SMART CITIES AND COVID-19: IMPLICATIONS FOR DATA ECOSYSTEMS FROM LESSONS LEARNED IN INDIA

This brief distils best data practice recommendations through consideration of key issues involved in the use of technology for surveillance, fact-checking and coordinated control during crisis or emergency response in resource constrained urban contexts. We draw lessons from how data enabled technologies were used in urban COVID-19 response, as well as how standard implementation procedures were affected by the pandemic. Disease control is a long-standing consideration in building smart city architecture, while humanitarian actions are increasingly digitised. However, there are competing city visions being employed in COVID-19 response. This is symptomatic of a broader range of tech-based responses in other humanitarian contexts. These visions range from aspirations for technology driven, centralised and surveillance oriented urban regimes, to 'frugal innovations' by firms, consumers and city governments. Data ecosystems are not immune from gendered- and socio-political discrimination, and technology-based interventions can worsen existing inequalities, particularly in emergencies. Technology driven public health (PH) interventions thus raise concerns about 1) what types of technologies are appropriate, 2) whether they produce inclusive outcomes for economically and socially disadvantaged urban residents and 3) the balance between surveillance and control on one hand, and privacy and citizen autonomy on the other.

Our findings and recommendations derive from a multi-year research collaboration with municipal authorities across several cities engaged in the Government of India's Smart Cities Mission. This included dialogue with relevant city- and national- authorities in the months prior to the COVID-19 pandemic and once the national decision to lockdown all public interaction was taken, as well as critical reflection with key city-stakeholders six months after control interventions were first implemented. This brief is intended for urban local authorities mandated with pandemic response, and for community groups representing those who bear the triple burden of disease, income vulnerability, and of marginalisation in official data architectures. It will also be of interest to local and national authorities and community groups utilising smart urban technologies in other humanitarian contexts, as well as other PH stakeholders engaging in contexts where data infrastructures are thwarted by information and communication gaps.

This review is part of the Social Science in Humanitarian Action Platform (SSHAP) series on the COVID-19 response in India. It was developed for SSHAP by Jaideep Gupte, Sarath Babu M G, Debjani Ghosh, Eric Kasper, Priyanka Mehra, and Asif Raza, with input and reviews from Megan Schmidt-Sane. It is the responsibility of SSHAP

SUMMARY CONSIDERATIONS

- COVID-19 response has relied heavily on digital technologies and real time data. Experiences from India show it is important to go local. Equally it is important to maintain analogue data systems where the goal is to include marginalised communities without access to digital devices, connectivity and digital literacy or agency in design and management of the urban infrastructure. Authorities should recognise that the local data ecosystem involves multiple actors with a range of responsibilities and motivations, and institutions, technologies, equipment and processes with varying degrees of direct representation of at-risk groups. Coherence and legibility across actors, institutions and technologies is therefore of central importance.
- Decentralised, privacy-enhancing and rights preserving public health infrastructures, sustained and resourced over time, are critical for responding to local health needs in emergencies. Local authorities should consider data architectures that support PH decentralisation, privacy and security of such that data is generated locally by those who perceive a utility from its accuracy and consistency, and made accessible to those who perceive a utility from responding effectively to local needs. Ground truthing by street smart people with skin in the game is essential to intelligent systems. PH decentralisation should be supported through open-source, locally operable, transparent, and believable data paired with simple, transparent and reproducible tools to track progress.
- The effective use of technologies for coordination, dissemination, and fact-checking across state- and citizen-led activities in COVID-19 response was shaped by data from formal and informal sources. Consider national data policies that promote standardisation and encourage local innovation. Where innovations outlast crisis response, it is of utmost importance to ensure compromises made in the 'heat-of-the-moment' are not hard-wired into a long-term status quo.
- Promote innovation practices which are based on principles of openness, diffusion and shared vision. This need not rely solely on 'frontier technologies' but also involve 'frugal' and mundane innovations. Where livelihoods and socio-cultural contexts were ignored, incomplete or inefficient, decision making has led to adverse outcomes. It is vital that in assessing overall effectiveness and longevity of local smart city

interventions, the merits and demerits of everyday technologies in achieving coordination across and within government smart city functionaries are weighed up. Technology must be accessible and appropriate for purpose, and it must enable, as well as be enabled by, effective and inclusive institutions. Where frugal innovation is deployed, it should be done alongside effective public health institutions and grounded within everyday data sharing realities.

- Blended data environments (where official, citizen-led, informal, digitised and analogue data coexist) produce numerous opportunities for strengthening local data capacities, evidence-based policymaking and local governance as a whole, enhancing responsiveness to community needs, improving reporting, and building co-ownership of policies, strategies, plans and projects. Consider capacity strengthening activities, including national urban learning platforms, that cut across levels of government and across actors with varying motivations to engage with data environments. There is less training overhead and less resistance to change when making use of the technologies people are already familiar with and comfortable using.
- Consider supporting national data-governance standards with local data action plans, and multi-stakeholder data alliances with explicit representation from community groups and civil society. City data officers and their teams should be considered essential for coordination between municipal departments, a core component of emergency public health response, and feed into broader humanitarian and disaster preparedness. They should be trained to anticipate that all data systems will grow incrementally. They can act as data champions to embed community and multiple decision makers into data reliant decision support systems.
- Citizens should be the creators, architects, and arbiters of technologies in cities. There are international examples, like the DECIDIM and DECODE projects in the cities of Barcelona, Amsterdam and Helsinki where citizens play a meaningful role in the design and management of data ecosystems and digital infrastructures in cities. In particular, DECODE has piloted new governance models such as data trusts and data commons and new decentralised and privacy-enhancing tools that put individuals in control of whether they keep their personal data private or share it for the public good.

BACKGROUND AND METHODOLOGY

Vulnerability to multiple and cascading disasters increasingly affects urban populations in low- and middle-income countries.[1] In this context, digital technologies have been a primary driver for 'smart urbanism' and offered as a flexible and responsive medium to bridging critical information gaps to improve quality of life and wellbeing of urban

residents.[2] Expectations of network flexibility and demand responsiveness from connected communities have, in turn, driven investments and reshaped policy priorities leading to accelerated rollout of smart urbanism.[3] Globally, smart urbanism technologies have been employed in three specific ways – to supplant non-existing services, to improve or link across existing services, or to carry out previously unachievable functions. This has resulted in the transfer of key responsibilities of social and economic welfare onto private sector technology providers, implementers and corporations accountable to shareholders, and to algorithms accountable to no-one, even if these entities are significantly underwritten by public finances and state institutions.[4] It is unclear whether this shift has led to more inclusive outcomes and resilience, particularly in at-risk communities, or further worsened existing inequalities.

> 'Smart urbanism' is the intersection of visions for the future of urban places, new technologies and infrastructures. 'Smart cities' provide the potential to contribute to goals of sustainability, safety, efficiency and convenience. There are many competing visions for smart cities. Technologically enhanced urban governance can take a bottom-up and human-centred approach, in which citizens govern what data is collected, for which purposes, or take a different approach by prioritising surveillance in which artificial intelligence systems provide police with 'panoptic' surveillance capabilities. Importantly, data used for decision making in cities can reflect structural inequality existing in those cities, and so the resulting decisions are likely to reproduce inequality, often at speed, at scale and through automated processes.

COVID-19 has shown that PH emergencies significantly extenuate existing spatial and infrastructural inequalities in urban areas.[5] Digital responses to the pandemic can be put into five categories:

1. Solutions for effective and efficient contact tracing, responding to the need to track transmission faster than traditional systems of disease reporting;
2. Testing and disaster responder capacity to improve, adapt or invest in medical devices, tests and protective gear;
3. Early warning and surveillance systems; quarantine and social control as important elements of the human side of a pandemic response; and
4. Technical advancements in vaccine, mitigation and treatment research.[6]

Experiences from India are useful points of reference as they provide examples of technology deployment in a resource scarce and infrastructurally patchy context, across each of these categories. In preparation for this brief, we surveyed data stakeholders and urban local authorities in four Indian cities (Kochi, Chennai, Bhopal, and Surat).

City Name	City Population (Census 2011)	Location
Kochi	6,01,574	Kerala, South India
Chennai	46,81,087	Tamil Nadu, South India
Bhopal	17,95,648	Madhya Pradesh, Central India
Surat	44,62,002	Gujarat, North West India

Figure 1 Stakeholder and Urban Local Authority Data

DATA DECENTRALISATION AND TRUST IN LOCAL INSTITUTIONS

Urban crisis response in cities relies on networks of trust and solidarity to mobilise local capacity.[7] However, the rapid deployment of everyday technologies can lead to massive data-privacy breaches, and can trigger a chain of new power relationships between data, citizens and the state,[8] seriously damaging trust in data and local governance.[9] Deploying technology in response to a humanitarian crisis - or 'digital humanitarianism'[10] - gained popularity following the 2010 earthquake in Haiti. Applying the principles of trust and accountability to data and digital architectures has since become a central concern in crisis response and disaster preparedness. A key concern arises from the inability to process the huge volume of data generated, even in contexts that are otherwise data poor, given the proliferation of data sources during crisis, for e.g., the potential for big data analysis during crises using short message service (SMS) from onsite victims, social media data from citizens, journalists, and aid organizations[11]. Such a data architecture is however vulnerable because of the connected nature of information producing and consuming entities, which can lead very rapidly to cascading errors and failures.[12] Trust management systems for the verification of the spatial information required for territorial response or gathered for an appropriate action, for example, are therefore essential.

However, fundamental questions on what type of data should be open to public use and how that data can be used, reused, repurposed, shared or linked, as well as efforts to set in place trust management systems, are still in their infancy in low- and middle-income country contexts.[13] In the meantime, however, there continue to be important indirect relationships between trust in local government data initiatives during crisis response, and the historical aspiration to make data architectures and data systems more inclusive.

DECENTRALISATION OF HEALTH INFRASTRUCTURES

Kerala reports one of the lowest case-fatality ratios in India. The decentralisation of PH infrastructures, that is, ..the synchronisation and joint delivery of health interventions between national and sub-national actors including community based health groups, and pre-existing health worker and volunteer networks, stands out as having been a key factor in minimising impact during the first wave of the pandemic.[14] In focus group discussions with key data stakeholders in Kochi (Kerala) before the onset of the pandemic, it became apparent that the long, if complicated, history of urban decentralisation had already fostered public trust in data governance processes and institutions (Figure-2. Kerala launched the People's Plan Campaign in 1996 to empower grassroots level planning from the smallest administrative levels (Ward Sabha meetings) to the District

Planning Committee. As a result, 25 to 30 percent of plan funds were made available to local level bodies for planning and resource mobilization. Kudumbashree, intended for poverty eradication and women empowerment, is one of the most renowned achievements of democratic decentralization. At the same time, primary and secondary healthcare were transferred to the direct purview of Local Self-Governments (LSGs). Most recently, Kerala launched the Aardram Mission to make the healthcare delivery system more accountable, with infrastructure and data processes that were more 'people-friendly'.

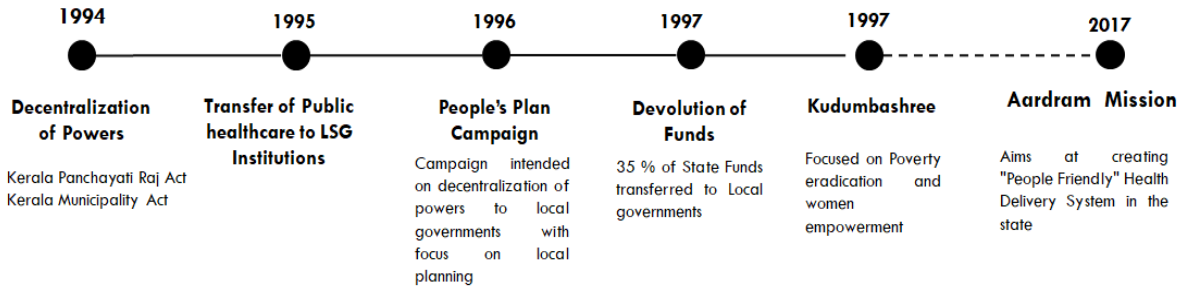

Figure 2: Timeline of Decentralization of powers in Kerala[15]

DATA ADDRESSING LOCAL NEEDS

There is a simultaneous need to resource the state's fiscal and institutional architectures of decentralisation, and make data architectures interface openly with everyday needs of neighbourhood and community groups. It is therefore counter-productive for digital technologies used in decentralising the state's administrative functions to undermine the public's trust in decentralised data architectures. The Aardram Mission is an important example as it included the systematisation of patient records to enable more appropriate treatment based on patient history. While this was not a digitised system of data sharing or analytics, data practices were operationalised through community health workers often working in tandem with elected representatives in local panchayats. The Mission thus includes a systematic and shared data architecture to make healthcare more efficient. Furthermore, the Aardram Mission includes specific efforts to make health services and the underlying data architecture more accessible. This was done by structuring data to meet local demand for indicators on population health needs in local wards, and on how well these are being addressed. For example, the Mission has enabled the integration of all departments and government hospitals into a Hospital Information and Management System, which relies on a high-speed Multi-Protocol Label Switching (MPLS) connectivity, and stores every transaction on a cloud based State Data Centre. Unique ID based health cards with linked Electronic Medical Records were issued to citizens, enabling direct patient access to their own records, something that had previously involved a lengthy process.

Experiences in Chennai show that the volume and speed with which data was being generated during the initial days of the national lockdown on specific vulnerable groups in the city (e.g. migrant labourers) could not be dealt with by city data officials alone, and required partnership with trusted NGOs and other volunteer support groups.[16] Once the data built up, the city developed a dedicated application to monitor people under quarantine. With the help of volunteers, city officials tried to ensure a supply of essentials at the doorsteps of vulnerable people, and those under quarantine.

These experiences demonstrate that empowered Local Self-Governments, to whom powers are devolved in real terms, can meaningfully address challenges in times of crisis. That said, attempts to follow Kerala's example would face particular challenges in other contexts. We suggest that forms of decentralisation which provide substantial resources alongside substantial powers to effective local actors should create conditions for more effective emergency response. Furthermore, these experiences reinforce the need to maintain an institutional and socio-political grasp on the technological transformations being envisaged and implemented through smart city PH initiatives.

"LOCAL DATA" IS A COMPLEX NETWORK OF DATA, ACTORS AND RESPONSIBILITIES

The label 'local data' is often used colloquially amongst urban stakeholders to refer interchangeably to datasets that can be disaggregated to small spatial areas or zones, like municipalities, wards or neighbourhoods (also called "granular" data), or to data that is generated "locally" by citizens or through installed sensors, and that is often 'real-time' in nature because of its disaggregated nature. A consensus is emerging around a definition of 'local data', recognising it as relevant, easily accessible, usable and re-usable by all.[17] [18] We note that, in practice, local data involves an amalgamation of digital and analogue data and a complex infrastructure consisting of actors with a range of responsibilities and a variety of actions, institutions, technologies, equipment and processes with various drivers and with varying degrees of direct representation of at-risk groups.

To illustrate the complex infrastructure of local data, we summarise the data and tech-based activities and interventions involved in the local response to COVID-19 in Kochi, Chennai, Bhopal and Surat in the table below.[19] In table rows, we group activities or interventions that generate, process or share data, into the broad categories of crisis management; communications/coordination; information dissemination; and direct aid or relief. These activities or interventions were carried out by three types of city-actors, shown as columns, with varying degrees of responsibility (denoted by coloured dots). To

note, the activities and interventions identified in the table also utilise various *types* of data including basic demographic data; socio-economic and health data of local populations; data on health and social services; spatial data; and data generated through social media networks and citizen-generated data. The green and blue arrows indicate opportunities for city- or national-level knowledge transfers and capacity strengthening, which we elaborate in the following section.

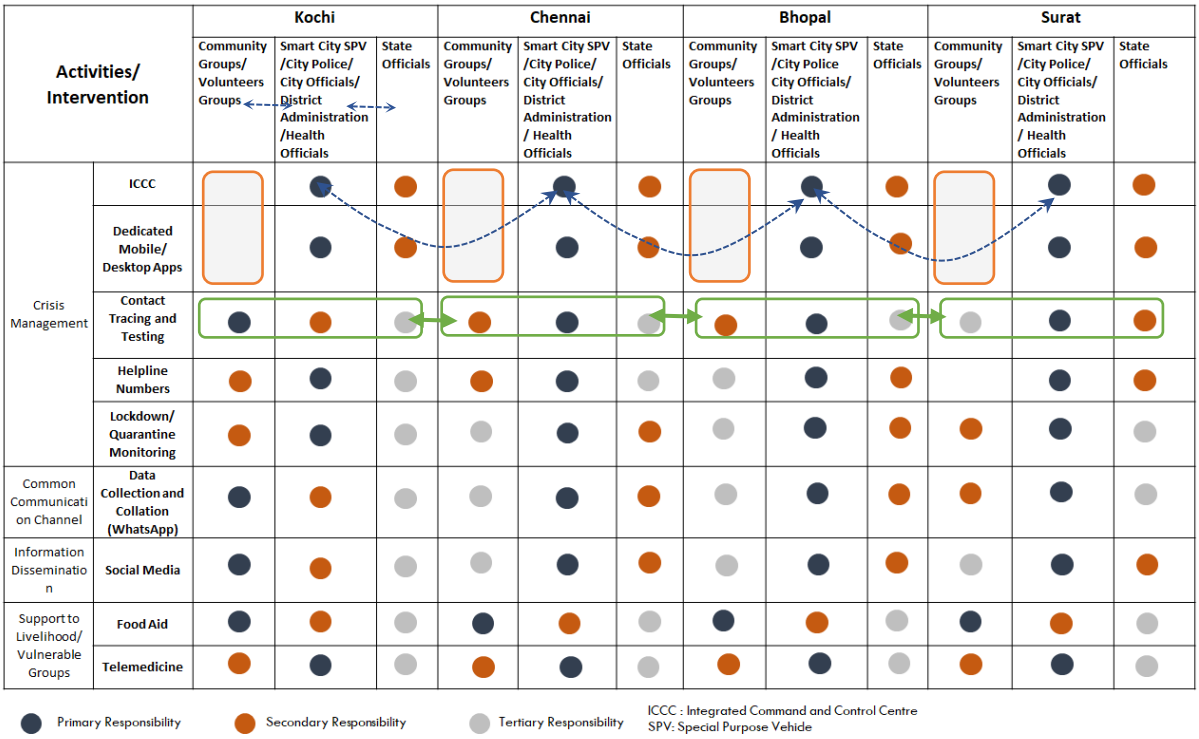

Figure 3: Summary of data and tech-based activities and interventions involved in the local response to COVID-19. Based on Babu et al 2021.

BUILDING SYSTEM RESILIENCE BY STRENGTHENING LOCAL DATA INITIATIVES

Sharing best practices and lessons learned remains critical to strengthening data systems for humanitarian response. How should this be done in a capacity-, resource-, and time-scarce environment where interventions are required at speed? Strengthening local data initiatives across a complex infrastructure requires a carefully considered approach. Blanket approaches that are not fine-tuned to specific actors, activities or levels of governance are unlikely to be successful.[20] A table like the one above can provide a roadmap to identify the appropriate *types* of capacity strengthening activities, and how they should be prioritised. For example, the varying degrees to which local actors were involved in the initiatives and interventions identified in the table above present four key opportunities for knowledge transfers and capacity strengthening activities: (1) at the city-level, to share experiences across all city-stakeholders involved in COVID-19 response; (2) within groups of similar actors across cities; (3) knowledge transfers focussed on specific

activities/interventions involving a variety of actors across cities; and (4) opportunities requiring external actors to bring new knowledge where local actors are not identifiable or have not been operational. (1) and (2) are indicated in the table by dark blue dotted arrows; (3) is indicated by the green arrows; while (4) is shown by the orange/grey shaded area.

It is conceivable that capacity strengthening and knowledge transfers at the city-level or within stakeholder groups (i.e. 1 and 2) can coalesce somewhat organically, relying on already existing city- or professional-networks (for example, across networks of health or data officers). Even where such networks do not formally exist, common language and pedagogical training can help coordinate capacity strengthening efforts. This can occur, for example, through the documentation of successful operating procedures, or distilling lessons where existing operating procedures did not produce optimal results.

Knowledge transfers and capacity strengthening involving different stakeholder groups, who may bear different levels of responsibility or have different motivations for involvement in an activity or intervention, will require national or regional coordination platforms. This is shown by the green arrows in the table above. For example, the responsibilities for contact tracing and testing during COVID-19 were borne primarily at the community level in Kochi, whereas these activities were led by urban local authorities in Chennai, Bhopal and Surat. We were not able to identify community-level responsibilities for track and trace in Surat. This suggests cities took fundamentally different approaches to track and trace, and any capacity strengthening focussed on data practices involved will require a national platform to coordinate learning across stakeholders taking different approaches. This must also involve an honest assessment of any political or technical barriers restricting the involvement of relevant city-stakeholders. Often, civil society organisations representing the interests of marginalised groups, can themselves face technological barriers.

To build systems resilience, national learning platforms should also seek to bring in expertise, at appropriate levels, to fill identified knowledge gaps. For example, we did not find community-level actors engaged in data generation, processing or sharing in the Integrated Command and Control Centre (ICCC) 'war rooms'.[21] Indeed, this reflects an absence of community voice, and in particular the representation of affected populations, in the deployment of technology in a wider range of humanitarian contexts outside India. Accountability and trust underpin successful crisis intervention, and local acceptance cannot be taken for granted.[22] Efforts to build or strengthen local data infrastructures will first need to address the absence of community-level actors.

STRENGTHENING BLENDED DATA SYSTEMS

Local data infrastructures often involve blended data flows, where formal (codified, institutional, or similar), informal (non-standardised, citizen-led, or similar), digitised and analogue information flows occur in tandem. Furthermore, there is a directionality to data flows, as they are mediated by institutions of governance and by people. While efforts to standardise data-infrastructures are well placed to promote comparability, traceability, and ultimately trust in data, standardisation should continue to allow innovation and adaptation during crises. An example of a blended data environment was in evidence in the COVID-19 contact tracing and testing in Kochi.

As the diagram below shows, the data/information flows involved in testing, tracing and isolating are non-linear, involving multiple directions of information flows, with multiple stages of decision-making, to cater to various disease parameters. For example, different information flows were required to test, trace and isolate people arriving into Kerala and those who were contracting the virus through community-spread (Scenario 1→10 and A→B respectively). Furthermore, formal and informal data streams operating simultaneously were critical to the success of this system. We found that the information flows on the official 'Jagaratha' data portal (shown by the blue dotted line) were complemented by informal data flows (on WhatsApp) at key stages that required quick and flexible coordination (shown by the grey dotted line).

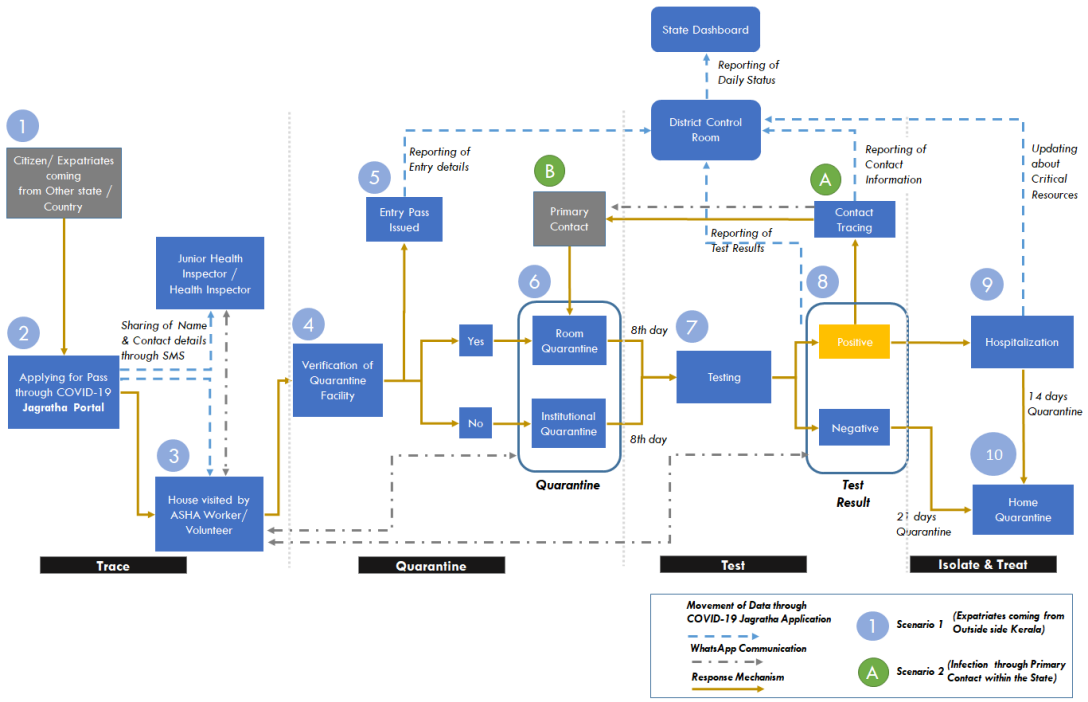

Figure 4: Data and information flows involved in testing, tracing and isolating in Kochi, Kerala. Based on Babu et al 2021.

EVERYDAY TECHNOLOGIES

Humanitarian or emergency situations often trigger 'frugal' innovation - the creation of faster, better and cheaper solutions for more people by employing minimal resources.[23] For instance, even in the resource rich context of the United States, components of federal hospital-data systems (e.g. a system created for tracking infections transmitted in hospitals) had to be rigged in a makeshift manner to create a national COVID-19 hospitalisation database to aid the national coordination effort. Hospitals or their intermediaries—such as state hospital associations—could send information to any one of a variety of systems scrambled together, to eventually feed into a national data system.[24] In India we repeatedly saw the use of common everyday software (e.g. Excel) and communication tools (e.g. WhatsApp) in place of expensive or specialised database software for coordinating COVID-19 response, surveillance and track & trace activities. Smaller (localised) reporting systems that had been put in place for past disease outbreaks (e.g. a 2018 Nipah virus outbreak in Kerala) were reutilised, and accessible everyday technologies (such as WhatsApp groups) were used to facilitate sharing of information, fight misinformation, gain public buy-in, and monitor the evolution of the outbreak in the absence of widespread testing.

The obvious benefit of these approaches to resource scarce contexts is the cost effectiveness of using or modifying commonly used office applications. They are often free or are part of long-standing service agreements with local small-scale technology providers. The ubiquitous nature of such applications or software can quickly create a common language across diverse actors and provide accessible pathways for marginalised people to advocate for or claim rights.[25] There is less training overhead and less resistance to change when making use of the technologies people are already familiar with and comfortable using.

However, we caution that makeshift data systems are also highly prone to costly mistakes and can lead to counterproductive outcomes. In England, an Excel error caused nearly 16,000 coronavirus cases to go unreported.[26] Equally, too much data can become concentrated in any one place, counterproductively leading to an increased vulnerability to future risks.[27] Furthermore, the pace of technological transformation, particularly in the context of an emergency as significant and far-reaching as COVID-19[28], can leave behind those living at the digital and urban margins.[29]

OPENNESS, DIFFUSION AND SHARED VISION FOR SPATIAL DECISION SUPPORT SYSTEMS

A wide range of Spatial Decision Support Systems (SDSS), applications which exploit the geographic relationships within data to produce richer models of vulnerabilities and risks, are being used to make decisions in emergency and disaster response.[30] SDSS applications integrate various forms of spatial data and the sourcing and representation of that data is an important design characteristic of such systems. The progress of algorithmic, computational, and communication approaches, as well as the availability of off-the-shelf, web-based and freeware software packages have made SDSS applications economically feasible, and therefore attractive to urban local authorities.

However, SDSS applications present complex and novel problems.[31] A key challenge is how best to support decisions by a wider set of decision-makers and improve group confidence in resulting decisions. Urban decision-making processes should bring together people from quite different social and educational backgrounds, and this diversity poses a challenge to software from a design and analytical point of view. Unless principles for engaging the community, and for understanding the everyday realities of those most at-risk, are embedded into their design, SDSS application can produce disjointed or meaningless results, or worse, decisions that heighten local vulnerabilities. Complete transparency with regard to the 'spatiality' of data is desirable, but it is a source of conflict because of the differential responses that governments provide to data emanating from different areas in cities that are divided across space on lines of class and community. Therefore, the targeting of certain presumed locations in cities that have deployed spatial data to trace the virus can create the false impression that, say, 'slums' are the 'origins of disease'.

A key example of this is digital surveillance for COVID-19 trace & trace purposes. There are real concerns that a key component of successful PH measures to track disease vectors, might outlive its purpose and normalise longer-term draconian online surveillance practices.[32] This requires a techno-institutional response promoting trust between various stakeholders, as well as institutional and technical custodians and users of data, and requires protocols for data comparison and error management, and audit trails for tracking what changes are made to the data, where, and by whom.[33]

NATIONAL DATA POLICIES ARE REQUIRED TO ENABLE LOCAL DATA ACTIONS

The unmet yet critical data needs in COVID-19 response, and to ensure transparency and accountability in functional and budgetary operations, show it is imperative to put in place a dedicated resource within city- or urban local body administration with a view to drive the data engagement and management strategies. Successful implementation of the data-driven projects at the local level requires specific inputs at different levels of governance in a synchronized way. It is of prime importance to define who will do what and at what levels:[34]

- National bureaucrats have a significant role to play in decentralising data systems, and will continue to hold significant responsibilities of coordinating decentralised data systems. National data policies must consider clear guidelines for nominations or selections of the officials that go beyond technical skills, to include a grasp of capacity constraints, as well as the limits of technology. Standards regarding the use of decentralised and privacy-enhancing technologies and governance models based on trust and data sharing should be fostered. Facilitation for collaborative engagements with research organisations, education institutions, multilateral organisations are also key skills.
- City- or urban local body authorities bear immediate responsibilities of aggregating, validating and integrating local data. Experience shows, however, that this occurs in tandem with informal data sharing systems, where citizen-led initiatives play an equally important role. Shaping open data commons, while preserving citizens' data sovereignty and their rights to privacy to meet local data needs and to tackle urban, social and environmental challenges is therefore key. Well trained officials can become a network of resources within their city, as well as across wider geographies to discuss and deliberate on objectives of data-driven governance as well as governance of data. Ethical digital standards integrated in public procurement, as experimented by the city of Barcelona and embraced by the Cities Coalition for Digital Rights, could be a good way to start to build capacity in the public administration.[35]
- Local governments are increasingly using participatory approaches to collect and validate data and information (for example 'Voluntary Local Reviews' to report on the SDGs). However, they often do not have the capacity to collect, organise and analyse multi-dimensional, multi-source, blended data. Local universities, think tanks and civil society groups focussed on these issues can help.

KEY RESOURCES

NETWORKS

- For a review of the most common factors contributing to opening online civic space as well as the most common tactics being used to close online civic space across 10 African countries, consult the Africa Digital Rights Network https://www.africandigitalrightsnetwork.org/
- The Cities Coalition for Digital Rights is a network of cities helping each other in the greenfield of digital rights-based policy-making. The Coalition is committed to promoting and defending digital rights in urban context through city action, to resolve common digital challenges and work towards legal, ethical and operational frameworks to advance human rights in digital environments. https://citiesfordigitalrights.org/
- Housing and Land Right Network - HLRN is advocating for a strong human rights approach to all COVID-19 related response and recovery measures. https://www.hlrn.org.in/COVID-19
- COVID Action Collaborative (CAC) - A Collaborative of Organisations that supports the most vulnerable, survive and thrive during humanitarian crises like COVID https://www.hlrn.org.in/COVID-19

PROGRAMMES AND PLATFORMS

- UN-Habitat's Safer Cities Programme: a holistic, integrated, multi-level government and multi-sectoral approach to improving the liveability of cities and quality of life for all urban residents, predicated on the confidence that good urban governance, planning and management can improve the safety of neighbourhoods. https://unhabitat.org/safer-cities
- The National Urban Learning Platform (NULP) - https://nulp.nuis.in
- Invest India Business Immunity Platform - The Invest India Business Immunity Platform is designed as a comprehensive resource to help businesses and investors get real-time updates on India's active response to COVID-19 https://www.hlrn.org.in/COVID-19
- Nasscom – end to end COVID platform to the Government of Telangana https://nasscom.in/press/nasscom-taskforce-develops-end-end-covid-19-platform-government-telangana

TOOLS AND TOOLKITS

- DECODE - tools that put individuals in control of whether they keep their personal data private or share it for the public good https://www.decodeproject.eu
- GSMA AI for Impact Digital Toolkit: provides a comprehensive guide to the key components needed to implement mobile data driven solutions. https://aiforimpacttoolkit.gsma.com/

ACKNOWLEDGMENTS

This brief has been written by Jaideep Gupte (J.Gupte@ids.ac.uk) with Sarath Babu M G, Debjani Ghosh, Eric Kasper, Priyanka Mehra, and Asif Raza.

Indian Urban local authorities consulted: Mr. Suhas S, IAS, District Collector, Ernakulam District; Ms. Soumini Jain, Former Mayor, Cochin Municipal Corporation; Mr. Meghanatha Reddy, I.A.S, Deputy Commissioner (Works and R& F), Greater Chennai Corporation; Mr. Jigar H Patel, Assistant Engineer (Computer), Information Systems Department, Surat Municipal Corporation; Mr. Jitendra Singh Rathore, Assistant Engineer (IT), Bhopal Smart City Development Corporation Limited; Ms. Visha Sujathan, ASHA Worker, Cochin Municipal Corporation

Indian National stakeholders consulted: Mr. Kunal Kumar, I.A.S, Joint Secretary, Smart Cities Mission Ministry of Housing and Urban Affairs, New Delhi; Mr. Hitesh Vaidya, Director, National Institute of Urban Affairs, New Delhi;

We also wish to acknowledge expert input from Francesca Bria, Tony Roberts, Jagan Shah, Pontus Westerberg, and Shipra Narang Suri.

CONTACT

If you have a direct request concerning the response to COVID-19, regarding a brief, tools, additional technical expertise or remote analysis, or should you like to be considered for the network of advisers, please contact the Social Science in Humanitarian Action Platform by emailing Annie Lowden (a.lowden@ids.ac.uk) or (oliviatulloch@anthrologica.com). Key Platform liaison points include: UNICEF (nnaqvi@unicef.org); IFRC (ombretta.baggio@ifrc.org); and GOARN Research Social Science Group (nina.gobat@phc.ox.ac.uk).

The Social Science in Humanitarian Action is a partnership between the Institute of Development Studies, Anthrologica and the London School of Hygiene and Tropical Medicine. This work was supported by the UK Foreign, Commonwealth and Development Office and Wellcome Grant Number 219169/Z/19/Z and the Smart Data For Inclusive Cities project [European Commission CSO-LA/2017/154670-2/13]. The views expressed are those of the authors and do not necessarily reflect those of the funders, or the views or policies of IDS, Anthrologica or LSHTM.

Suggested citation: Gupte, J., Babu, S. M. G., Ghosh, D., Kasper, E., Mehra, P. and Raza, A. (2021) Smart Cities and COVID-19: Implications for Data Ecosystems from Lessons Learned in India, *Briefing*, Brighton: Social Science In Humanitarian Action (SSHAP) DOI: 10.19088/SSHAP.2021.012

Published March 2021

REFERENCES

[1] See Risks of exposures of world's cities to natural hazards https://marroninstitute.nyu.edu/uploads/content/GuGerland_2014_NYU_Risks_of_Exposures_of__UTF-8_B_IFdvcmxk4oCZcyBDaXRpZXMgdG8gTmF0dXJhbC.pdf

[2] Neirotti, Paolo, et al. 2014. Current trends in Smart City initiatives: Some stylised facts. *Cities* 38: 25-36.

[3] Luque-Ayala, Andrés, and Simon Marvin. 2015. Developing a critical understanding of smart urbanism? *Urban Studies* 52 (12): 2105-2116.

[4] See Mazzucato on role of the state in private sector entrepreneurship and innovation in Mazzucato, Mariana. 2018. *The entrepreneurial state: debunking public vs private sector myths*. London: Penguin Books.

[5] See Wilkinson, 2020. Key considerations: COVID-19 in informal urban settlements. SSHAP Brief. https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/15185/SSHAP_COVID-19_Key_Considerations_Informal_Settlements-final.pdf

[6] McDonald S. 2020, The Digital Response to the Outbreak of COVID-19, Centre for International Governance Innovation (CIGI), accessed 30 March 2020 at https://www.cigionline.org/articles/digital-response-outbreak-covid-19.

[7] For example, in planning the response to the bombing of Manchester city centre. See Williams, et al. 2000. Responding to urban crisis: The emergency planning response to the bombing of Manchester city centre. *Cities* 17 (4): 293-304.

[8] Datta, Ayona. 2020. Self(ie)-governance: Technologies of intimate surveillance in India under COVID-19. *Dialogues in Human Geography* 10 (2): 234-237.

[9] Kitchin, Rob. 2020. Civil liberties or public health, or civil liberties and public health? Using surveillance technologies to tackle the spread of COVID-19. *Space and Polity* 24 (3): 362-381.

[10] Meier, Patrick. 2015. "Digital humanitarians: how big data is changing the face of humanitarian response." Boca Raton, FL: CRC Press https://www.taylorfrancis.com/books/9780429256639.

[11] See the case of proliferation of data sources in Haiti following the 2010 earthquake in Qadir, Junaid, et al. 2016. Crisis analytics: big data-driven crisis response. *Journal of International Humanitarian Action* 1 (1): 12.

[12] See "vulnerability of connectivity" in Barabási, Albert-László. 2016. *Network science*. Cambridge: Cambridge Uni Press.

[13] See Verhulst, Stefaan. 2017. "Open Data in Developing Economies: Toward Building an Evidence Base on What Works and How." Cape Town, South Africa: African Minds. Directory of Open Access Books (DOAB) http://www.africanminds.co.za/wp-content/uploads/2017/10/AM-OD-in-Developing-Economies-COMPLETE-R-WEB-10Nov2017.pdf or Project Muse Open Access Books https://muse.jhu.edu/book/57263 .

[14] Holmes, R. and Hunt, A. *forthcoming*. Have social protection responses to Covid-19 undermined or supported gender equality? Emerging lessons from a gender perspective. ODI Working Paper

[15] Babu, Sarath MG et al. *forthcoming*. Kerala's grassroots-led pandemic response: Deciphering the strength of decentralization of powers. Smart Data for Inclusive Cities. Forthcoming IDS Working Paper.

[16] Interview with Deputy Commissioner of Greater Chennai Corporation

[17] See Klopp, J et al. 2017. The urban sustainable development goal: Indicators, complexity and the politics of measuring cities. *Cities* 63: 92-97.

[18] See Theron, G, et al. 2015. Data for action: collection and use of local data to end tuberculosis. *The Lancet* 386 (10010): 2324-2333.

[19] Stakeholder interviews were set in relation to a desk based review of the literature produced using the following Web of Science search syntax: (TS=(("data science" OR "data management" OR "big data" OR "data devolution" OR "data platform" OR "data system" OR "dataism" OR "smart" OR "data infrastructure" OR "information science" OR "information management" OR "information devolution" OR "information platform" OR "information system") AND (urban OR city OR suburban OR metropolitan) AND (health) AND (India))) Timespan: Last 5 years.

[20] See the example of London's city data initiatives for challenges faced in complex city data environments and the importance of an integrated view in Gupta, Anushri, et al. 2020. An orchestration approach to smart city data ecosystems. *Technological Forecasting and Social Change* 153: 119929.

[21] See Datta, A, et al. 2020. Apps, maps and war rooms: on the modes of existence of "COVtech" in India. *Urban Geography*: 1-9.
[22] Gibbons, Pat, et al. 2020. Putting affected people at the center of humanitarian action: an argument for the principle of humanitarian subsidiarity. *Disasters* 44 (3): 499-517.
[23] In the Indian context, this type of frugalness if colloquially termed *jugaad*, roughly translated to resourceful entrepreneurship. See Prabhu, Jaideep. 2017. Frugal innovation: doing more with less for more. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences* 375 (2095): 20160372.
[24] See https://www.theatlantic.com/health/archive/2021/01/hhs-hospitalization-pandemic-data/617725/
[25] See for example, Datta, A. 2019. Women from Delhi's outskirts are taking selfies to claim their right to the city. The Print. https://theprint.in/features/women-from-delhis-outskirts-are-taking-selfies-to-claim-their-right-to-the-city/187227/
[26] See https://www.bbc.co.uk/news/technology-54423988
[27] See Harari, Y, 2020. Lessons from a year of Covid. Financial Times. 26 February. https://www.ft.com/content/f1b30f2c-84aa-4595-84f2-7816796d6841
[28] Lambert, Helen, Jaideep Gupte, Helen Fletcher, Laura Hammond, Nicola Lowe, Mark Pelling, Neelam Raina, Tahrat Shahid, and Kelsey Shanks. 2020. COVID-19 as a global challenge: towards an inclusive and sustainable future. The Lancet Planetary Health 4 (8): e312-e314.
[29] Datta, Ayona. 2020. The "Smart Safe City": Gendered Time, Speed, and Violence in the Margins of India's Urban Age. *Annals of the American Association of Geographers* 110 (5): 1318-1334.
[30] Keenan, Peter Bernard, and Piotr Jankowski. 2019. Spatial Decision Support Systems: Three decades on. *Decision Support Systems* 116: 64-76.
[31] Pettit, Christopher, et al. 2018. Planning support systems for smart cities. *City, Culture and Society* 12: 13-24.
[32] See Hernandez, Kevin and Roberts, Tony (2018) Leaving No One Behind in a Digital World. K4D Emerging Issues Report, Brighton, UK, Institute of Development Studies. https://opendocs.ids.ac.uk/opendocs/bitstream/handle/20.500.12413/14147/Emerging%20Issues_LNOBDW_final.pdf
[33] See Nambiar, Devaki, et al. 2020. Monitoring Universal Health Coverage reforms in primary health care facilities: Creating a framework, selecting and field-testing indicators in Kerala, India. *PLOS ONE* 15 (8): e0236169.
[34] Based on Ghosh, D et al. Unpublished work. Analysis of Chief Data Officers (CDO) in Indian Smart Cities-Assessment of 100 City Chief Data Officers
[35] https://www.barcelona.cat/digitalstandards/en/init/0.1/index.html; https://citiesfordigitalrights.org