Built environment

CSIR develops tool for measuring transport-related air quality

A multidisciplinary research team from the CSIR has developed and demonstrated the feasibility of a health risk assessment tool for measuring air quality impact relating to traffic emissions. Aspects taken into account are traffic congestion, air pollution, green house gas emissions and the relative health risk of these to susceptible communities.

During August, the team showcased the Aquila software tool to the South African National Energy Research Institute (SANERI), which commissioned the two-year research project. The research report will be handed to SANERI for possible future involvement of local and provincial government sectors. The demonstration was also attended by representatives from industry, municipalities and the Department of Water and Environmental Affairs. The tool will aid decision-support and enable monitoring of policy and project impacts.

Kobus Labuschagne

"We drew on CSIR expertise in traffic engineering, systems engineering, ICT, systems architecture and environmental chemistry for Project Aquila," explains Kobus Labuschagne, project leader from CSIR Built Environment.

Initially, researchers measured emission from CSIR colleagues' vehicles on the organisation's site in Pretoria, as part of a bench-marking exercise to gain some understanding of the South African vehicle fleet emission levels as opposed to internal standard emission factors. For the development of the Aquila tool, a section of the Pretoria-Johannesburg corridor was used as a research case study.

"The Aquila software is a real-time tool able to give an emission and health risk index at a given time, at a specific location. One can thus compare the air quality at places from one moment to another, detecting change. As the technology can visualise a given situation in high resolution graphical format, potential users can get a better understanding of the impact of measurements," notes Labuschagne.

Currently, transport-related data are not easily accessible and available. Electronic generation of data and the development of a data framework now provide an opportunity to vastly improve the accessibility of data on traffic flow, vehicle identification and emissions, and air monitoring. With Aquila, the web-based NyendaWeb platform is utilised for acquiring data in any format at source and transferring it to a temporary central repository on a server of choice. Based on sensor web concept, NyendaWeb will be an intelligent transport system (ITS) aimed at boosting collaborative R&D in ITS, transport engineering and traffic management, which includes road safety and other social and environmental aspects. Such collaboration will also result in human capital development in these fields.

"In developing the Aquila tool, we used some existing emission dispersion and related models that are generally applied in low granulation data environments. The Aquila tool is intended to lead to the development of enhanced analytical tools for data-rich environments. With modern computing power, one would be able to improve greatly on current models. As this is open source software, we'll invite peers to scrutinise and improve on aspects," says Labuschagne.

As part of the project, the research team also developed a sensor controller that is GPS-coded and transfers data wirelessly from its location to any defined server. "Once refined, such a sensor could have many other applications, including switching ones geyser at home on and off from the office," concludes Labuschagne.

- Hilda van Rooyen