



# Odourmap, an Online Web Based Tool for Field Observation, Resident Participation, and Odour Community Relations

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In response to odour regulation for solid waste management installations in France a web based tool was developed to monitor odour impacts using volunteer community field panels, spontaneous resident observations and professional panels. This approach has been used for some time in France, and allows close monitoring of the impact of new waste management sites after these are commissioned. A web based online application called Odourmap was designed for this purpose and implemented at a waste management facility in Angers, France, in 2012. In addition to online recording and displaying the observations of resident panels (by SMS or smartphone) other functionality was added, including online display of meteorological data, online dispersion model, resident complaint registration via internet and the option to show instrumental measurements of environmental parameters (e.g. e-nose, sonometer, production parameters). Odourmap combines all these information channels in one Google Maps based display, which allows time travel by the user, navigating via a customisable timeline. This allows to see the current situation, but also to see future predicted impacts of the plume based on prognostic weather data. Historical data on emissions, impacts, observations, complaints etc. can be seen for specific moments, or for a user selected period. In this period, results can be shown as an animated progression, or through statistical views such as pie charts. Odourmap allows different user levels to be set, serving the needs of administrators, operators, community representatives and resident citizens. This way a communication strategy can be managed. In the Angers situation, the impact of the waste management facility was not causing significant community annoyance. However, the tool is designed to be effective in providing transparency and managed communication in conflictive situations, allowing direct interaction between citizens, administrators and plant operators with the aim to de-escalate community conflicts and implementation of effective fact based odour impact management policies.

## 1. Introduction

Our behaviour as citizens is undergoing some fundamental changes in the way we communicate and interact. If you look around in any public space, like a train or a bus, you see many people looking at their smartphone, communicating almost continuously. This high connectivity unavoidably has implications for the way we can manage community relations, and more specifically those concerning sensory environmental impacts caused by odour, noise, dust, vibrations etc.

In the past, when citizens experienced environmental annoyance, they would register a complaint by telephone or in writing, addressing the emergency services or a dedicated point of contact of the local authorities, such as a complaint line.

It was then up to the authority to follow-up, and investigate the cause, or simply register the complaint and leave it at that. The citizen would rarely receive feedback. The complaint would contribute to the statistics, and the statistics might become relevant to environmental license enforcement. Typically, the management of the facilities that might cause the (odour) complaint would not be informed of specific complaints, citing privacy issues. Basically the process of resident feedback was a one way street.

Modern city management and incident management by emergency services demands ever more transparency, and also accountability. In a connected, e-padded society this means that citizens will expect to file complaints and observations instantly, online. They will also expect to see the follow up, and receive feedback on what was done with their complaint.

This means that we need to create systems that move on from the old unilateral communication to bilateral and multilateral communication in community relations.

It even implies transforming one-way complaint lines into involving the citizens in environmental protection through crowdsourcing: a process that involves outsourcing tasks to a distributed group of people.

## **2. Concept and methodology: What is Odourmap and what does it do?**

Odourmap is such a system, a web based application that shows information that is relevant to managing community relations where sensory impacts are concerned (odour, noise, dust ...)

Odourmap collects and registers, processes and displays, reports and communicates the following types of data in one display of a map with a timeline:

- citizen input, geo-referenced and with date/time, e.g. complaints, observations
- Input from systematic field observations, using citizen panels or professional observers or facility site staff
- Meteorological observations
- Meteorological predictions
- Modelled impacts using dispersion models
- Continuous emission monitoring data
- Continuous ambient monitoring data
- Facility process data (as far as relevant)
- Planned (maintenance, venting, transfers) and unplanned emission incidents
- Any other type of data that can be linked to a date/time and a location

Odourmap has a full secure user management facility, allowing fully customised levels of authority, in order to tailor the available data display to the user level.

Potential users are all the stakeholders in local environmental management:

- Citizens
- Local authorities (including emergency services, local police, local environmental staff)
- Relevant management levels of licensed facilities
  - Environmental officers
  - Production managers
  - Community relations officers
- Press and media

Odourmap provides the following usage:

- Online collection and registration of citizen observations and complaints via smartphone (app), internet page form, SMS or telephone
- Online display of complaints/observations at the correct geo-locations, on a Google-map type display

- With dispersion models and weather predictions, estimated impact and the risk of perceptible events in certain locations can be predicted. This can help citizens plan activities, just as they do taking weather predictions into account.
- Online display of actual weather and optionally also the modelled actual impact caused by known, regulated sources of emission. This can help in plausibility checks of observations, and in assigning observations/complaints to the most plausible source under the current windflow conditions.
- One-to-many communication, providing relevant authorities and or community relations staff at industrial installations to make relevant announcements to the public (on situations of heightened risk, recently occurred exceptional situations, information on the cause of smell incidents to reduce community anxiety over toxicity etc.)
- One-to-one or several-to-one-communication, for example to follow up individual complaints, and provide information on the follow-up of this complaint (was it caused by an incidental emission spike? Or an unfavourable weather event? Or something else). This can be done
  - Directly by the facility management or
  - in collaboration with the local authority and/or emergency services. Providing adequate information and giving attention to complainants can contribute meaningfully in reducing anxiety and the related stress symptoms.
- Continuous online display of emissions monitoring and compliance status of regulated facility sources
- Importantly, the display provides a timeline. This allows
  - Display of situations in the past (and in the future, where risk of impacts is concerned) You can 'time travel' and see situations develop
  - Animated sequences to see and analyse the progression of an incident, and the way it interacts with meteorological conditions and emission incidents
  - Statistical views, where the recorded citizen feedback and the information about emission sources, continuous monitoring data, weather data etc. can be processed statistically and reported in a standardised way. This allows for monitoring event limit values and also comparing progress (or the lack of it) in managing community impacts
  - Statistics on monitoring data (e-noses, emissions and ambient air monitoring, field panels)

Recording all relevant information on the local environment in one web based database application, with managed online display and statistical reporting facilities creates an environment to manage data collection, manage

Making available the web based Odournet application, with the information tailored to the specific requirements of the stakeholders, has several consequences and creates opportunities

1. *Involving the residents as a monitoring method*
  - a. Resident complaints and observations can be instantly recorded with the location and time of the complaint, and also the location and time of the sensory event (odour, noise etc) that caused the complaint. Having these complaints online on a map means that resident complaints and observations can become a monitoring tool, instantly warning facility operators and local authorities about events that are out of the ordinary
  - b. Resident panel can become involved in the monitoring of the environment around installations that carry a risk of causing sensory impacts. You can move away from the formality of complaints and pre-empt complaint situations by using citizen volunteer panels, facility staff panel and paid field observers as a real time monitoring tool. This can help in creating dialogue and a joint sense of purpose, using one transparent platform for data

2. *Complainants can receive individual feedback*

- a. Using the bilateral communication of complaint follow up in Odourmap provides a controlled traceable incident ticket follow up where involved stakeholders can combine information, leading in the end to one concerted outcome of investigation by the local authority or by the management/community liaison staff of the installation that may have caused the event
- b. This information can be shared with the complainant in a controlled one-on-one channel
- c. The complainants level of satisfaction with the follow-up can be recorded

3. *Provide transparent information in order to avoid information gap anxiety*

- a. Fast, correct provision of information can be vital in managing accidental emission incidents involving odorous compounds. Strong smelling compounds invariably raise questions on the risk of toxic effects. A clear information provision to the public is vital in these situations
- b. If citizens and other stakeholders get used to interpreting online modelling displays, they reach a better understanding on interpreting incidents, impacts caused by exceptional adverse weather situations etc
- c. Incidental emissions caused by planned activities can be announced by facility operators, and even modelled using prognostic weather data, in order to provide the relevant residents with information that helps them plan their lives around a transient risk of sensory annoyance.

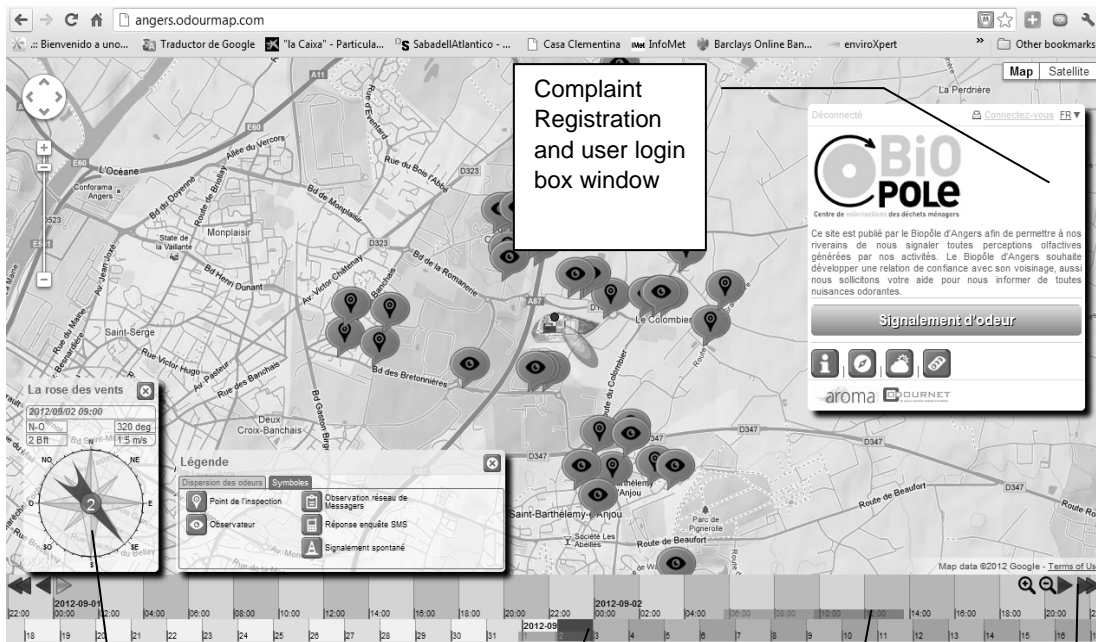
**3. An implementation example: Angers waste facility**

In France the regulatory system provides certain advantages if community panels are involved in monitoring impacts around municipal solid waste facilities <<reference>>.

This approach has been implemented in the last few years, using a variety of applications.

Within this context, the Odourmap platform can provide the required functionality, and potentially more.

The first proof of concept application has been set up for the Biopole facility management of a municipal waste management facility in Angers, France



Complaint Registration and user login box window

Display of meteo data, observed and prognostic

Now!

Timeline. The blue bar shows the period for which the data are displayed. The timebar can be animated or frozen for static viewing

Timeline controls, zoom in (weeks> days > hours), zoom out window

In the statistical widow, Odourmap generates statistical analysis over a user-defined period of time for each of its data channels, seen examples below

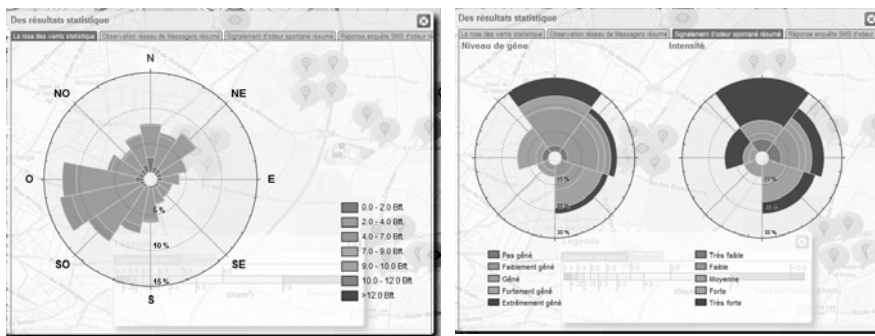


Figure 1: Example of the map and timeline display and statistical report views in Odourmap

The Angers implementation of Odourmap is a limited application, tailored to the requirements of the client including:

- Meteorological data (observed and prognostic)
- Online plume modelling, and displaying the estimated perceptible odour plume
- Complaints registration/ spontaneous citizen observations
- Juries de nez, or volunteer resident field panels who provide observations of perceptible odours on demand, when asked to do so by an automated SMS system. Using their mobile phone they indicate: type of smell and intensity
- OFIM field panel measurements of odour frequency, using trained observers. These observers go to predefined locations and record odour frequency, according to VDI3940

The system went online in late 2011 and is still operational today.

The main motive for the facility operator to put the system in place was to demonstrate their clear intention to work in collaboration with the citizens in reducing the impacts in the startup and commissioning phase of the installation.

The commissioning, thankfully, has created very few impacts, and therefore the full potential of Odourmap in reducing the level of antagonism in social conflicts over sensory environmental annoyance has not been demonstrated in this example. So much the better for the residents and the facility operator!

#### **4. Discussion**

In recent years, inevitably, internet and web based applications are being introduced in the management of the local environment. When this leads to direct citizen involvement this leads to a crowdsourcing approach.

Applications range from showing results of environmental monitoring online to online display of e-nose monitoring with associated online dispersion modelling results. Examples can be viewed online [www.geluidsnet.nl](http://www.geluidsnet.nl)

In city management web applications are being used to allow citizens to report potholes and broken street furniture: <http://mas-city.com/> and <http://www.fixmystreet.com/around?pc=Manchester>

In Boston the city even uses the i-phone ability to detect movement to make a statistical analysis of feedback, detecting where potholes develop using feedback from phones of motorists. The Street Bump app is an excellent example of using crowdsourcing effectively <http://streetbump.org/>

What all these applications have in common is that they are mostly one way streets: they collect information and display this on a map.

The Odourmap web application for managing sensory environmental annoyance discussed in this paper is being developed with an emphasis on providing a bilateral and multilateral communication platform, where all stakeholders can access information relevant to them, and stakeholders can choose how to communicate effectively responding to citizen feedback, as part of a communication relations and environmental management strategy aimed at reducing the frequency of impacts, as well as minimising citizen anxiety when these impacts occur.

In the next few years we can see citizens to come to expect to provide direct feedback on sensory environmental annoyance by using their smartphone app, and also trust that this information is acted upon effectively by the local environmental authority and the facility management that may have caused the impact.

Facility community relations management can benefit from these developments by increasing their options to be proactive, involving the local community in monitoring the impact of their activities and reducing anxiety levels. The role of the formal administrative process can be expected to diminish, while dynamic community relations strategies will provide the necessary tools to work things out between them, if the good will is there. Crowdsourcing in managing the local environment is here to stay.