

Systems Thinking and Water, Sanitation and Hygiene: Examples from Kenya's *Afya Jijini* Program

Cougar Hall^{1*}, Benjamin Crookston¹, Josh West¹, Mary Linehan², Chris McGahey², Dan Wendo³, Ali Abdi³

¹Department of Public Health, Brigham Young University, Provo, USA

²IMA World Health, Washington DC, USA

³IMA World Health, Nairobi, Kenya

Email: *coughall@gmail.com

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Abstract

The *Afya Jijini* program targeted improved access to and quality of health services in Nairobi City County through the strengthening of local health systems. The program took a systems thinking approach recognizing that strong, coordinated commitments and contributions from various levels of multiple sectors such as health, public works, and education would be essential to the program's success. Consistent with the World Health Organization's proclamation that the provision of safe water, sanitation, and hygiene (WASH) are prerequisites for all public health endeavors, WASH-related efforts were woven into nearly all facets of the *Afya Jijini* program. IRC is a nonprofit located in the Netherlands focused on systems thinking approaches for sustainable WASH improvements. IRC's 9 building blocks are tools to assist in breaking down the complexities of systems, identifying key actors and factors that contribute to sustainable improvements, and setting clear program indicators and targets for success. This conceptual manuscript seeks to explore the *Afya Jijini* program through the lens of the IRC's building block approach to systems thinking. Examples of *Afya Jijini* programming aligned with each building block are presented to assist program planners and guide future interventions. *Afya Jijini* could have benefited from increased attention to several key building blocks, including *institutions*, *finance*, and *learning and adaptation*.

Keywords

WASH, Systems Thinking, Kenya, Building Blocks of Sustainability

1. Introduction

Inadequate access to improved water, sanitation, and hygiene (WASH) threatens child survival in Nairobi City County (NCC), Kenya. Approximately 60 - 70 percent of Nairobi's rapidly growing population live in urban informal settlements, where they frequently experience water shortages and unhealthy sanitation conditions [1]. Only 22 percent of informal settlement households have water connections, and these are often over-taxed and shared across many dwellings. Residents of informal settlements regularly access water from illegal connections, high-cost water vendors, and other sources that are typically unsafe, unreliable, and easily contaminated [1]. Inadequate sanitation and low levels of personal and community hygiene also contribute to significant widespread diarrhea morbidity [2]. Residents of informal settlements frequently lack household access to toilets and regularly use poor quality, pay-per-use communal toilets [2]. They also resort to throwing bagged human waste onto rooftops or into open footpaths or sewers, a practice referred to as flying toilets. The lack of clean water and sanitation and inattention to hygiene contributes to frequent cholera and other diarrheal diseases. It is a decades-long barrier to Kenya's efforts to reduce child morbidity and mortality by addressing diarrheal disease, malnutrition, and acute respiratory infections [1].

In 2013, Kenyans voted to undergo government decentralization [3]. In this process the central government's responsibility to ensure and regulate safe water supply, sanitation, and other health services was shared with 49 newly constructed departments. This restructuring introduced both challenges and opportunities in service delivery. Opportunities included being able to prioritize local health needs and establish synergies between various line ministries that contribute to positive health outcomes. Challenges included resource distribution, capacity and knowledge. Siloed approaches to addressing the broad-scale service needs at the national level were no longer adequate with the new style of governing [3]. By contrast, complex, coordinated efforts across multiple government and non-governmental sectors were needed, especially to address the many facets of service delivery in the WASH sector.

2. Systems Thinking

2.1. Building Block Approach

The first World Health Assembly of the World Health Organization (WHO) in 1948 affirmed that the provision of safe water and sanitation was a prerequisite for all public health initiatives [4]. Ten years later at the eleventh World Health Assembly, hope was expressed that an expanded, multisectoral effort between the WHO and the many government agencies would give strong leadership in water supply and that there would be far closer cooperation with departments of public works [5]. Systems thinking agrees that health care and WASH services cannot be siloed and should not be treated as if independent of one another. A systems approach recognizes that these sectors are also far more than merely the

sum of their parts. Rather, these two systems of service delivery are profoundly connected and should operate together in an organized, coordinated way. They share a multitude of contact points and are impacted by a variety of inputs, deficits, and pressures. While health care and WASH are often narrowly focused on unique and specific challenges, a systems approach encourages taking a broader perspective, one where overall structures, patterns, and cycles are brought into view and the necessity of interrelated contributions can be seen. This approach recognizes that establishing and maintaining WASH services is only possible with strong, coordinated commitments and contributions from various levels of multiple sectors such as health, public works, and education.

While a systems thinking approach may appear intuitive, many past WASH programs have focused almost exclusively on direct service provision and infrastructure development. These efforts often result in tangible products such as latrines, handwashing stations, and water networks. Yet, even the most well-intended and properly funded direct service provision efforts and state-of-the-art infrastructure have consistently fallen short of establishing sustainable WASH improvements and changes in behavior. This continued commitment to conventional approaches has resulted in endemic issues of sustainability failure and slowed the uptake of a more systematic approach [6]. There continues to be a universe of parallel systems; in one lane the “health sector” and in another, the “WASH sector” with little shared language, joint planning, and collaborative programming. In addition to largely neglecting the interconnectedness and dependence on other systems for sustainable success, the intended beneficiaries of such efforts typically inherit the ongoing maintenance of infrastructure with little or no technical or financial support. What is needed is a systems thinking approach, one that requires great patience in recruiting and organizing actors from multiple sectors and maintains a consistent focus on building the capacity of those who will be required to maintain operations at the program’s end. It’s an approach requiring major time and investment, especially with regard to planning, evaluation, and monitoring; but one which has begun to establish self-reliant systems in perpetuity [7].

IRC is an international think-and-do tank based in the Netherlands that works with governments, non-government organizations (NGOs), and entrepreneurs to find long-term solutions to global WASH challenges [8]. Rooted in systems thinking, IRC advocates for a building block approach on behalf of sustainable improvements. IRC’s 9 building blocks (see **Figure 1**) are tools to assist in breaking down the complexities of systems, identifying key actors and factors that contribute to sustainable improvements, and setting clear program indicators and targets. The building block framework can be adapted to a program’s resources, aims, scope, and scale.

2.2. Afya Jijini

The United States Agency for International Development’s (USAID) *Afya Jijini* program aimed to improve access to and quality of health services in NCC by










 Policy & Legislation	 Planning
 Institutions	 Finance
 Infrastructure	 Regulation & Accountability
 Monitoring	 Water Resources Management
 Learning & Adaptation	

Figure 1. IRC's building blocks
(<https://www.ircwash.org/news/building-blocks-strong-and-healthy-wash-systems>).

combining direct support with strengthening of the county and sub-county health system [9]. The program focused on preventing the most pressing urban health issues that impact maternal and child mortality within the county. Launched in September 2015, IMA World Health (IMA) led the implementation of this five-year project (2015-2020), working in close collaboration with the NCC Health Department and through a local team of partner Kenyan NGOs: the Christian Health Association of Kenya (CHAK), Mission for Essential Drugs and Supplies (MEDS), and the National Organization of Peer Educators (NOPE). Working with government and NGO partners, *Afya Jijini* organized its technical assistance around three essential work streams: 1) HIV/AIDS prevention, care, and treatment; 2) maternal, newborn, and child health; and 3) health systems strengthening [10]. *Afya Jijini* experienced great success in each of these target areas. Notable WASH-related accomplishments aligned with work streams two and include: 26.4 million liters of water treated with point-of-use water treatment products to improve household water quality for 57,600 households; WASH improvements in 39 villages and reaching more than 700,000 people; construction of 486 new communal sanitation facilities; a 6 percent reduction in open defecation in targeted informal settlements, reductions in cholera disease outbreaks, and scaled up oral rehydration treatment (ORT) in 29 facilities that have helped treat more than 129,786 children under the age of five with ORT [10]. The purpose of this conceptual paper is to describe the ways in which *Afya Jijini* applied a systems thinking approach to simultaneously improving health and WASH capacity. In particular this paper aims to describe the *Afya Jijini* program's alignment with the IRC building block approach and provide recommendations for future WASH interventions.

3. Building Blocks and *Afya Jijini*

3.1. Building Block 1: Institutions

The compacts among organizations in a particular location and the WASH sector, the capital and capacity brought by each organization, and collaborative ef-

forts between organizations is referred to as the *institutions* building block. While organizational arrangements can differ greatly, the paramount point is that organizations have well understood roles and responsibilities so as to avoid gaps. This building block is critical to all service delivery models within a country.

One of the founding principles of *Afya Jijini* was to foster and develop institutional collaborations and promote effective communication. *Afya Jijini* invested in these collaborations at both county and local levels with government, non-profit, and private partners. For example, the project revitalized the County WASH Coordination Forum as a critical platform for WASH coordination. The Forum now regularly convenes multi-sectoral partners—including the USAID KiWASH program, UNICEF/Concern Worldwide, CRS, AMREF, Sanergy, and Child Fund—enabling NCC to capture their inputs into their overall work plan and improve collaboration on WASH efforts. The project also introduced two new WASH technical working groups (TWGs): urban sanitation and school health/WASH, at the request of the county, both of which provided essential technical leadership and coordination in these areas.

At the community level, *Afya Jijini* worked with local NGOs and Community Health Volunteers (CHVs) to promote the adoption of positive individual, household, and community behaviors that reduce diarrheal disease and increase demand for WASH services. These efforts helped improve the overall local ownership and sustainability of WASH interventions. Further, the project worked with sub-counties and hospitals to develop and execute healthcare waste management plans, which included waste referral to other sites, and to monitor their implementation.

Afya Jijini also worked with private partners. The program developed an innovative public-private partnership for urban community-led total sanitation (UCLTS) with a private company, Sanergy to complement UCLTS behavior change. Using a market-based approach, Sanergy provided franchised Fresh Life toilets that offered high quality, clean, pay-per-use latrines for communal use.

3.2. Building Block 2: Policy and Legislation

Governmental efforts to establish a vision for the sector (policy) and a plan for achieving such a vision (legislation) comprise the policy and legislation building block. National policies work to develop targets for improving WASH and direction for mobilizing institutional arrangements. It is critical that legislation supports policy, is clearly linked, and provides guidance to organizations working to advance WASH services.

Afya Jijini worked with both government and non-governmental partners to establish a new vision for WASH in Kenya. Using the TWGs, *Afya Jijini* advocated for and drafted the first-ever county-level environment and sanitation bill. The bill established the institutional framework for environmental health and sanitation, detailing citizen rights and county responsibilities in regulating and

providing a clean and healthy environment (including sanitation licensing and regulation). The project also helped the NCC adapt national WASH-related technical strategies and guidelines to Nairobi's unique urban environment and improve the regulatory and policy environment for WASH issues.

3.3. Building Block 3: Finance

The finance building block consists of a clear understanding that necessary WASH services are fully funded for the entire lifecycle of the service. This building block covers efforts to make estimates of service delivery costs, secure funding sources, establish how various partners will provide and use funding, identify sustainable funding plans, and develop vehicles for moving funds to wherever they are needed.

Afya Jijini worked to finance necessary WASH services at various levels where feasible. For example, healthcare waste was a serious and persistent challenge in Kenya, with only half of sites safely disposing of medical waste, and a third of health facilities having basic healthcare waste management [2]. As a result of *Afya Jijini* efforts, 30 project-supported facilities are now advocating and budgeting public funds for operation and maintenance of healthcare waste management within their annual work plan.

3.4. Building Block 4: Regulation and Accountability

The application and enforcement of policy and legislation leads to the regulation and accountability building block. This building block focuses on holding decision makers, service providers, and users accountable for their efforts. It encourages partners to respect the interests of others. Further, this building block includes informal systems such as the behaviors and obligations of various partners.

At the sub-county level, *Afya Jijini* worked with NCC to identify, orient, and support sub-county WASH focal persons responsible for oversight. Since the introduction of the focal persons, WASH activities scaled-up in their respective areas and experienced improved sub-county level coordination between public health officers, focal persons, and non-WASH unit heads with regard to oversight of efforts to address WASH.

3.5. Building Block 5: Monitoring

The monitoring building block refers to the ability to measure a program's progress against the program's plans and requires the sharing of up-to-date data with multiple sectors and program partners. Unlike traditional monitoring and evaluation tactics, a less territorial and increasingly transparent approach to program progress and data are required. Such an approach works to increase buy-in across sectors, informs action on multiple project levels, and facilitates coordinated decision making throughout all other building blocks.

Afya Jijini took a building block approach to monitoring allowing for conti-

nuous feedback and ongoing quality improvement. At the sub-county level, *Afya Jijini* worked with NCC to support sub-county WASH focal persons trained to track, monitor, and advocate for WASH commodities, which are often viewed as lower priority items compared to essential medicines. These include waste segregation supplies (bins, bin liners), hygiene items (soap, hand washing stations), and water treatment technologies. Additionally, specialists organized into sub-county Health Management Teams (SCHMTs) allowed for continuous monitoring and oversight of community facilities. *Afya Jijini* coordinated with focal persons and SCHMTs to conduct joint supportive monitoring and supervision. Teams conducted a quarterly visual audit to ensure there was proper medical waste segregation and disposal, clean and functional latrines, running water, and handwashing stations with soap in each health facility.

Afya Jijini similarly partnered with larger clinics and hospitals to develop and execute healthcare waste management plans. Implementation efforts were monitored and adjusted according to each facility's needs. Through the transparent sharing of up-to-date findings between hospitals, SCHMTs, and supply-chain managers, facilities were also equipped with clean running water, safe and accessible latrines, handwashing stations, and proper waste segregation and disposal.

Finally, the program strengthened government's capacity for WASH data collection, analysis, and use. Efforts involved providing training and reporting tools, and registers as well as follow-up mentorship to sub-county WASH focal persons, Health Record Information Officers, and community health assistants. As a result, WASH-related data and reporting increased within the web-based District Health Information Software 2 (DHIS2) platform, as well as the online UCLTS portal. The project continually aimed at improving data sharing across all WASH and health partners in an effort for ongoing program improvement.

3.6. Building Block 6: Planning

Planning refers to establishing pathways for achieving programmatic goals and objectives. As a building block for systems thinking, this effort includes strategic planning, annual planning, and infrastructure planning.

Afya Jijini engaged in strategic planning focused on alignment and shared goals with other program partners and multiple offices of government. At the community level, *Afya Jijini* worked with local NGOs and CHVs to promote the adoption of positive WASH behaviors as an integral part of their annual work plans.

Annual planning occurred at every level of the *Afya Jijini* program. Specifically, *Afya Jijini* addressed healthcare waste during health sector annual planning, including budgeting for waste management among the 30 *Afya Jijini*-supported facilities. As a result, healthcare waste disposal is now a part of all hospital and care facility annual work plans.

Infrastructure planning involved a variety of partners including Sanergy, the County WASH Coordination Forum, and the TWGs. Sanergy provided fran-

chised, clean, pay-per-use latrines for communal use. Their sustainable sanitation cycle engages local entrepreneurs in urban informal settlements to collect the waste that is then processed into fertilizer for smallholder farmers.

3.7. Building Block 7: Infrastructure

Infrastructure includes all hardware required for delivering programmatic services and the ability to develop, maintain and manage them over time. As programs are notorious for establishing infrastructure that is either unsustainable given locally available resources or lacks long-term utility given a variety of contextual factors, a systems thinking approach to infrastructure is essential.

Afya Jijini's public-private partnership for UCLTS with Sanergy is a strong example of the infrastructure building block. Using a market-based approach, the 166 new Sanergy Fresh Life toilets were constructed with a plan in place for ongoing maintenance and profitable management by franchisees.

3.8. Building Block 8: Water and Resource Management

The water and resource management building block includes the source of all water services and the means by which wastewater is returned. Improving water, sanitation and hygiene services is a frequent goal of health promotion programs given the strong association of WASH to maternal and child health outcomes. Protecting water resources is fundamental to all sectors of society, and thus truly requires systems thinking inclusive of effectively incorporating all eight other building blocks in a multi-sectoral approach.

A primary objective of *Afya Jijini* was to ensure that all NCC health facilities possessed clean and functional water and sanitation services. At the county level, the project helped public health managers navigate and coordinate across sectors to improve awareness of WASH efforts, and to mobilize and deploy resources more effectively. The project worked with sub-counties and hospitals to develop and execute healthcare waste management plans and to monitor their implementation to ensure contamination did not reach the environment. As described previously, *Afya Jijini* collaborated with SCHMTs to conduct quarterly audits ensuring proper medical waste disposal, clean and functional latrines, running water, and handwashing stations with soap at hospitals and clinics.

Several community-level WASH interventions were implemented to increase access to clean water and improve positive individual hygiene behaviors. *Afya Jijini* ensured that households in target villages had reliable, year around access to potable water through supporting sub-county-led water quality checks, provision of chlorine powder, and protection of water sources. In addition, *Afya Jijini* procured and distributed water disinfection agent Aquatabs at public water points, to households in targeted villages, and to parents who brought children to clinics for oral rehydration treatment for persistent diarrhea.

3.9. Building Block 9: Learning and Adaptation

Good WASH systems are those that learn and adapt. Learning can happen

through various mechanisms but is likely to include inputs from stakeholders with diverse backgrounds and experience as well as evaluation of, and reflection on, existing programs. Knowledge and insights gained in the process then are implemented into course corrections or modifications to adapt and improve.

Afya Jijini relied on continuous feedback from every program level to inform ongoing program planning and implementation efforts. Formative evaluations designed to identify strengths and weaknesses aimed at improvement rather than judgment were key. A systems approach was beneficial allowing *Afya Jijini* to move beyond the realization that work in NCC was complicated to focusing on the opportunities that complexity provides for continuous improvement and adaptability when system partners prioritize collaboration. One such example of learning and adaptation is captured in the adoption of waterless toilets in informal settlements. Uptake of these facilities was a tiered process, which started with *Afya Jijini* staff spearheading efforts with the involvement of local leadership. Early solutions were costly and included far too few toilets to sufficiently address the unhealthy practice of open defecation. Targeted approaches with key populations that are marginalized and vulnerable are often most successfully implemented by the communities themselves. In this manner, communities are positioned better to be able to evaluate the needs, resources, attitudes and beliefs of its own members and to make adaptations that will satisfy both community norms and best practice. In this instance, local leadership councils held frequent community hearings to learn about willingness to adopt new practices. This information was then shared with *Afya Jijini* technical staff who used the feedback loop to identify and present local leadership with a variety of potential solutions. Local leadership assumed responsibility for managing the waterless toilets and adapting them to fit local needs with respect to placement, expectations for cleanliness, and their regular maintenance.

4. Future WASH Interventions

Afya Jijini employed a systems thinking approach which included many of the fundamental principles underlying the IRC's building blocks. Furthermore, consistent with the WHO's now decades-old proclamation that the provision of safe water and sanitation is a prerequisite for all public health endeavors, WASH-related efforts were woven into nearly all facets of the *Afya Jijini* program. The key role that WASH plays in protecting health and preventing disease has ensured its inclusion in health programming to the point that WASH-sector programs may benefit from observing the health-sector's application of system thinking.

Afya Jijini alignment with the building blocks was strong, yet several building blocks could have been stronger and should receive more attention from future programs. Institutions (Building Block 1) are essential to a systems approach and rely on consistent leadership and vision. One of the greatest challenges for *Afya Jijini* was multiple changes in top leadership at various sectors and levels in NCC during program implementation. Instability at top-level leaderships im-

pacted negatively not only the speed of implementation of priority interventions but also caused frequent shifts in strategy when there was change in leadership. These situations highlight the need for future programs to seek partners with stable leadership, including lower-tiered leaders and decision makers likely to be promoted in the event of top-level vacancies, and plan for additional time and investment in developing and nurturing shared long-term commitments, visions, and goals among new leadership. In addition, the combination of institutional structures and finance (Building Block 3) could have been more thoroughly established so that the formal and inform coordinating mechanisms become funded, standard practice across NCC and its sub-county partners. Establishing clear and consistent procedures, particularly among a network of partners with differing pre-existing protocols, takes time yet is essential. *Afya Jijini* focused heavily on continuous learning and adaptation (Building Block 9), yet the need for continual technical assistance was substantial and should not be overlooked. In the absence of ongoing support, the likelihood of backsliding and eroding gains is great. Finally, it should be noted that *Afya Jijini* was not designed to, nor did it, make programmatic decisions based on the elements of the building blocks. Instead, they were applied retroactively to unpack the project's achievements in establishing a sustainable, multi-sector system that benefited both previously siloed sectors. Future programming would benefit from a more intentional and proactive application of IRC's building blocks in an effort to increase coordination between, and synergy among, various sectors.

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Author's Contributions

CH, BC, JW, ML, and CM were major contributors to the writing of this manuscript. AA and DW provided programmatic details and key recommendations for practice.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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