How low cost monitoring network would be useful for real time air pollution observations, predictions and health impact studies? A project on particulate matter pollution in urban Coimbatore, India

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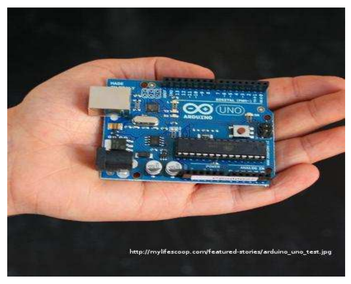
Monitoring network based on open source development, adherence to standardization and community participation could ensure the much needed sustainability for addressing pressing questions on air pollution

Open development

Open source methodology is reached a stage of viable production and development pathway in software[1] sector.

Open source hardware also follows the same surge[2] and promises.

Developments in open source micro controllers such as Arduino is playing a major role in that surge.



Inexpensive and easy usability makes them one of the rapid prototyping and development tools especially related with sensing and monitoring requirements.

This is forecast as the important enablers in creating basic environmental monitors, which can provide more intense and relevant real time data for richer evidence based decision making and related applications.

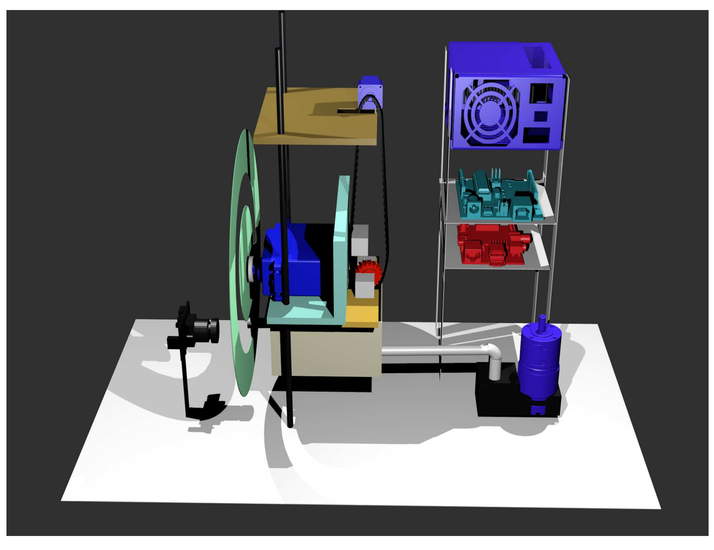
The crowd funded project air quality egg[3] is an Arduino based air quality monitor.

By following open source, crowd funding development model it achieve the objectives of being a low cost and high intense distributed real time air quality sensor networks.

Currently, the developed sensing system is capable of sense air pollutant such as Nitrogen dioxide and Carbon monoxide.

Though the sensor and the data generated from it is inferior to commercial sensors, it has great potential in establishing low cost high intense monitoring network.

The Current project in Coimbatore aims to develop a real time particulate matter monitor.



The monitor is based on low cost dust sensor coupled with chromatic modulation technique.

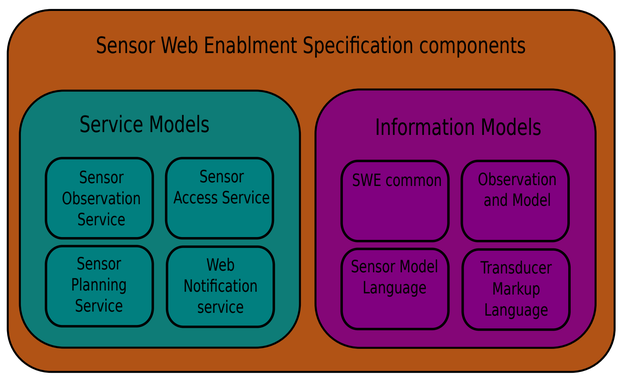
Standards

Standards and specifications directs the interoperability, accessibility and usability of different kind of services and applications.

In World Wide Web, standards[4] has ensured the simple and affordable access of Internet and its various applications.

This same logic was applied in adopting the Sensor Web Enablement (SWE) specifications for naturally and functionally diversified environmental sensor networks[5]. Open Geo spatial Consortium spear heads SWE specifications development[6].

Sensor Web Enablement specifications are set of standards comprised of information and service models to access and control the heterogeneous sensor resources[7].



For example in Taiwan[8] Sensor Web Enablement specifications were used for managing heterogeneous sensors directed for debris flow monitoring. It organize and manages divers sensor resources such as Geophones, mobile and fixed monitoring stations for a coordinated functionality of risk preparedness and disaster management.

Current project in Coimbatore region is applying SWE specifications for particulate monitor and integrate with other available sensor resources.

The objective is to implement air pollution modeling Web Processing Services (WPS) utilizing real time data from Sensor Observation Service (SOS) of particulate monitor and other real time data of study location available in Internet such as meteorological and remote sensed information.

Using Open GeoSMS specifications the project is set to disseminate the information upon location-specific queries.

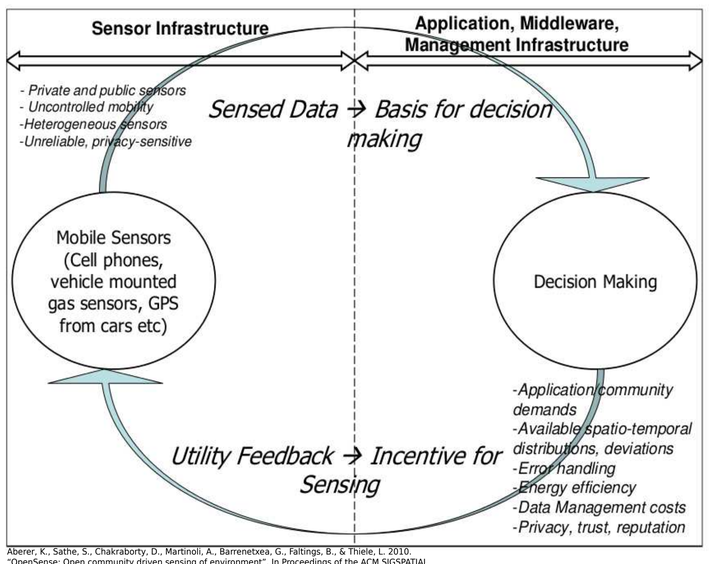
Community participation

To achieve better socio-ecological system understanding, it is increasingly stressed to have public involvement for close collaboration among user community and scientific establishments[9].

It is felt and proved that organizing people from different disciplines and social backgrounds can accomplish the needed community organization to manage the public goods[10] and enriches the localized contextual knowledge[11]. This makes the community participation a part of environmental monitoring initiatives.

This sets out a environmental monitoring program which is to be both enriching and involving the common public of a locality to get know about the level of complexity and interrelationship of their surrounding and encourage to find the solution for problems[12].

The new initiative of community sensing for air pollution shows bottom up form of air pollution monitoring in urban spaces[13].



Instead of conventional top up air pollution monitoring regime where the whole process is driven for regulatory compliances or research purposes, community sensing proposes a open infrastructure comprised of heterogeneous sensor owned or carried by community for air pollution monitoring.

The utilitarian model based set up of this in the city of Lausanne, Switzerland shows that, it is a quite workable model to drive the community involvement.

The current project in Coimbatore is following community sensing model.

As a community participation tool, the project is developing a outdoor augmented reality game "NUDGE". It is a game of location specific querying of particulate matter pollution and reflection on the pollution level.

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