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BUILDING HEALTHY CITIES

Air Sensors in Action

Increasing Community Participation in Air Pollution Mitigation in Indore City, India

THRIVE NETWORKS

International Organization for Migration (IOM)
The UN Migration Agency

URBAN INSTITUTE

Background

- India's National Clean Air Plan calls for the expansion of air quality monitoring using both reference instruments and air sensors
- Building Healthy Cities (BHC) is a U.S. Agency for International Development-funded project to refocus city policies, planning, and services with a health equity lens while improving data-driven decision-making for Smart Cities in India, Indonesia, Nepal, and Vietnam.
- Deployed air sensor in Indore, India to further data-driven decision making and increase community participation in air pollution mitigation.

Background

Indore, India

- City of 3.2 Million
- 1 continuous reference monitor*

*More monitors recently installed

Study

- Objective
  - Spatial patterns
  - Community awareness
- Details
  - 1 year of monitoring
  - 20 $PM_{2.5}$ sensors (Skymet)
  - Deep engagement with community
  - Integration with city's command & control center

Background

- Clean Air Guides
  - 20 Guides
  - Duties as Guides
  - Training and learnings

Collocation

Sensor to Reference

One sensor collocated with reference for whole study

Sensor to Sensor

2-week collocation & training of CAGs

Collocation at PCB Site at Chhoti Gwaltoli

Air sensors meet U.S. EPA Performance Targets

Collocation results at the PCB site (Chhoti Gwaltoli) show that the $PM_{2.5}$ air sensors meet the U.S. EPA's Performance Metrics and Target Values for $PM_{2.5}$ Air Sensors*

EPA Metric	EPA Target Value	Value from collocation PCB site (Chhoti Gwaltoli)	Result
Bias - Slope	1.0 ± 0.35	0.86	✓ Meets target
Bias - Intercept (b)	-5 ≤ b ≤ 5 µg/m^3	+4.7 ug/m^3	✓ Meets target
Linearity Coefficient of Determination (R^2)	> 0.70	0.84	✓ Meets target
Normalized Root Mean Square Error (NRMSE)	<30%	27%	✓ Meets target
Data completeness	>75%	94%	✓ Meets target

* https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryId=350785&Lab=CEMM

Results - AQI Overview

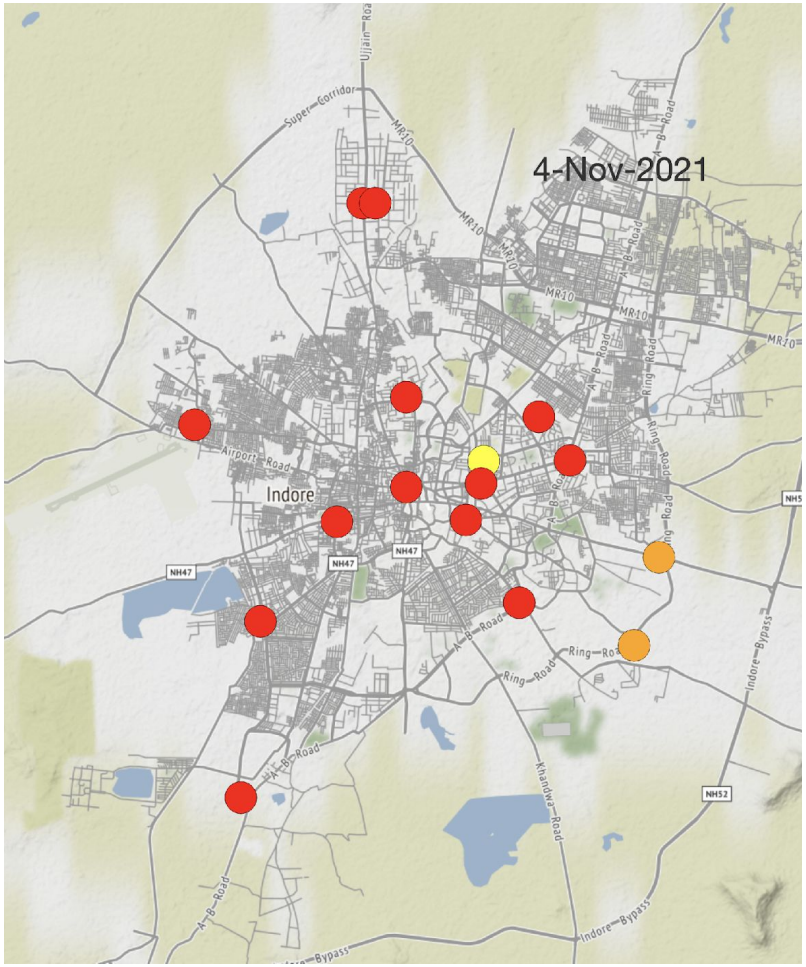
Counts of days in each AQI category

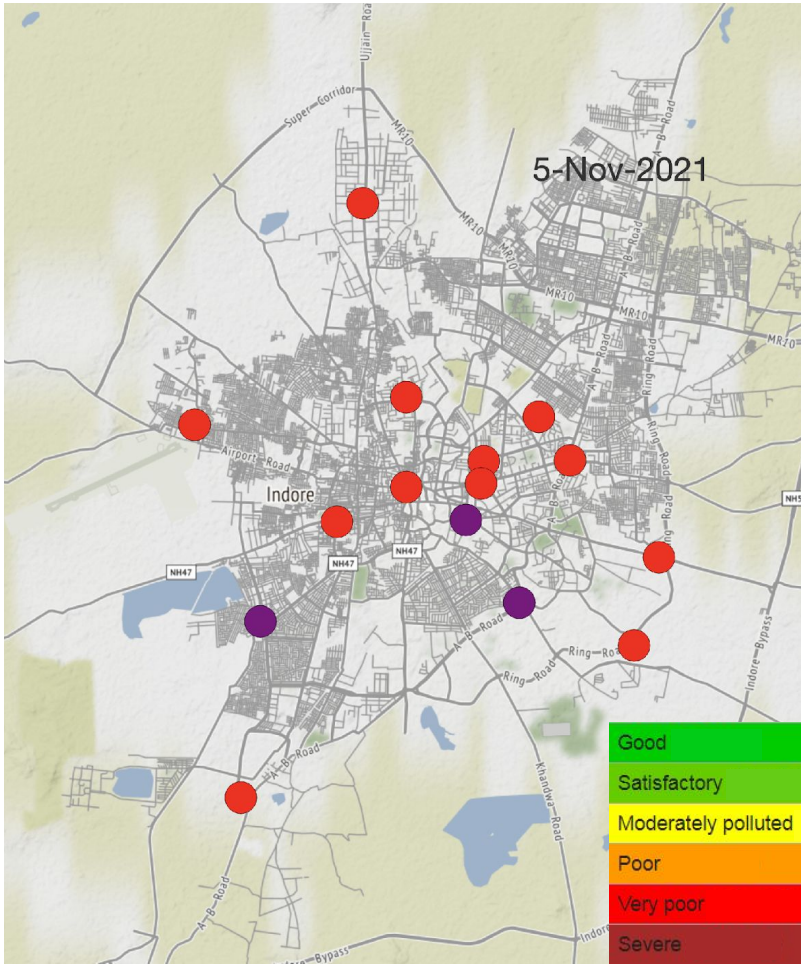
Site Type	Commercial				Traffic						Slum						Residential	Industrial		Commercial
AQI Category	Choti Gwaltoli	Indore Smart City Office	M.Y. Teaching Hospital	Near Rajwada	Reti Mandi	Congested Food street	Palasiya Square	Navlakha Square	Phooti Kothi Square	Gangwal Bus Stand	Amar Tekri Primary School	Amar Tekri Anganwadi Center	Luniya Pura	Indira Ekta Nagar	In Front Of Airport	Narwal Sanwer Road Anganwadi Center	Pipliyahana Square	Narwal Sanwer Road Primary School	IPCA Industrial Area	Choti Gwaltoli MPPCB
Good	109	204	67	88	95	84	102	5	81	79	117	79	56	125	104	40	32	49	70	137
Satisfactory	156	132	76	144	162	117	140	63	158	152	135	164	168	161	145	65	166	118	84	124
Moderate	58	14	34	57	59	53	57	68	69	66	21	77	76	49	74	61	26	91	52	65
Poor	17	0	27	11	25	14	29	32	22	37	5	25	29	10	21	20	4	62	36	33
Very Poor	3	1	14	4	3	0	17	12	5	14	0	5	8	3	6	27	1	31	9	6
Severe	0	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	1	0	0

- Gray bars indicate sites with less than 75% data completeness
- Industrial and traffic sites generally have more days with Moderate-Very Poor AQI

Results - AQI Maps – Several Days

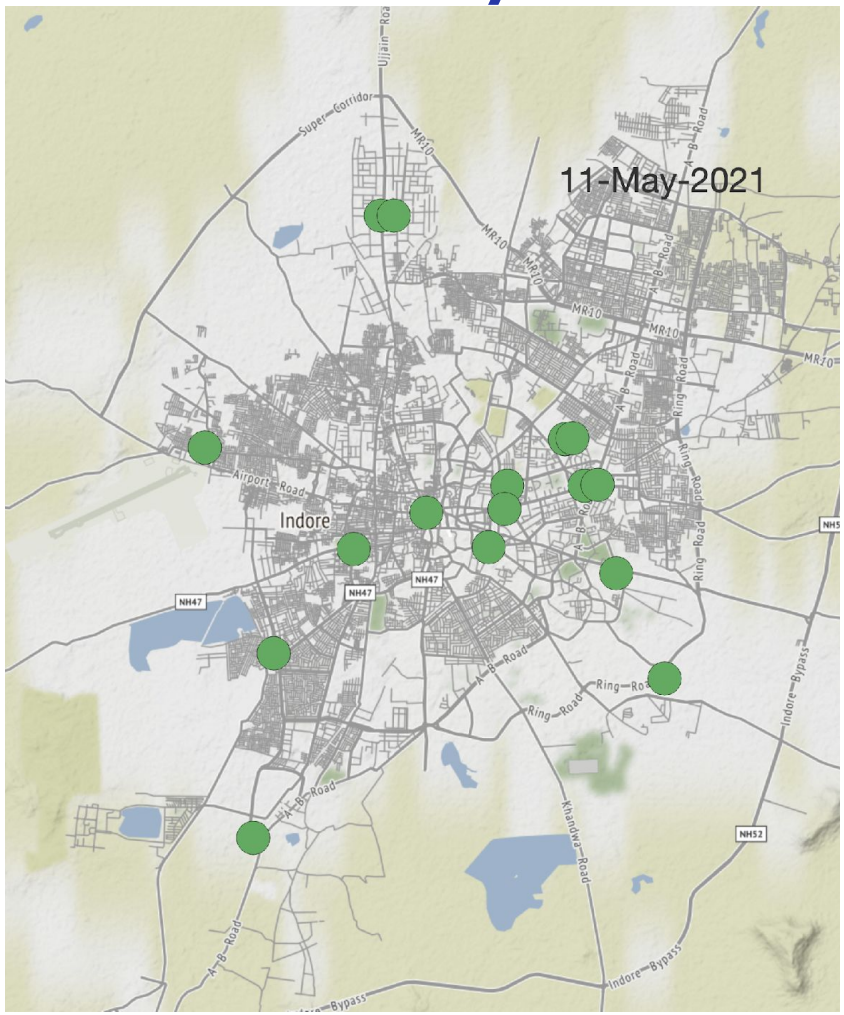
Air quality during Diwali

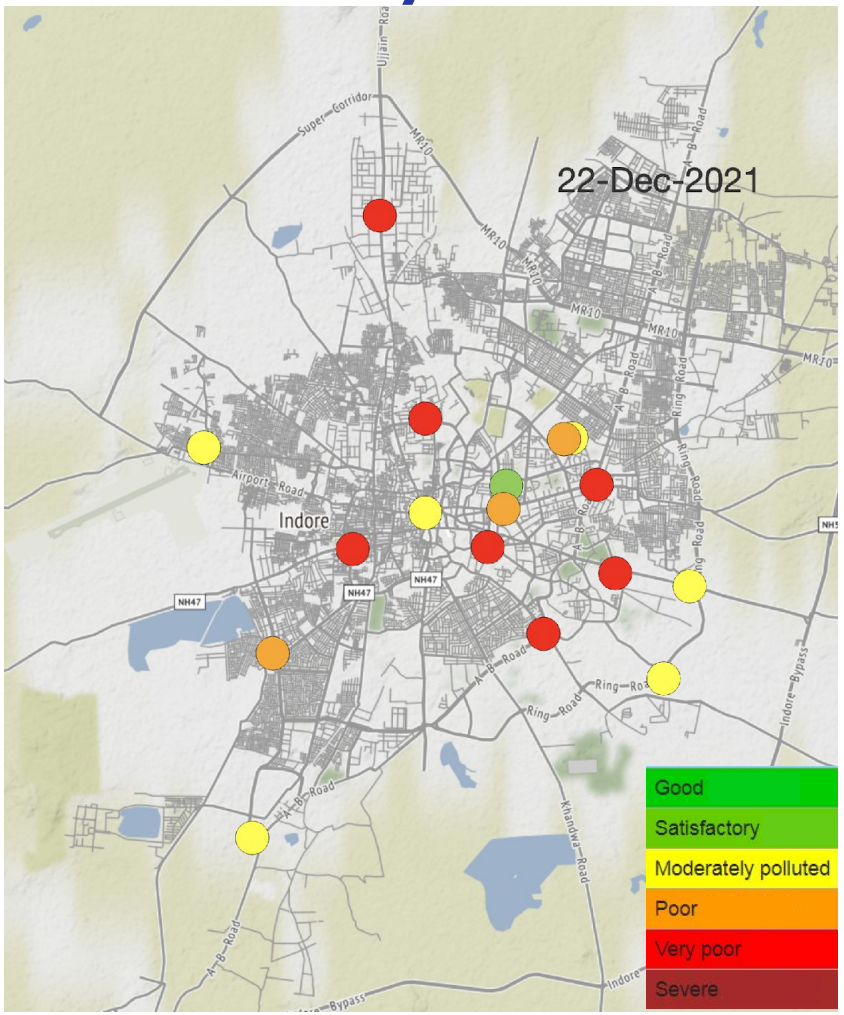




Results - AQI Maps – Several Days

Cleanest day and Most Polluted Day*





*Excluding Diwali

CAGs - Outreach


Air Quality Index - particulate Matter
GOOD
0-30
SATISFACTORY
31-60
MODERATE
61-90
POOR
91-120
VERY POOR
121-250
SEVERE
>251

CAGs - Outreach

CAGs - Outreach

CAGs - Interventions

CAGs - Interventions

Conclusions & Next Steps

- Collocation critical
- PM sensors are reliable and accurate
- Manufacturer responsive (lots of support)
- Engagement and action and Clean Air Guides were critical for linking data to people and creating action
- Real-time AQ dashboard to the central city dashboard
- Next steps
  - Network continues
  - Decision taken by City Authorities (CEO, Smart City) top continue CAGs through an MoU with Confederation of Indian Industry (a good example of Public-Private Partnership
  - Augmenting network with 30 additional PM sensors for deployment in industrial and peripheral area through CII support.