Air Quality Monitoring in Developing Regions

Dr. Chris Hazell-Marshall is air quality technical lead for ERM’s Europe Middle East and Africa region, and provides a perspective on the challenges of undertaking air quality monitoring in Developing Regions.

Introduction

ERM supports clients on managing air quality issues around the world and working in certain geographies like sub-Saharan Africa and in South East Asia brings unique challenges when it comes to air quality monitoring.

The Knowledge Gap

In many of the countries where ERM works, ambient air quality monitoring is not routinely undertaken by the government or by industry. As a result of the lack of existing data, ambient air quality monitoring frequently needs to be conducted. In addition to there being no existing data that can be used, this also means that there are no skilled local practitioners who can be brought into a project.

When such monitoring is undertaken using basic techniques, such as passive diffusion monitors, the Knowledge Gap can be bridged by ERM undertaking hands-on training and providing remote support to in-country personnel.

However, passive techniques are not appropriate for every pollutant, or every circumstance.

Where this is the case, more complex instrumentation must be used. Where this equipment must be used, more significant challenges arise in ensuring that equipment is being operated correctly and results are meaningful.

In the developed world large scale air quality monitoring networks using highly sophisticated certified monitors are commonplace. These sites require highly skilled practitioners in order to be run reliably and produce good quality, meaningful results. As a result of the Knowledge Gap, running such a site in developing regions is not possible in all but a few exceptional cases.

One of the exceptional cases is an ERM oil and gas project in southwest Africa, where local sub-consultants are being trained to service and calibrate equipment. These skills set the groundwork, as further air quality monitoring is rolled out by the government and industrial sectors. Another is for a power sector client in a major west Africa city. In this case, ERM is working with the client to undertake calibration, data verification and reporting to ensure high quality data is collected. In this case, there is significant upskilling required.

The Equipment Gap

In addition, to the Knowledge Gap, the Equipment Gap is equally as significant. Air quality monitors are primarily developed in, and designed for, operation in temperate climates. As a result, when these monitors are deployed in locations with significantly different climates monitors respond differently.
These differences are particularly exacerbated by heat and humidity, commonplace in many developing regions. This affects passive diffusion monitors where pollutant absorption onto sample media changes and light scattering devices where water droplets and humidity interfere with sampling. This is also a critical issue for the new generation low-cost gaseous monitors which rely upon solid state electrochemical cells. These cells experience cross-interference and one of the most critical factors of their correct function is in the complex algorithms that are required to decipher the readings. However, these algorithms are designed for temperate climates, and the error margins increase with heat and humidity.

The European Commission\(^1\) and the UK Government Department of the Environment Food and Rural Affairs\(^2\) have both flagged concerns about the reliability of data from low cost monitors. Low cost sensors were also discussed last year at the Air Pollution in London (APRIL) network meeting, concluding that the technology has applications in some specific cases, but without co-location with a full reference monitor is of limited use.

The use of a fully air-conditioned monitoring station, using certified monitors, circumvents these issues. However, due to the Knowledge Gap, running such stations in developing regions is, as has been noted, practically impossible in most cases.

**The Way Forward**

Air quality is a huge issue in many developing nations, with megacities frequently experiencing air pollution many times the air quality standards, and smaller rural communities also frequently exposed to high concentrations of pollutants. However, these are also the same locations where new infrastructure to push forward development is critical.

ERM is committed to working with clients in developing sustainable infrastructure and working with governments and NGOs. EIA is an important mechanism for these improvements, in terms of both gathering monitoring data and ensuring the sustainability of new projects. Air quality monitoring forms a critical element of this to understand ambient concentrations, sources and ultimately begin to formulate improvement through the EIA process.

*This article was written as a contribution to the EIA Quality Mark commitment to improving EIA practice*

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