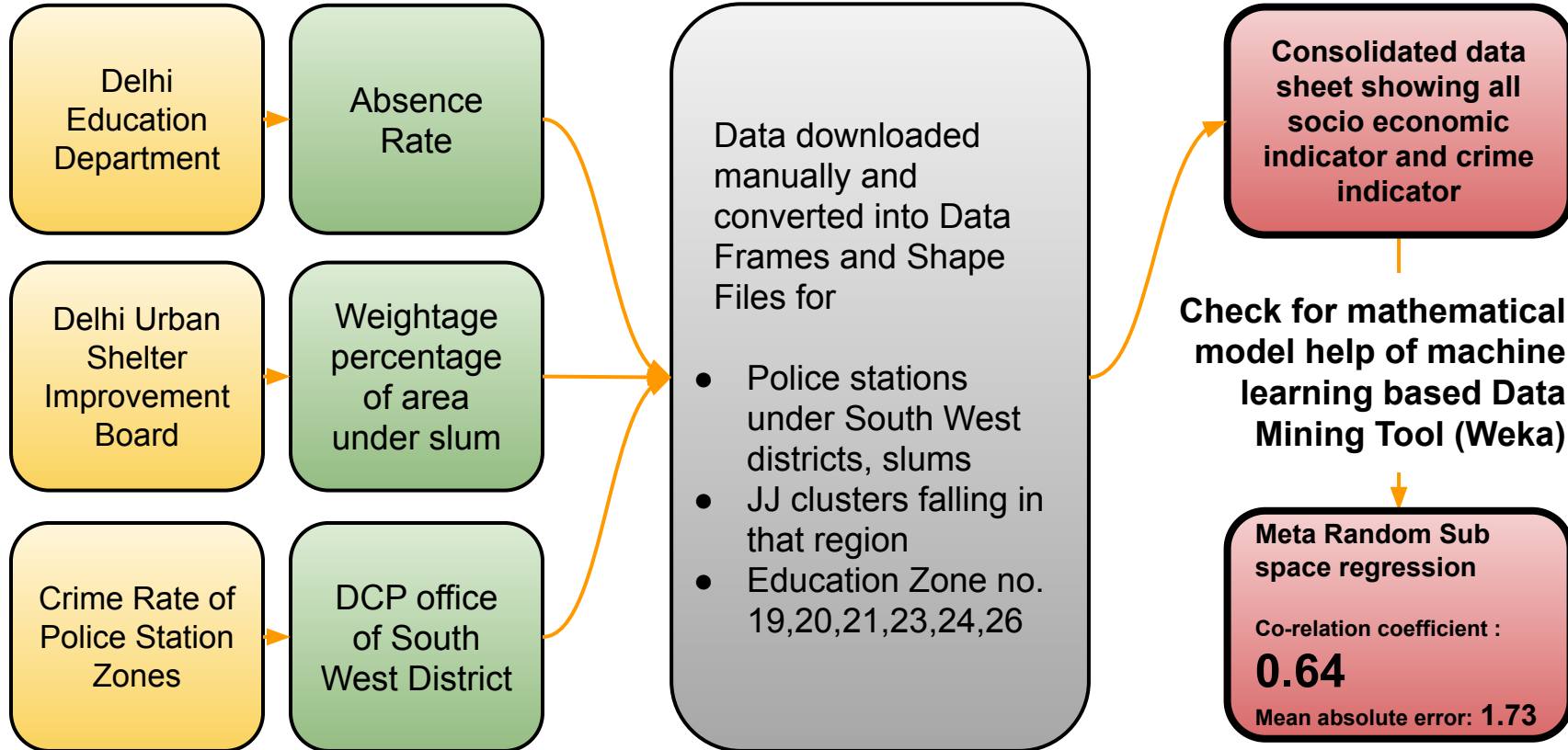
Procurement of Developer

- Ministry Intervention

Shared Project brief to Head of sales L&T

Feedback awaited

# Project Development Validation



# Project Development Validation

674 Slums points segregated based on Police Station Zone Boundary

DUSIB\_Slum\_Data

📍 1.0–57.0

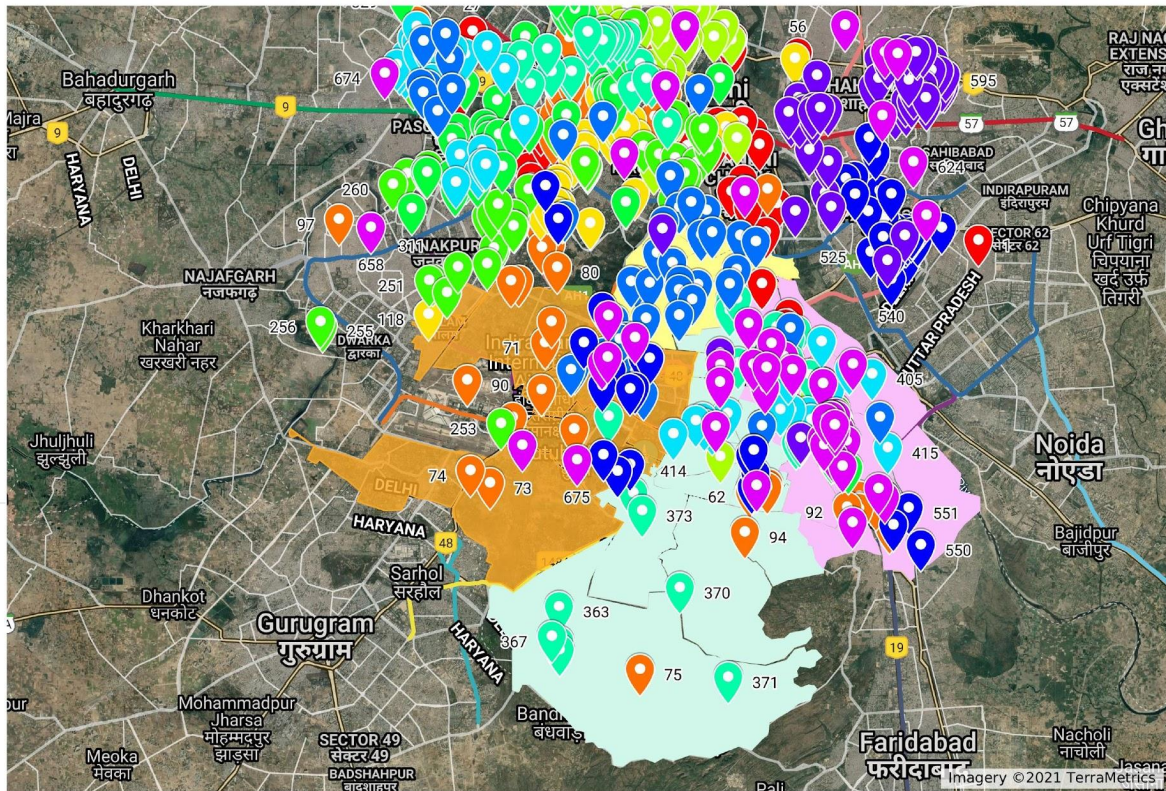
South West Delhi Police Station Maps

- 📍 Delhi Cantt. Police Station
- 📍 Safdarung Enclave Police station
- 📍 Kapashera Police Station
- 📍 Vasant Vihar Police Station
- 📍 Palam Village Police Station
- 📍 R. K. Puram Police Station
- 📍 Sarojini Nagar Police station
- 📍 South Campus Police Station
- 📍 Vasant Kunj North Police Station
- 📍 Sagarpur Police Station
- 📍 Vasant Kunj South Police Station

South Delhi Police Station Maps

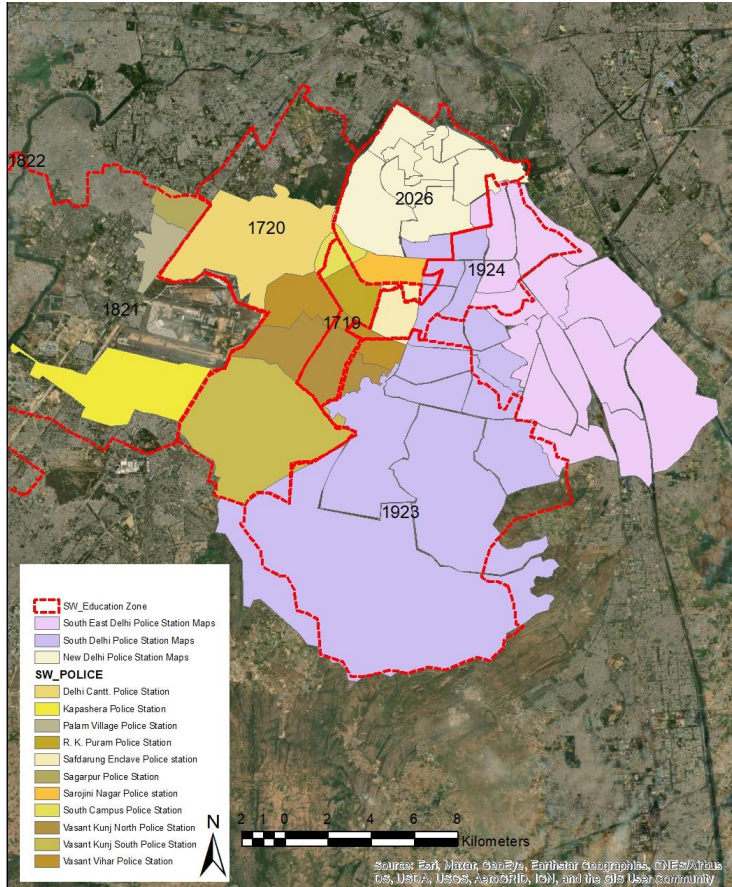
South East Delhi Police Station Maps

New Delhi Police Station Maps



# Project Development Validation

## Education Department



D	E	F	G	H	I	J	K	L	M
id	name	Education Zone_Name	Police_Station	Shape_Area	Shape_Percent	Area (sqm)	Zone_Area	Percentage	
0	0BD41725	1719	1719 Vasant Kunj South Police Station	0.011452	0.000001	10310.62	12735500	0.08%	
0	0BD41725	1719	1719 Vasant Kunj North Police Station	0.095969	0.000519	5628492	12735500	44.20%	
0	0BD41725	1719	1719 Vasant Vihar Police Station	0.004611	0.000059	640334.8	12735500	5.03%	
0	0BD41725	1719	1719 Sarojini Nagar Police station	0.040695	0.000007	81030.85	12735500	0.64%	
0	0BD41725	1719	1719 Safdarjung Enclave Police station	0.056174	0.00007	760584.8	12735500	5.97%	
0	0BD41725	1719	1719 R. K. Puram Police Station	0.083139	0.00038	4126899	12735500	32.40%	
0	0BD41725	1719	1719 South Campus Police Station	0.049046	0.000126	1365744	12735500	10.72%	
1	10CF79CC	1720	1720 Vasant Kunj South Police Station	0.022942	0.002865	31087480	94364400	32.94%	
1	10CF79CC	1720	1720 Vasant Kunj North Police Station	0.142897	0.000637	6905919	94364400	7.32%	
1	10CF79CC	1720	1720 Vasant Vihar Police Station	0.117589	0.000607	6582590	94364400	6.98%	
1	10CF79CC	1720	1720 South Campus Police Station	0.048896	0.000072	784337.6	94364400	0.83%	
1	10CF79CC	1720	1720 Delhi Cantt. Police Station	0.258017	0.002315	25102590	94364400	26.60%	
1	10CF79CC	1720	1720 Sagarpur Police Station	0.006825	0.000001	10833.09	94364400	0.01%	
2	0C6CC1E5	1821	1821 Kapashera Police Station	0.243317	0.001598	17335820	137638000	12.60%	
2	0C6CC1E5	1821	1821 Vasant Kunj South Police Station	0.077111	0.000019	216500.1	137638000	0.15%	
2	0C6CC1E5	1821	1821 Vasant Kunj North Police Station	0.036593	0.000018	195134	137638000	0.14%	
2	0C6CC1E5	1821	1821 Vasant Vihar Police Station	0.009768	0.000003	33859.56	137638000	0.02%	
2	0C6CC1E5	1821	1821 Palam Village Police Station	0.113619	0.000397	4303792	137638000	3.13%	
2	0C6CC1E5	1821	1821 Delhi Cantt. Police Station	0.117159	0.000037	402114.1	137638000	0.29%	
2	0C6CC1E5	1821	1821 Sagarpur Police Station	0.07444	0.000283	3068682	137638000	2.23%	
4	01D7C25A	1923	1923 Vasant Kunj South Police Station	0.115756	0.000069	752572.4	146622000	0.51%	
4	01D7C25A	1923	1923 Vasant Kunj North Police Station	0.104218	0.000194	2101871	146622000	1.43%	
4	01D7C25A	1923	1923 Vasant Vihar Police Station	0.06242	0.000211	2288637	146622000	1.56%	
4	01D7C25A	1923	1923 Safdarjung Enclave Police station	0.026267	0.000012	134801.4	146622000	0.09%	
5	0D839B67	1924	1924 Vasant Vihar Police Station	0.043416	0.000064	698465.6	27987400	2.50%	
5	0D839B67	1924	1924 Safdarjung Enclave Police Station	0.076286	0.000344	3715717	27987400	13.33%	

A	B	C	D	E	F	G	H	I
Police Station Zones	Education_Zone	present	absent	leaves	total		(Absent + Leaves) / Highest total (Strength)	
1	Delhi Cantt. Police Station	1720 01/01/2019	995 7406	4045 069	4166 314	9121 124		0.19462498
3	Delhi Cantt. Police Station	1720 02/01/2019	1235 314	4164 982	3305 871	8706 224		0.17708995
4	Delhi Cantt. Police Station	1720 03/01/2019	1329 703	4262 778	3373 289	8965 77		0.181005206
5	Delhi Cantt. Police Station	1720 04/01/2019	1146 902	3569 413	2951 994	7668 31		0.15489347
6	Delhi Cantt. Police Station	1720 05/01/2019	1204 727	4205 486	3321 86	8732 072		0.17842008
7	Delhi Cantt. Police Station	1720 06/01/2019	0	0	0	0		0
8	Delhi Cantt. Police Station	1720 07/01/2019	1216 452	4010 161	3362 364	8688 976		0.174758202
9	Delhi Cantt. Police Station	1720 08/01/2019	1205 26	4096 232	2699 644	8001 135		0.161089327
10	Delhi Cantt. Police Station	1720 09/01/2019	1236 97	4186 566	3308 269	8731 806		0.177657468
11	Delhi Cantt. Police Station	1720 10/01/2019	1287 867	4183 102	3760 475	9231 444		0.18893443
12	Delhi Cantt. Police Station	1720 11/01/2019	1305 987	4161 784	3763 406	9231 177		0.18786592
13	Delhi Cantt. Police Station	1720 12/01/2019	0	0	0	0		0
14	Delhi Cantt. Police Station	1720 13/01/2019	0	0	0	0		0
15	Delhi Cantt. Police Station	1720 14/01/2019	998 985	4416	3519 05	8903 148		0.188092302
16	Delhi Cantt. Police Station	1720 15/01/2019	1038 449	4278 5	2954 659	8271 606		0.17145468
17	Delhi Cantt. Police Station	1720 16/01/2019	6427 609	4162 317	114 3172	10704 24		0.101373274
18	Delhi Cantt. Police Station	1720 17/01/2019	7605 955	2446 227	98 86169	10151 04		0.060328752
19	Delhi Cantt. Police Station	1720 18/01/2019	8036 51	2573 069	94 86459	10703 44		0.063240652
20	Delhi Cantt. Police Station	1720 19/01/2019	7695 49	2945 865	127 3744	10768 73		0.072840206
21	Delhi Cantt. Police Station	1720 20/01/2019	0	0	0	0		0
22	Delhi Cantt. Police Station	1720 21/01/2019	8278 001	2036 125	147 8928	10462 02		0.051769914
23	Delhi Cantt. Police Station	1720 22/01/2019	7142 558	3531 574	152 6894	10826 62		0.087331727
24	Delhi Cantt. Police Station	1720 23/01/2019	8620 154	2059 308	164 4142	10843 88		0.052711071
25	Delhi Cantt. Police Station	1720 24/01/2019	8453 34	96 042	94 06571	10515 45		0.048827459
26	Delhi Cantt. Police Station	1720 25/01/2019	7393 043	2662 604	146 075	10201 67		0.065675756
27	Delhi Cantt. Police Station	1720 26/01/2019	0	0	0	0		0
28	Delhi Cantt. Police Station	1720 27/01/2019	0	0	0	0		0

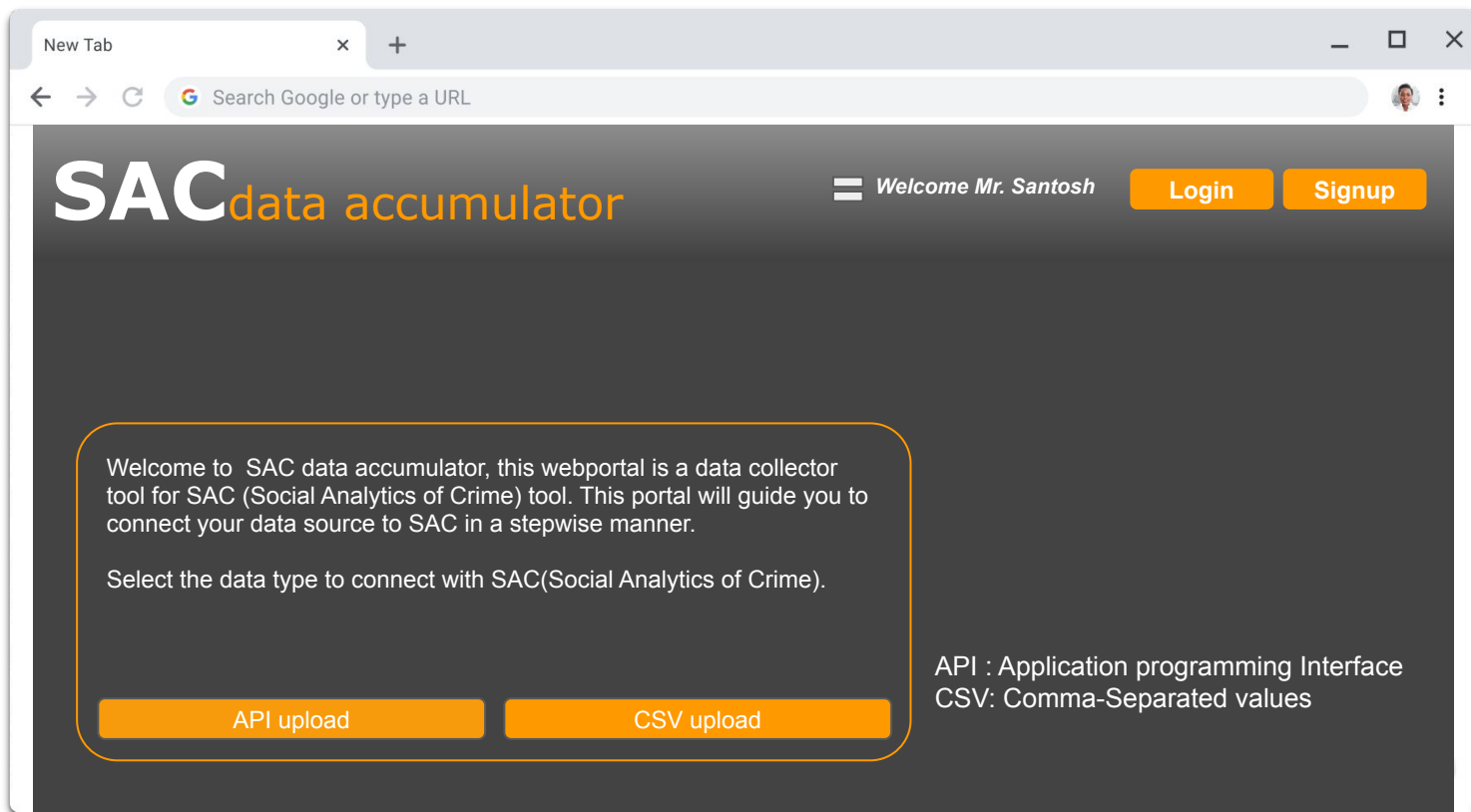
# Project Development Validation

Test result for prediction of crime rate of **Palam Village & Sagarpur Police station** using the **Model created in Weka**

Month	Year	Actual Crime rate per 1 lakh population	Predicted crime rate per 1 lakh population	Absolute Error (%)
Palam village Police Station				
October	2019	11.561	9.205	-20.4
November	2019	2.312	2.2683	-1.9
December	2019	6.937	8.592	23.9
Sagarpur Police Station				
October	2019	23.942	17.645	-26.3
November	2019	14.964	17.645	17.9
December	2019	5.985	9.625	60.8

**2/3** times  
prediction of  
**Relative  
Ranking**  
of police  
stations are  
accurate

# Showcasing the Pilot SAC Data Accumulator



The screenshot shows a web browser window with a single tab titled "New Tab". The address bar contains "Search Google or type a URL". The page header features the logo "SAC data accumulator" on the left, a hamburger menu icon, the text "Welcome Mr. Santosh", and two orange buttons labeled "Login" and "Signup". The main content area has a dark background with a white-bordered box containing the following text:

Welcome to SAC data accumulator, this webportal is a data collector tool for SAC (Social Analytics of Crime) tool. This portal will guide you to connect your data source to SAC in a stepwise manner.

Select the data type to connect with SAC(Social Analytics of Crime).

Below this text are two orange buttons: "API upload" and "CSV upload".

API : Application programming Interface  
CSV: Comma-Separated values

# Showcasing the Pilot SAC Data Accumulator

The screenshot shows a web browser window with a single tab titled "New Tab". The address bar contains "Search Google or type a URL". The page header features the logo "SAC data accumulator" on the left, a hamburger menu icon followed by "Welcome Mr. Santosh" in the center, and "Login" and "Signup" buttons on the right. The main content area is titled "SAC CSV connector" with a subtext "(please fill in the below mentioned fields to connect your data source with SAC)". Below this, there are several input fields: "Your Focus Sector" (dropdown), "Analysis No" (text), "Analysis title" (text), "Upload CSV file" (dropdown), "Use CSV as" (text), and "Interval of update" (text). A table with three rows is present, each row having three columns: "Type Header name", "Select the header type", and "Select secondary attribute". An "Add Row" button is located below the table. At the bottom center, there is a large "Upload" button. A small edit icon is visible in the bottom right corner of the form area.

New Tab

Search Google or type a URL

## SAC data accumulator

Welcome Mr. Santosh

Login Signup

### SAC CSV connector

(please fill in the below mentioned fields to connect your data source with SAC)

**Your Focus Sector**

**Analysis No**

**Analysis title**

**Upload CSV file**

**Use CSV as**

**Interval of update**

<input type="text" value="Type Header name"/>	<input type="text" value="Select the header type"/>	<input type="text" value="Select secondary attribute"/>
<input type="text" value="Type Header name"/>	<input type="text" value="Select the header type"/>	<input type="text" value="Select secondary attribute"/>
<input type="text" value="Type Header name"/>	<input type="text" value="Select the header type"/>	<input type="text" value="Select secondary attribute"/>

Add Row

Upload

# Showcasing the Pilot SAC Data Accumulator

The screenshot displays the SAC Data Accumulator web application. The browser window shows a 'New Tab' with a search bar containing 'Search Google or type a URL'. The application header includes the logo 'SAC data accumulator', a user greeting 'Welcome Mr. Santosh', and 'Login' and 'Signup' buttons. The main content area is titled 'Data provider Profile Mr. santosh' and features 'Update profile' and 'Update credential' buttons. Below this, the 'Your Focus Sector' is set to 'Education' with a 'Change' button. The 'Your Data Set' section contains three analysis cards: 'Analysis 1 Dropout analysis CSV Update pending CF 1, Error 0.99', 'Analysis 2 Attendance analysis CSV Update pending CF 1, Error 0.99', and 'Analysis 3 Literacy analysis API Updated CF 1, Error 0.99'. Each card has an 'Update' button, and there is a 'Delete' button for the entire set. The 'Report and Alert' section shows three report cards with 'Print' and 'Delete' buttons. At the bottom, there are 'Cancel' and 'Save' buttons.

New Tab x +

← → ↻ G Search Google or type a URL

**SAC** data accumulator ≡ Welcome Mr. Santosh Login Signup

**Data provider Profile** Mr. santosh Update profile Update credential

Your Focus Sector Education Change

**Your Data Set**

- Analysis 1  
Dropout analysis  
CSV  
Update pending  
CF 1, Error 0.99
- Analysis 2  
Attendance analysis  
CSV  
Update pending  
CF 1, Error 0.99
- Analysis 3  
Literacy analysis  
API  
Updated  
CF 1, Error 0.99

Update Delete

**Report and Alert**

- 
- 
- 

Print Delete

Cancel Save



# Showcasing the Pilot Social Analytics of Crime

The screenshot displays the SAC Social Analytics of Crime dashboard. At the top, the browser window shows a 'New Tab' with a search bar. The dashboard header includes the SAC logo, the text 'Social Analytics of Crime', a user greeting 'Welcome Mr. Santosh', and 'Login' and 'Signup' buttons. The main content area is divided into several sections: a 'Welcome Mr. Santosh' section with 'Update Settings', 'Run simulation', and 'Resources(Model)' buttons; a 'Your Data Sets' section featuring three database icons, each with a title, description, status, and performance metrics, alongside 'Select All', 'Include', 'Update', and 'Delete' buttons; and a 'Report and Alert' section with a white box containing report content and a 'Goto Dashboard' button. At the bottom, there are 'Cancel' and 'Save' buttons.

New Tab

Search Google or type a URL

## SAC Social Analytics of Crime

Welcome Mr. Santosh

Login Signup

Welcome Mr. Santosh

Update Settings Run simulation

Resources(Model)

### Your Data Sets

			Select All
Analysis 1 Dropout analysis CSV Update pending CF 1, Error 0.99	Analysis 2 Attendance analysis CSV Update pending CF 1, Error 0.99	Analysis 3 Literacy analysis API Updated CF 1, Error 0.99	Include
			Update
			Delete

### Report and Alert

Report content  
CF: 1  
Error: 0.99  
Mathematical model classifier :

Goto Dashboard

Cancel Save

# SAC

Social Analytics of Crime

Select Year for...

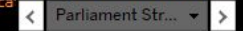


Crime landscape - 2016, 1 (Use year)

Future trends (select PS)

Parliament Street Police Station - Social Indica

Select police station for Pe...



## Instructions

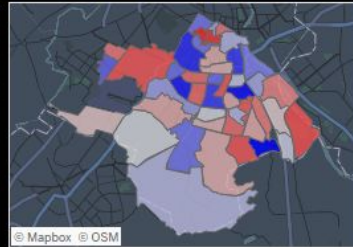
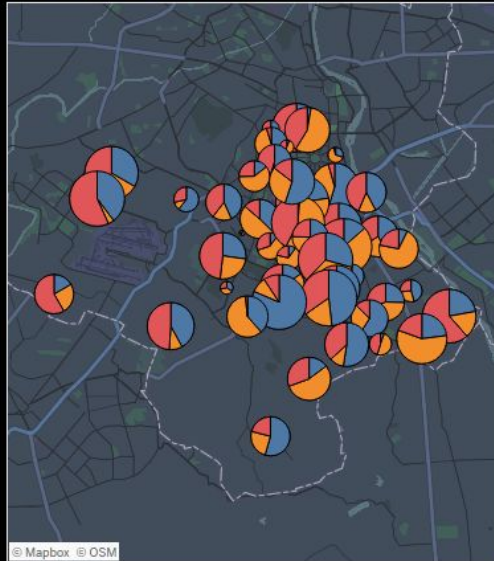
1. use the slider to change year for the crime landscape map
2. Use the dropdown list to select the desired police station
3. Click on the download button to download PDF.

Download ...

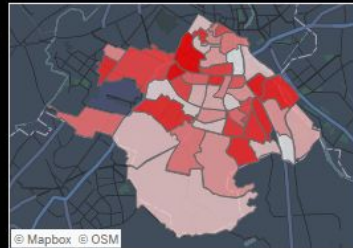
Name (South ...

(All)

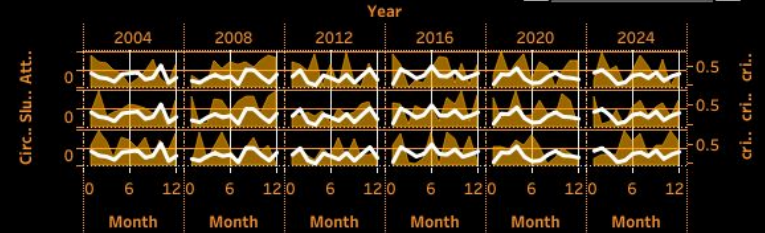
powered by  
@Tableau



RealTime Hotspots



Education Zones



Social Indicators



[https://public.tableau.com/shared/NXG6QDHX5?:display\\_count=y&:origin=viz\\_share\\_link](https://public.tableau.com/shared/NXG6QDHX5?:display_count=y&:origin=viz_share_link)

# Problems Faced

Proving relevance of selecting Crime involving Children for prediction modeling

Collecting crime data from Police Department was a challenge as they were not ready to share the data for city governance  
(Breaking the siloed approach in the given timeframe was difficult)

Data standardization on a single administrative boundary was tedious

Delay due to multiple administrative approvals

Reluctance of NDMC IT Department to assist the team in developing the proposed tool

Appointment / Onboarding of a Digital Tool Developer is still a challenge.

# Steps Taken

Research for tapping related socio economic indicators

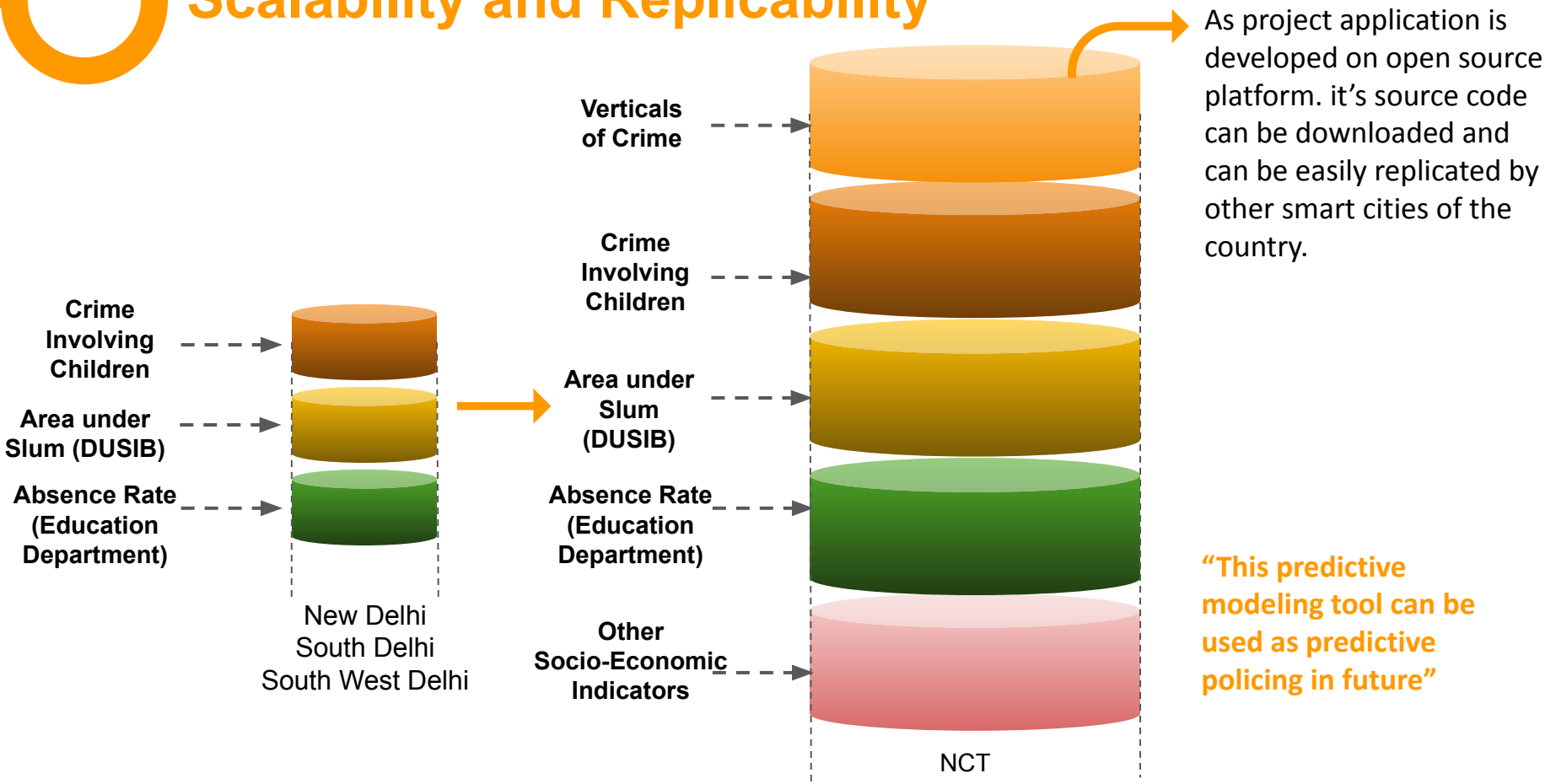
Formal Request from SPV, CEO and Joint Secretary, MoHUA  
Daily follow up on Phone Call  
Weekly visit to department

Use of Geographical Information System and Calculative Assumptions

Contacted developers at personal level  
Asked IT Team assistance to find the suitable help  
Asked for Joint Secretary, Mission Director and NDMC Secretary's Intervention



# Scalability and Replicability



As project application is developed on open source platform. it's source code can be downloaded and can be easily replicated by other smart cities of the country.

**“This predictive modeling tool can be used as predictive policing in future”**



# Thank You

## ISCF Team Recon

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