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BUILDING HEALTHY CITIES

Air Pollution

Indore Journey Map Series 2019-2021

About This Series

Building Healthy Cities (BHC) is a USAID-funded learning project in four Smart Cites in Asia – Indore, India; Makassar, Indonesia; Da Nang, Vietnam; and Kathmandu, Nepal. BHC is testing how to successfully apply urban planning approaches that improve the social determinants of health in complex systems.

BHC uses exploratory data collection, multisectoral engagement, and citizen participation. This systems approach informs project activities and the prioritization of city-funded workplans. The combined impact should improve the lives of all residents in these three cities and reduce preventable mortality.

BHC is using several tools and processes to create coalitions and organize its approach in each city. One key process is systems mapping to illustrate the key dynamics (patterns underlying problems) and define key entry (or 'leverage') points to address social and environmental determinants of health. Another way that BHC is documenting citizen experiences in each city is through Journey Maps.

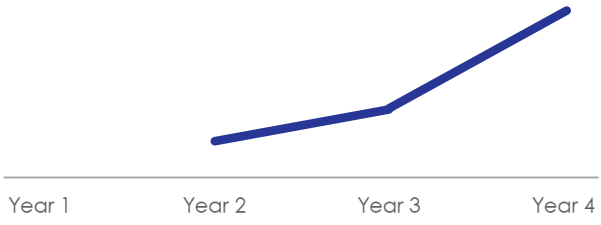
The Journey Maps apply 'design thinking' approaches, which are often used to tailor products to intended customers; citizens are like customers in that they pay taxes or fees to use city services. BHC has adapted this tool to document the experience (or 'journey') of citizens who are trying to overcome one service issue in each city, over time, updated on a quarterly basis. The specific topics were identified during the first year of activities in each city and fit within the larger context shown in the systems maps. BHC is using these Journey Maps to track citizen and city official perspectives, and to document change at the neighborhood level.

BHC is training people in each neighborhood to develop and use these Journey Maps and on grassroots advocacy techniques. By bringing the citizen experience directly to city planners, BHC hopes to better align municipal planning with community priorities such as safe water, clean air, hygiene, traffic safety, and other key components of healthy urban living.

Life of Project Journey Map Summary

BHC is concluding the Journey Maps in 2021. This process brought insights into day-to-day service availability for Indore residents, and created a regular dialogue with the community and city offices about the causes, consequences, and potential solutions to persistent urban health-related issues. Air quality was a major focus for the Smart City Mission over the course of this 3-year map. BHC procured, installed, and calibrated low-cost air quality sensors to collect data at the neighborhood level. BHC also recruited and trained neighborhood residents to be Clean Air Guides, who collect qualitative data on behaviors that cause air pollution. Pairing these two data sources allows neighborhood residents to target and decrease specific causes of air pollution. BHC also integrated this data into the Smart City Integrated Command & Control Center, making it available to the public and decision-makers.

Journey Map Trajectory



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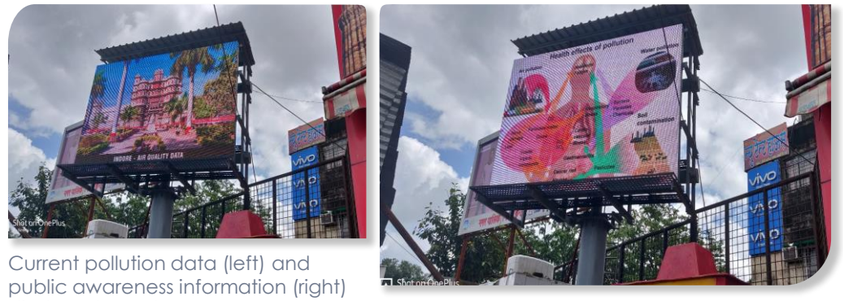
Indore Journey Map #4 – Air Pollution

YEAR 2 Air pollution levels have decreased in Indore since 2015, in part due to initiatives such as Swachh Bharat that focus on improving the environment. Indore Smart City Development Limited has also made reduction of air pollution a priority. Specific initiatives have included mechanical street sweeping to decrease dust, free left loop roads to reduce traffic congestion at key intersections, and improved solid waste collection and disposal to reduce household burning of trash. As a result of these combined efforts, Indore was declared India's cleanest city in both 2017 and 2018. However, during interviews conducted for BHC's 2017-2018 *Health Needs Assessment*, citizens did not mention air pollution as a barrier to healthy living. BHC has followed this issue and its impact on healthy living over time in Indore, monitoring changes in citizen knowledge around the effects of air pollution on health, and the city's continued efforts to improve air quality.



Current pollution data (left) and public awareness information (right) displayed on a large screen.

Quarter 1

"Reduction in air pollution is visible through the efforts made by IMC under Swach Bharat Mission."
— IMC Commissioner, Dec. 2018

"Government has to share data of air pollution with us so that we can understand the level of pollution in our area."
— Resident, Dec. 2018

"Transport system of Indore needs to be improved. Major inputs from city administrators are required."
— Newspaper coverage, Dec. 2018

"Area is clean and regular sweeping has been done by the IMC but river near industrial area needs to be clean."
— Resident, Dec. 2018

There are only 3 air pollution measurement stations in the city.

Quarter 2

ACTION:
Large screens displaying current pollution data were installed in 3 new locations — Palasia Square, Rajeev Gandhi Square, and the airport.

"We are not fully aware the permissible limits and harms of different indicators of pollution data, it would be useful if we can see the level of pollution of our city currently it is not there."
— Traveler in Palasia Square

MPCB plans to install 3 new pollution data collection centers (Mhow Naka Square, Regal Square, and Vijay Nagar) with a display screen to show current pollution data.

Quarter 3

ACTION:
Three additional air pollution measurement stations are now fully functional and data are now available.

"Our industrial area is green so we are not finding any major air pollution concern. A display is also installed by pollution control board. It is useful that we can see levels of air pollution of our area."
— Traveler in Industrial Area

"We are maintaining this station and as per your suggestion we would call our technician to provide maintenance service regularly for accurate data."
— IPCA Laoboratory Staff, June 2019

In an interview with a person from the Madhya Pradesh Pollution Control Board, it was recommended that BHC support conducting a source apportionment study to assess source-wise contributions from industries, vehicles, households, road dust, construction sites, brick kilns, etc. These data will be useful to identify targeted interventions to further reduce air pollution in the city. The idea of using low cost sensors to get more information about levels of pollutants at strategic locations of Indore was appealing. However, authorization for the use of those sensors would need to be given by the Central Pollution Control Board, New Delhi.

Quarter 4

ACTION:
Display boards now include public awareness information such as health effects of pollution.

"Now Indore is on a good pace of development. We are number one in cleanliness and now we would be number one in all parameters. Thanks to administrators of Indore."
— Traveler

"We want to capture air pollution data from places where no permanent air pollution measuring station is located through low cost sensors linked with Integrated Command & Control Center (ICCC) for better policy making for the city."
— Ms. Aditi Garg, CEO, ISCDL

"I have seen few display board that showing air pollution but I live in Sudama Nagar and no display screen installed there. I am interested to see data near my residence."
— Traveler

KEY: Action · Negative Action · No Action · Special Note · Citizen/Resident · Media · Government Official · Service Provider · Data Point

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Indore Journey Map #4 – Air Pollution

YEAR 3 Air pollution levels have decreased in Indore since 2015, in part due to initiatives such as Swachh Bharat that focus on improving the environment. Indore Smart City Development Limited has also made reduction of air pollution a priority. Specific initiatives have included mechanical street sweeping to decrease dust, free left loop roads to reduce traffic congestion at key intersections, and improved solid waste collection and disposal to reduce household burning of trash. As a result of these combined efforts, Indore was declared India's cleanest city in both 2017 and 2018. However, during interviews conducted for BHC's 2017-2018 *Health Needs Assessment*, citizens did not mention air pollution as a barrier to healthy living. BHC has followed this issue and its impact on healthy living over time in Indore, monitoring changes in citizen knowledge around the effects of air pollution on health, and the city's continued efforts to improve air quality.

Current pollution data (left) and public awareness information (right) displayed on a large screen.

Quarter 1

NEGATIVE ACTION:
Two display boards were not functioning at the time of this assessment.

"Government is displaying air pollution data is very important to aware people of Indore that we should make our city healthy also. We need to take lesson from Delhi and should try to use electric vehicle or public transport."
— Traveler

"Due to cold air pollution is bit high and we are continuously monitoring the data."
— Chief Chemist, Madhya Pradesh Pollution Control Board

"I am traveling daily to go to my office by scooter and I am not feeling air pollution in the city. Government should plant more trees to make air healthy. Indore is a clean city so air pollution is also low."
— Traveler

Display screens now also include suggestions of small actions citizens can take to reduce pollution.

Quarter 2

ACTION:
Prior to their April deadline, oil companies have geared up to roll out Bharat Stage VI compliant fuel in the state. Air pollution levels are down due to national lockdown response to COVID-19.

"We hope to see a major reduction in pollution levels with the usage of upgraded fuels as these emission norms are set to get stricter."
— Chief Chemist, Madhya Pradesh Pollution Control Board

"Barely a week into the nationwide lockdown with little vehicular movement – pollution levels have dipped in major cities...In Indore, the air quality was 'moderate' which turned into 'satisfactory' on Friday (27 March)."
— Times of India News Article, 28 March 2020

DATA POINT:
Indore's PM2.5 concentrations were 58% lower in the week after the national lockdown as compared to the quarterly average PM2.5 previous to the lockdown (Jan 1st - March 26th).
— MPPCB data taken from OpenAQ, analyzed by BHC

Quarter 3

NO ACTION:
While air quality has improved during the lockdown, one of the display boards (at Palasia Square) was not operating.

DATA POINT:
Indore's PM2.5, NO2, and CO concentrations were 35, 51, and 52 percent lower during the first two phases of the lockdown as compared to the "Open" period (Jan 1st - March 26th).
— MPPCB data taken from OpenAQ, analyzed by BHC

"Due to lockdown, emission of gases is very low and emissions from traffic and industries is almost zero in the city. In the River Khan and Saraswati, oxygen levels roses to 5 from almost zero. The quality of bodies of water in Indore has improved. Noise pollution has also reduced during this period, and a decrease in temperature due to increased greenery has been noted. Normally the temperature rises to 46 degrees however it has not crossed 42 degrees yet. The Deputy Commissioner of the Garden Department, Municipal Corporation, Indore and the Chief Chemist, MPPCB have validated these outcomes of the lockdown.
— Hindi newspaper *Dainik Dabang Duniya*, 5 June 2020

Quarter 4

NO ACTION:
While air quality has improved during the lockdown, with low levels of movement and industrial activity, no long term actions have been documented.

"We are continuously monitoring the data and due to rain and COVID lockdown air quality index is under permissible limits. We are continuously displaying the data through our display boards."
— Madhya Pradesh Pollution Control Board

"Due to COVID pandemic, less number of vehicles are on the roads so vehicular emission is very low. I am working in a chartered accountant firm and I am going to office on alternate days."
— Traveler, Sept. 2020

"Due to IMC's Clean India activities and rain, dust on the road is not visible. Indore is green too so level of air pollution is low."
— Traveler, Sept. 2020

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BUILDING HEALTHY CITIES

Indore Journey Map #4 – Air Pollution

Low-cost air sensor during calibration (left) and in final location (center). Touring the ICCC during data integration testing (right).

YEAR 4 Air pollution levels have decreased in Indore since 2015, in part due to initiatives such as Swachh Bharat that focus on improving the environment. Indore Smart City Development Limited has also made reduction of air pollution a priority. Specific initiatives have included mechanical street sweeping to decrease dust, free left loop roads to reduce traffic congestion at key intersections, and improved solid waste collection and disposal to reduce household burning of trash. As a result of these combined efforts, Indore was declared India's cleanest city in both 2017 and 2018. However, during interviews conducted for BHC's 2017-2018 *Health Needs Assessment*, citizens did not mention air pollution as a barrier to healthy living. BHC has followed this issue and its impact on healthy living over time in Indore, monitoring changes in citizen knowledge around the effects of air pollution on health, and the city's continued efforts to improve air quality.

Quarter 1

ACTION:
A new low-cost air sensor was installed at the Smart City office.

"Now a days we are using masks while driving, so we are safe from air pollution also. Display boards are showing that air quality is bad, may be because of huge number of vehicles on the road."
— Traveler, Dec. 2020

"City administration should work on the traffic management in the city to reduce air pollution and should also focus on plantation more trees."
— Traveler, Dec. 2020

BHC installed one low-cost air sensor at the Smart City office, with another 19 to follow. BHC also trained a group of Smart City interns on how to use the air sensor technology.

Quarter 2

ACTION:
Low-cost air sensors were moved to their final locations. IMC raised funds for outdoor air pollution controllers in major squares.

"IMC has installed these air pollution controllers but not sure that they are reducing air pollution. They should have some display screen with this device to see the levels of air pollution."
— Traveler, March 2021

"I have just seen this device and hope they will work properly. Indore is number one in cleanliness and IMC is doing good to keep this air pollution free also."
— Traveler, March 2021

BHC installed all low-cost air sensors in their final locations after completing the calibration process. Skymet, the sensor manufacturer, developed a dashboard for community Clean Air Guides to see data for their location.

IMC raised funds to install outdoor air pollution controllers (devices that absorb dust and vehicular emissions) in major squares in Indore to reduce air pollution.

Quarter 3

ACTION:
PM2.5 and PM10 air pollution levels decreased dramatically during the COVID-19 lockdown in April-June 2021.

"Due to COVID restrictions, industrial activities and vehicular emission were less and it is visible in data also. MPPCB is continuously following the city action plan to reduce air pollution."
— MPPCB, June 2021

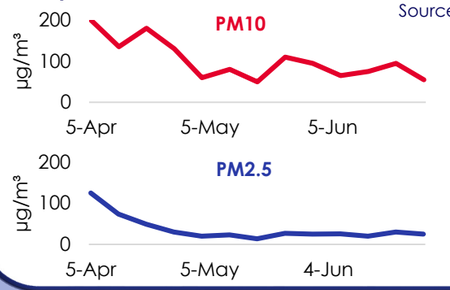
In some neighborhoods, increased cremation rates due to COVID-19 deaths negatively impacted air quality.

"Due to COVID lockdown levels of air pollution in the city seems lower side as we can see the clear sky and less dust in the environment. During this period we saw more birds flying in the sky and we felt that nature has its own balance system."
— Traveler, June 2021

"Biggest issue of Indore is traffic control and due this unorganized traffic, air pollution increases and harms our health but city government is not considering this as a big problem."
— Traveler, June 2021

DATA POINT:
Change in PM10 and PM2.5 levels in Chhoti Gwaltoli, Indore, April-June 2021.

Source: MPPCB



Quarter 4

ACTION:
BHC integrated data from low-cost air quality sensors into Smart City's Integrated Command & Control Center (ICCC).

"This system is the brain of our city and we can do lot with the help of this ICCC. Data of air pollution is now integrated and that will be very useful for the city and administrators like us to take appropriate action to control air pollution in the city."
— Mr. Rishav Gupta, CEO Smart City, Sept. 2021

"If we need to control the air pollution in the city then we have to control this slow moving traffic. This is the biggest challenge for the government."
— Traveler, Sept. 2021

"Now the road dust is very low due to rain and the clean India mission initiatives by the IMC. We are observing many more plants have been planted by the IMC in the dividers and that are really a good feeling for a daily commuter."
— Traveler, Sept. 2021

Journey Map Summary
Air quality was a major focus for the Smart City Mission over the course of this 3-year map. BHC procured, installed, and calibrated low-cost air quality sensors to collect data at the neighborhood level. BHC also recruited and trained neighborhood residents to be Clean Air Guides, who collect qualitative data on behaviors that cause air pollution. Pairing these two data sources allows neighborhood residents to target and decrease specific causes of air pollution. BHC also integrated this data into the Smart City Integrated Command & Control Center, making it available to the public and decision-makers.

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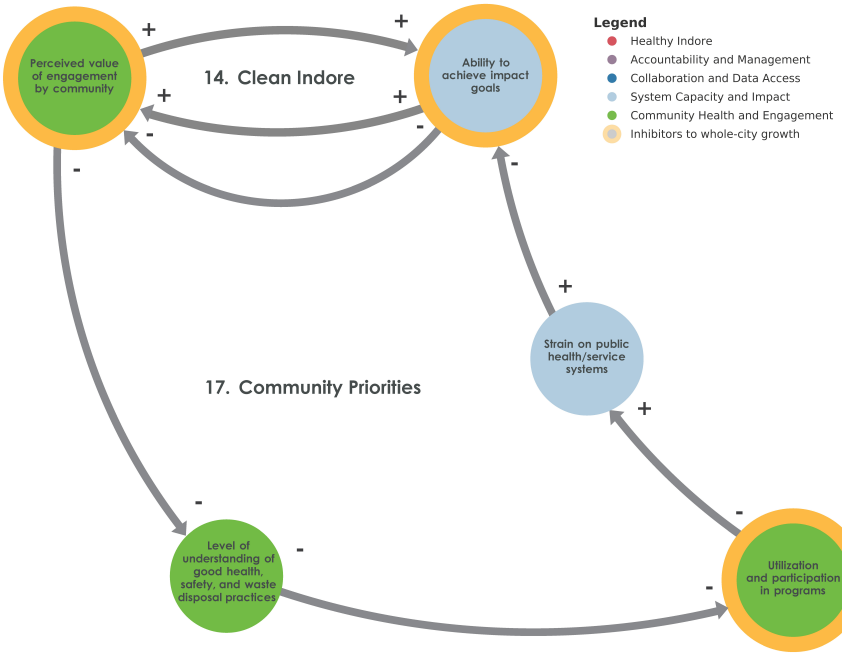
How Does This Story Connect to the Indore Systems Map?

Loops 14 (Clean Indore) & 17 (Community Priorities)

The Clean Indore loop (14) states that when city health or environmental improvement initiatives are implemented well and begin to achieve positive outcomes, citizens experience personal improvements to their quality of life. They may also feel pride in the accomplishments of their city and want to be a part of it. As a result, they are more willing to support program efforts and adopt recommendations. When the value of a program is recognized, community participation accelerates the ability of programs to achieve their impact goals, resulting in greater recognition and success for that initiative, and therefore pride in that community. As a result, they are more willing to support program efforts and adopt recommendations.

Example: Under the Clean India Mission, effective solid waste management (collection, disposal and use in energy), better water supply, and other measures to improve the environment have led to measurable reduction in levels of air and water pollution and visibly improved sanitary conditions. BHC analyzed the annual average concentrations of sulfur dioxide, nitrogen oxides, and particulate matter (PM2.5 and PM10) from three air pollution measuring stations in Indore city during 2013-2017. A declining trend was observed in PM10 and PM 2.5 concentrations, possibly due to various measures taken by the Municipal Corporation and Indore Smart City Mission.

However, issues arise due to a lack of citizen knowledge, especially among vulnerable populations, regarding air pollution and its impact on human health. The Community Priorities loop (17) explains that when the community has a limited understanding of good health and safety practices, or these practices are not feasible in their circumstances, their demands and behaviors may not align with building a healthier community. Building a healthy city is a longer-term goal and can be trumped by short term goals like getting food to eat or being paid for work. Citizens are not prioritizing healthy and clean air because the efforts by the government have not been recognized. Without awareness raising, these communities will continue with unsustainable practices, like burning coal. In the absence of community awareness of air pollution, it is less likely that they will have the capacity to participate in community improvement efforts. Even if they can engage, they will likely have a limited understanding of what is needed to build a sustainable healthy community, and will focus their demands on short term goals.



Example: Indore has set up five ambient air quality monitoring stations at various locations. In the absence of much information about the Air Quality Index and its health implications, it might be difficult for citizens to participate in efforts to reduce air pollution and related impacts on human health in the city. This issue needs to be addressed by continuous public awareness campaigns for behavior change.

For additional information on the Indore Systems Map and BHC's activities, visit jsi.com/buildinghealthycities