



EVERY BREATH YOU TAKE: Who is monitoring air quality in Kenya?

By Priyanka de Souza



“Is that air you’re breathing now?” Morpheus asks Neo in the 1990s cult classic, *The Matrix*. The same question could be asked of millions of Kenyans for whom the quality of what they inhale on a daily basis has for too long been taken for granted.

In May 2016, I was part of a team at the United Nations Environment Programme (UNEP) that measured air quality around Nairobi. We deployed low-cost monitors in different parts of the city, including four schools - Alliance Girls School in the green, leafy suburb of Kikuyu; All Saints Cathedral School in an area populated by small industries and shops; St. Scholastica, off the notoriously congested Thika highway; and Kibera Girls Soccer Academy, close to the railway tracks in the heart of Kibera. In addition, we sampled the air around the Viwandani Community Centre in the Lungalunga slum and at the UNEP headquarters in Gigiri. We [published the results](#) from this deployment in the South African open-source Clean Air Journal and made the data [publicly available](#).

Perhaps unsurprisingly, air pollution within the informal settlements was troublingly high. In the absence of collection of waste by municipal authorities, communities in Kibera are forced to burn it, which fouls up the air. Indoor air pollution from the use of kerosene and charcoal for cooking has also had an adverse impact on the health of people living in informal settlements. Across the city in Lunga Lunga, residents have no control over pollution from industries in the vicinity, including, we

were told, a tear gas producing factory.

What did come as a surprise was that St. Scholastica had comparable levels of pollution, mostly from cars plying the Thika Highway. We also expected Alliance Girls School to be the cleanest but observed large spikes in dust each Wednesday morning, when firewood was burned. At UNEP and All Saints, pollution was lower than at the other sites.

Collecting data

Four years ago, Kenya gazetted [Air Quality Regulations](#) that specify air quality standards, as well as steps to be taken for “prevention, control and abatement” of air pollution in recognition of the terrible toll it takes on the health of Kenyans’ health. The [2017 Kenya Economic Survey](#) estimated that 19.9 million Kenyans suffer from respiratory ailments that are exacerbated by poor air quality. However, the government has been unable to enforce the regulations due to a lack of high-quality air quality monitoring data. Without an understanding of the baseline air quality in Kenya and how it varies across the country as well as over time, the standards and regulations cannot be enforced.

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The monitors UNEP used were relatively low-cost (under US\$3,000) and not very accurate; though they provided crucial insights into air pollution at each site, scientists are still figuring out how to make sense of the “noisy” data they produce. The European Environment Agency has created a Working Group to certify a section of low-cost monitors for “indicative” purposes and India and China are also working toward certification programmes.

Highly accurate monitors, also known as reference monitors, used by many countries for regulatory purposes, are expensive and can cost upwards of US\$100,000. This places them out of the reach of most communities. Low-cost monitors, however, can fill in the gaps in our understanding of air pollution and are even more important for developing countries where few high-quality instruments exist, if they exist at all. We found that the UNEP monitors were actually helpful in identifying major sources of air pollution at each site and in raising awareness about air pollution and its deleterious effects on human health.

More recently, others have deployed such monitors giving Kenya a good reason to join the conversation about how to use the data from them for regulatory purposes. Code for Africa have [developed](#) their own low-cost monitors, deployed three across Nairobi and made the data publicly available. The Stockholm Environment Centre (SEI) has also [deployed](#) some in Lungalunga and has empowered the community to lobby their ward representative to do something about the terrible air pollution they are exposed to. The African Population and Health Research Center also [monitors](#) air pollution in Korogocho and Viwandani.

This is encouraging but till we figure out how to use the data for enforcement of the 2014 Air Quality Regulations, it is prudent to ask whether any high-quality air monitoring stations exist in the country. As it turns out, the entire country has just three such monitors, and even these are not always used to their full potential.

The University of Nairobi has a reference monitoring station which they have used to conduct several important studies, mainly in Nairobi. For example, Professor Michael Gatari’s research group, in partnership with colleagues from universities around the world, have used the high-quality equipment to show that vehicle emissions are [a major source of pollution](#) in the city centre. They

have also shown the [shockingly high exposure to air pollution](#) of matatu drivers and traffic policemen.

Kenyan government agencies also have high-quality systems. The Kenya Meteorological Department (KMD) operates a monitoring station on Mount Kenya, and in addition owns, and sometimes operates, a mobile van that has high-quality instruments that can measure a range of air pollutants. The National Environment Management Authority (NEMA) also requires industrial facilities to contract designated laboratories with high-quality equipment to report their stack emissions (emissions coming out of their smoke stacks after burning waste) and to make provisions for continuous monitoring in accordance with the 2014 Air Quality Regulations. Some of these laboratories also measure ambient air quality.

So what data do they collect and how do they use it?

KMD's station on Mount Kenya is actually owned by the World Meteorological Organization (WMO) and is part of the [WMO Global Atmospheric Watch network](#). The station has instruments for [measuring particulate matter/dust and surface ozone, among other air pollutants](#) and its data is supposed to be public. However, due to a lack of funds for routine expenditures, such as the filters that are crucial for some measurements, only surface ozone data is currently being collected at this site. Data for other pollutants does not exist online.

Some of the pollution trends from the KMD mobile van have been published in academic papers and can be found on the KMD [website](#), but the data itself has not been made public. When I visited the KMD headquarters in Nairobi in December, I paid to access a few days' worth of data. When asked about why the data was not free of charge, many KMD staff, while sympathetic to my request, said that as the mobile van is expensive to run on a regular basis, they needed to charge for the data to recover costs.

These costs arise from the fact that though KMD owns the van, the firm from which they bought it, SI Analytics, actually owns the data, for which KMD has to pay an access fee of Sh80,000 a year to download the data from their servers in the UK. This is a common scheme in the industry that could either be seen as a way to make the technology accessible to cash-strapped institutions, or as a way of maintaining a constant revenue stream from them over time. SI Analytics have offered an alternative arrangement where a one-time cost could be made to buy the data logger in perpetuity and KMD could consider raising funds to move to this arrangement so that the van is used to its full potential.

Additionally, other costs, such as a license fee to use and operate the van, makes it hard to consistently operate the platform and fully reap its potential benefits. As it is, given the costs, KMD typically only operates the van when contracted by NEMA to monitor pollution in specific locations. NEMA then pays for the associated operating costs. However, the Authority only receives an official analysis report from KMD, which is open to interpretation, rather than the data set itself. This creates a lack of clarity in the division of responsibilities and in checks and balances, which can foster suspicion and breed mistrust among government agencies.

KMD has for several years also been collecting and [publishing](#) data on surface ozone in partnership with MeteoSwiss, the Swiss Office of Meteorology and Climatology, at their Nairobi headquarters. Surface ozone is very harmful to human health and such data is exceedingly useful for developing pollution management plans. However, although the data is public, it has received scant attention. This is partially because not many people know that it is available, and, furthermore, because it has not been interpreted in a way that makes it meaningful for the development of an air pollution management plan. This last part falls outside of KMD's mandate, which is to monitor the

environment for meteorological purposes. The data, however, could be of great use to NEMA, which, as the national body in charge of environmental policy, requires high quality data to ground its work.

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Many countries use raw data to develop an air quality index (Good, Moderate, Bad, Very Bad) that gives the public an intuitive understanding of the air they breathe and allows them to issue warnings when the air quality is very bad and to provide recommendations about what people can do (for example, not to exercise outdoors). Government agencies and the tech community in Kenya need to design a similar index to convey existing data effectively to the public. Fortunately, they don't need to reinvent the wheel and can utilise one of the many existing ones.

As mentioned earlier, NEMA requires industries to submit data on their stack emissions. However, the Authority does not openly publish the data it gets. On their website, NEMA states that only a [handful of designated laboratories](#) are capable of monitoring emissions on behalf of industries, and at the moment there are only two listed as capable of monitoring air quality, which is obviously insufficient for the country's needs. Industries also often complain about the burden of self-reporting as well as the high cost of retrofitting existing facilities to eliminate or reduce emissions. These factors compound to dilute the progress needed for enforcing emissions standards. In fact, to date, NEMA has not publicly announced a single air quality enforcement action against an industrial player.

It is clear that the current situation presents a vulnerable scenario where potentially corrupt behaviour could happen. This warrants further investigation and points to the need for calibrating the existing carrots for industries to do the right thing in addition to the current sticks. Such incentives, for example, could be in the form of technical advice or in the form of financial help, both of which are often needed to offset the additional burden required by regulatory frameworks seeking to curtail emissions.

The low number of designated laboratories also suggest either lack of interest from the private sector in the market or non-competitive behaviour. This is a shame because many studies have shown that investing in more air pollution stations can have tremendous health and systemic financial benefits. For example, in the United States, the Clean Air Act is estimated to have [health and environmental savings of over US\\$22 trillion](#)! Therefore, it makes good policy sense to consider the adoption of these systems, since experience shows that the initial high costs of deploying reference monitoring stations would be more than recovered by the huge savings from the interventions based on the data from the stations.

Regardless, some high-quality air quality data does exist in Kenya. Though it is incomplete and sparse, and almost all of it is for Nairobi, it can still be useful, which brings about the question of why isn't it more so?

Lack of effective coordination

The coordination of the development of a national air quality monitoring strategy currently falls under the purview of the Ministry of Environment and Natural Resources (MENR). Various government agencies, including NEMA and KMD are responsible for different aspects of managing air pollution. Some of the other organisations involved include the National Transport and Safety Authority, that is in charge of testing vehicles (even though NEMA also has a task force

independently working on emissions from motor vehicles) and the Office of Health and Safety Authority in the Ministry of Labour are in charge of ensuring the safety of workers from indoor air quality.

The challenge of coordination between these different entities is a major barrier to the development of an effective holistic air quality management strategy. To add to the general complexity, the task of managing air quality has been now devolved to the counties, with the Council of Governors Committee on Environment bearing responsibility for coordinating air pollution management for the different counties. However, beyond the actual executive capabilities of each stakeholder, there is a degree of confusion with regards to the proper jurisdiction and responsibilities of monitoring and enforcing air pollution levels among some of them, since for example, both NEMA as well as the county governments count it as part of their mandate. This further adds to the question of what the distribution of tasks is between different agencies and institutions at various levels of government.

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The advent of devolution, with new roles assigned to counties but without adequate funding to perform them, has made the separation of tasks even more difficult. In this sense, additional conversations need to happen between NEMA and the various county agencies so that everyone is on the same page about who is responsible for what.

Such a situation is symptomatic of the struggles between organisations after the advent of the umbrella Environmental Management and Coordination Act (EMCA) established in Kenya in 1999. Under this framework, NEMA shouldn't take on the tasks of existing agencies, but rather is charged with coordinating their efforts. However, the current framework makes it easy for NEMA to overreach and take on roles originally assigned to others, if they think they are not performing as they should, a situation that could potentially resolve issues in the short term, but that could also stunt their development.

Other potential reasons for the existing air pollution data not being used to its full potential are a lack of funds and trained personnel needed to manage the reference stations and keep them running. There is also a generalised shortage of staff who can interpret the data effectively and issue public health warnings or make the appropriate urban planning recommendations. Hope is not lost, however; there are clear efforts from the likes of the University of Nairobi, which has been heavily involved in training programmes to correct this.

Another impediment to effective use of the existing data is the fact that much of it is simply not available to the public. This is despite Kenya having an Open Data Initiative and the right of access to public information being enshrined in the constitution. Publicly funded organisations, such as NEMA and KMD, should be more accountable, in accordance with international standards of transparency. It is only then that public participation in decision-making, as clearly stated in Kenya's constitution, can be made actionable. Ultimately, the development of a national air quality monitoring strategy can only be achieved if people are made aware of the quality of the air that they breathe and if they're given the proper vehicle for participation.

Kenya Air Quality Network

In the face of the confusion, air quality researchers and civil society in Kenya have not been silent.

As mentioned earlier, the University of Nairobi has conducted several short-term studies using high quality reference equipment. Also, UNEP, SEI and APHRC have complemented this with data from low-cost air quality monitors. Researchers involved in these initiatives have come together to form the Kenya Air Quality Network (KAQN) which focuses on three action areas: 1) Data research and instrumentation, 2) Policy and stakeholder engagement, 3) Education and public awareness. The Network has organised three meetings so far to update members on the progress being made by task forces assigned to work on each of the action areas. So far, the key thrust of KAQN has been to make the data from various studies using different low-cost monitors comparable so that broader claims about air quality in the city can be made.

Local governments seem to recognise this effort, which is why the Chief of Environment of Nairobi County attended KAQN's annual meeting in December 2016 and committed to initiating a process to develop an air quality management plan for the city. In this way, Nairobi County became the first, and so far only, county to have committed to developing an air quality management plan. Nonetheless, it must be noted that the Nairobi County government does not have any capacity to monitor air pollution as its office essentially deals with environment-related nuisances by crowdsourcing reports from the public. When I was at the county government, I was shown the register. Although there were no specific air quality-related complaints, there were a few complaints about noxious smells.

Unfortunately, after the 2017 election, it was unclear if the Chief of the Environment and the top county team that had initiated the process of developing a county air quality management plan for Nairobi were going to remain in their positions, which made it difficult to assess how the process was going to unfold.

MENR has also attended KAQN meetings and initiated a parallel process of developing a National Air Quality Management Strategy and Action Plan. It has established an Inter-Agency Committee of institutions that are working on different aspects of managing air pollution, including KAQN and the private sector. However, the process has currently stalled due to a dearth in funding as no specific budget line has been provided by the ministry.

So what comes next? How is Kenya going to tackle these thorny issues of coordination between entities, engagement with the public, and the lack of a well-defined budget for air quality related activities?

Some of the people I spoke to in Nairobi were of the opinion that the only way things would change was if Kenya developed a separate Clean Air Act, like the one the United States has. They believe that the current law cannot resolve the problem of ineffective coordination between the different government organisations, especially after devolution. Indeed, because of this, separate Acts have already been proposed for Water, Climate Change and Solid Waste Management to clarify the roles of different agencies. Many air quality researchers believe that a similar approach has been proposed for Air Quality.

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However, the development of such an Act will take time and effort, for which public pressure is key.

In this case, it is important for the public to write to the Principal Secretary of the Environment and hold the government accountable for the current state of progress, as this appears to be a critical step by which the state can be compelled to deal with the deadly threat of poor air quality and to help us answer Morpheus' question.

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