



D-NOSES

Distributed Network for Odour Sensing,
Empowerment and Sustainability

Standardizing the monitoring of odour pollution through citizen science: the experience in Spain

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Acronyms

- AEAS - Asociación Española de Aguas Sanitarias
- AG - Action Group
- AMIGO - International Environmental Association of Odour Managers
- D-NOSES - Distributed Network for Odour Sensing Empowerment and Sustainability
- GDPR - General Data Protection Regulation
- IOMS - Instrumental Odour Monitoring Systems
- ISO - International Organization for Standardization
- OC - OdourCollect
- NGOs - Non-Governmental Organisation
- TG - Task Group
- TG01 - Task group of participation and transparency
- TG02- Task group of methodology
- TG03- Task group of plausibility verification
- TG04 - Task group of terms and definitions
- UNE - Spanish Standardization Body
- WWTP - WasteWater Treatment Plant

Summary

The D-NOSES project has been a great push to the methodologies for assessing odour impact, allowing to go beyond the state-of-the-art by introducing citizen science for real time monitoring from the receptors' point of view.

There are many methodologies for assessing odour impact, such as dynamic olfactometry coupled with the use of dispersion models, field inspections, etc. However, none of these techniques is able to link this odour impact to the annoyance caused. Traditionally, odour impact assessment has been carried out using what is known as psychometry. Psychometry is a field of study focusing on the theory and technique of psychological measurement that has been used for several decades in the odour field.

However, nowadays it is possible to assess odour impact using more advanced psychometric tools based on the use of mobile applications that record the exact time and location of an odour observation.

The International Environmental Association of Odour Managers (AMIGO), along with other D-NOSES partners (Ibercivis / Science for Change), consultants, NGOs, odour emitting activities and public administrations (AMB, following their active participation in D-NOSES), is developing the first text on mapping odour annoyance by using advanced psychometry based on citizen science. The proposed text will allow the unification of criteria when evaluating the odour annoyance and the future uptake of the new methodology by environmental authorities and public bodies to inform local decision making and new odour regulations.

After a consultation with the Spanish Standardization Body (UNE), the development of a national standard in Spain before developing a European Standard was recommended, which eventually could be adopted at European level as an European standard. The 3rd of May 2019, the first meeting of the Spanish working group towards the technical standard took place, and since then, several meetings have been carried out with the aim of publishing the final text for the Spanish standard by the beginning of 2022.

The aim of this public deliverable is to detail the work being done to date in the Spanish working group to develop the first technical standard to monitor odour pollution based on citizen science. The standard will be an important advancement in terms of improving odour pollution management, but also for the citizen science community in terms of recognition of the validity of the proposed methodology.

The document is structured as follows:

Chapter 1. INTRODUCTION & SCOPE: This section describes how and why the proposal of developing a technical standard/guideline that will deal with odour monitoring by using citizen science started.

Chapter 2. STRUCTURE: This chapter describes how the text and work have been structured and the working groups that have been created.

Chapter 3. TG01: This chapter deals with the work done on Task Group 1 (TG01) working on participation of all the stakeholders and their roles on the development of each project.

Chapter 4. TG02: This chapter deals with the part done by Task Group 2 (TG02) that is working on how and what information should be recorded on the area of study.

Chapter 5. TG03: This chapter deals with the plausibility check for the reports, done by the Task Group 3 (TG03).

Chapter 6. TG04: This section describes the work done by Task Group 4 (TG04) that is based on the homogenization of the text and the terms' definitions.

Chapter 7. CONCLUSIONS: The development of this standard is one of the main achievements of the D-NOSES project to place odour pollution in the policies agendas and inform future evidence-based decision making and regulations.

Chapter 8. ACKNOWLEDGMENTS: The DNOSES thanks to all volunteers involved in the work to develop the first standard to monitor odour pollution based on citizen science.

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1. Introduction & scope

This section describes how and why the proposal of developing a technical standard/guideline that will deal with odour monitoring based on citizen science.

At European level, traditionally **odour dose-response studies** have been based on questionnaires, surveys, odour diaries, etc. under the scope of some guidelines and standards (e.g. [VDI 3883-1: 2015 German Standard about effects and assessment of odours](#)¹). However, this standard does not include two important issues on the data to be collected: **1) the real time of an impact and 2) the exact position of the complaint**. These data are two of the most important pieces of information to collect in order to detect and monitor an impacted area by odour pollution.

Typically, the conducted odour studies have been developed through odour measurement methods, such as **dynamic olfactometry**, which is a standardised way of measuring odour concentrations using the human sense of smell. Dynamic olfactometry can be used to measure the concentration of odours emitted at the source, that is, at the emission level, and **it cannot give information about the presence of odours in ambient air**, where receptors are². Without a harmonized European approach, addressing odour at local level is challenging and it leaves citizens who have to deal with odour annoyance in their daily lives, to their own devices, while odour emitting industries also do not have the benefit of a clear regulatory framework or a continuous monitoring system to adapt their activities.

However, it is now possible to assess odour impact using **more advanced psychometric tools** based on the use of mobile applications that allow the exact location and instant of an odour incidence to be recorded. To date, there are no technical standards to our knowledge that regulate this methodology, although there are several tools on the market, and each day, new studies about odour complaints are published. Standardizing a methodology can help future studies for being more productive, more reliable, and comparable among each other, and will contribute to the official uptake of the proposed methodology by environmental authorities and/or to establish new immission limits in future odour regulations.

D-NOSES project attempts to **introduce odour pollution in the policies agendas** in the medium term and promote the D-NOSES shifts from the existing top-down and expert-led process, to a bottom-up approach empowering citizens to become a driving force for change.

¹ VDI 3883 Part 1, 2015, Effects and assessment of odours – Assessment of Odour Annoyance - Questionnaires, German Engineering Association VDI/DIN Commission on Air Pollution Control (KRdL), Germany.

² See more information about traditional odour impact assessment Methods in: D-NOSES Deliverable 2.1 Review on odour pollution, odour measurement and abatement techniques, retrieved from: https://dnoses.eu/wp-content/uploads/2019/10/D2.1_Review-on-odour-pollution-measurement-abatement_v3.2.pdf

This methodology is not aimed to change the traditional approaches based on standardized and existing methodologies, but to complement the available tools when others can not be used or the results may have a lot of uncertainties (due to measurement methods, sources, panelists, or even when the sources are unknown). A discussion on when to use and when not to use each existing method for monitoring odour pollution is presented in D-NOSES D2.1 and also summarised in the Odour Observatory (<https://odourobservatory.org/measuring-odour/>).

Therefore, the development of this new Spanish Standard on odour monitoring through citizen science, as a previous step to eventually inform a European Standard, is a direct result of the impact collectively achieved by D-NOSES with respect to its objective: *Standardized methodologies and impact criteria and provide common scientific guidelines for policy making*. This process of establishing a new EU-Wide odour management standard was not explicitly planned before the project, but the opportunity emerged from the interactions among the multi-disciplinary partners, as a step towards establishing an EU-wide standard upon which new policies can be designed and established. The new standard has started from the national level (in Spain) and is supported by UNE (Spanish Standardization body), who has been accompanying and advising during the process. A contract for the publication of the standard has been signed during the year 2021 between AMIGO and UNE, now that the text of the standard is almost finalised, although the work started in 2019. The payment of the contract has been made through the association AMIGO, which has had the financial support of the entities and persons involved in the development, including as an important part of the total amount part of the funds of the European H2020 project D-NOSES.

So, considering all these, that's why the initiative to elaborate this standard arises due to the need to **standardize the use of this type of technologies that evaluate and map odour nuisance based on citizen science methodologies**. The targeted body of this future Spanish Standard is any citizen, entity, NGO, association, public administration or private company (odour emitting activities, olfactometry laboratories, environmental consultancies, etc.) that wants to held a project for odour impact mapping through citizen science, so this document under development is trying to define an understandable text for all comprehension levels, no matter if your expertise is odour pollution and management or not.

Dissemination and outreach have been the focuses throughout this process. A first paper entitled "A New Methodology Based on Citizen Science to Improve Environmental Odour Management" was issued within the framework of the NOSE Conference 2018³, one of the most important international conferences on odours, which took place in Milan in September 2018. A second paper⁴ presenting the work on the standard was presented at NOSE 2020.

³ Arias R., Capelli L., Diaz Jimenez C. (2018). A New Methodology Based on Citizen Science to Improve Environmental Odour Management, Chemical Engineering Transactions, 68, 7-12. <https://doi.org/10.3303/CET1868002>

⁴ Izquierdo, C. et al. (2021). "Developing a New Spanish Standard: Building Collaborative Odour Maps through Citizen Science". The Italian Association of Chemical Engineering, VOL. 82, 2020. Retrieved from: [Developing of a New Spanish Standard "Building Collaborative Odour Maps through Citizen Science"](#) (Accessed 10/09/2021).

2. Structure

This section describes the work being done at this stage by a wide group of Spanish experts in different fields in order to publish the first standard that will deal with odour mapping by using citizen science.

The development of this standard is being carried out by a group of experts including some of the actors involved in the subject: consultancies, laboratories, public administration, industrial managers and owners, associations, citizen science experts and NGOs; among which are included some partners and stakeholders of D-NOSES such as: Ibercivis / Science for Change, Metropolitan Area of Barcelona (AMB) and AMIGO. There have been more than 10 virtual meetings and 2 face-to-face meetings with all members, till the writing of this text. In addition, there have been multiple meetings of the Task Groups (TG). The first virtual meeting started with a total of 10 participants. As of today, the group already has a total of 22 volunteers. This group has the goal to have a first draft of the standard in December 2021.

About the national standardisation body in Spain (UNE) is formally part of several CEN (i.e. the European Committee for Standardisation) groups dealing with odours standards, such as the *CEN/TC 264/WG 41* dealing with Instrumental Odour Monitoring Systems and the *CEN/TC 264/WG 2* dealing with the review of the standard about Dynamic Olfactometry. According to the early feedback received by experts in policy making, the approach defined and implemented has been the following: initially target the development of a national-level standard and subsequently extend it to the European level. Spain was chosen as this first country for several reasons:

1. The presence of a number of partners within the D-NOSES consortium, including the Project Coordinator and the international association of odour experts AMIGO.
2. The presence of AEAS (Asociación Española de Aguas Sanitarias), an association of professionals involved in wastewater treatment activities, and, within it, a working group dedicated to odours. A relationship has been established, although not formally, but as a collaborative partnership between AMIGO and AEAS.
3. The interest of the regional environmental authority of the Metropolitan Area of Barcelona (AMB) in participating in the development of the standard, after their active role in the D-NOSES Barcelona pilot.
4. The presence of a network of actors that are already working on different odour-related projects in Spain.

2.1. Draft standard index

An initial structure was proposed for the index of the document, reviewed by each TG, as follows:

1. Objectives and scope
2. Reference standards
3. Terms and definitions (TG04)
4. Symbols and abbreviations
5. Participation and transparency (TG01)
 - a. Participation
 - i. Actors involved, roles and responsibilities
 - ii. Action group
 - b. Transparency
 - i. Entitlement to information or right to information
 1. Communication tools design
 2. Joint evaluation plans design
6. Methodology (TG02)
 - a. Definition of the evaluation area
 - b. Coordinator and participants of the citizen science project
 - i. Director and coordinator of odour episode alerts
 - ii. Selection of participants (citizens' panel)
 - c. Form Design
 - d. Duration of monitoring
7. Plausibility verification (TG03)
 - a. Minimum criteria of representativeness
 - b. Minimum criteria for using meteorology
 - c. Minimum criteria for using mathematical dispersion algorithms
 - d. Other verifications

2.2. Group & Meetings

The working group is composed of more than 22 members. As mentioned above, this group has a wide expertise in odour pollution and citizen science, and that is one of its best assets. It is composed of olfactometry laboratories, WWTP managers and designers, environmental associations related to odours and air quality, public administrations, citizen science experts, Technology Centres, private companies specialised in meteorological services, etc.

During the year 2019, three online meetings were held in order to define the collaborators, and the main purpose of this first idea. The 18th of September 2019 took place the 4th meeting of the group dealing with the Spanish standard on odour mapping, but it was the first face-to-face meeting and was held in Barcelona. After that one, another on-site meeting was held in Tarragona, in January 2020, but it was the last face-to-face meeting due to the Covid-19 pandemic. After that, all the work done has been shared through online meetings.



Figure 1: Picture during the second face-to-face meeting in Tarragona (January 2020).

During the course of the different meetings, several topics have been discussed, among which the following can be highlighted:

- The overall intention of the working group is to develop a standard, although it may eventually become a technical guide.
- Funding was needed to take the standard forward in the Spanish Standardization body and cover for the associated costs.
- In order for the standard to be operationalizable, it should include all principles, tools and methods to enable others to undertake similar projects. Thus the work was divided into four blocks, and four working groups or **Task Groups (TG)** were created. The volunteers chose in which of the task groups they wanted to collaborate, depending on their own expertise and interests, except for the TG04, which consists of the coordinators of the other 3 TGs. In addition, a group coordinator was elected for each TG, and an overall coordinator for the initiative. So far, each group has worked independently on their topics in order to advance on the text, and currently the contents generated by each TG and the vocabulary used are being homogenized.
 - **TG01** Participation and transparency
 - **TG02** Methodology
 - **TG03** Plausibility verification
 - **TG04** Terms and definitions

Based on this division of tasks, a draft index was defined, as shown in the previous section. The way of working has been defined, based on the creation of an online shared folder, where each task group works on its document and in face-to-face or (mostly) online meetings all the work done is shared and decisions are not made until consensus is reached.

3. TG01 Participation and transparency

This section describes the work being done at this stage by the task group TG01, which has divided this work into 2 sections: participation and transparency.

The task of the first group is based on citizen science methodologies, as it is dealing with participation and transparency. The [10 pilots](#) carried out in the D-NOSES project provided a huge expertise for the development of this task. For instance, the standard uses the **quadruple helix**⁵ engagement model to define the actors to get involved, one of the pillars of the D-NOSES methodology (see more information in D4.1 Multilevel engagement plan for stakeholders and communities⁶). The *participation section* includes the different roles and responsibilities of each stakeholder:

- **Potential odour impact emitters:** represented by all those industries that generate odour in their daily activities and which may be a potential source of nuisance in either a residential or industrial environment (waste-water treatment plants, waste management centres, pet food production, slaughterhouses, etc.). They must have knowledge of all the processes and activities that may generate potential odour emissions and will play an active role in resolving the impacts that they generate.
- **Potential receptors of the odour impact:** represented by citizens in general and people located close to odour emitting activities. One of their key tasks will be the reporting of nuisance or impact due to odour. These reports should be objective regarding the existence or not of odour, the type of smell, the degree of discomfort or the intensity.
- **Government authorities:** represented by organisms in charge of controlling industrial processes. On the other hand, they must also inform and be informed, control the incidents produced, encourage and promote citizen participation. Government authorities will be to establish norms, guidelines, as well.
- **Universities, research centres or other organizations** as bilateral groups. They will generate valuable information and advice in the process of dialogue and progress for

⁵ Schütz, F., Heidingsfelder, M.L., Schraudner, M. (2019), "Co-shaping the Future in Quadruple Helix Innovation Systems: Uncovering Public Preferences toward Participatory Research and Innovation", *She Ji: The Journal of Design, Economics, and Innovation*, Volume 5, Issue 2, Pages 128-146, ISSN 2405-8726, <https://doi.org/10.1016/j.sheji.2019.04.002>.

⁶ Balestrini M., Creus J., Errandonea L., Arias R., Salas Seoane N. (2018), Map of odour issues and priorities. Multilevel engagement plan for stakeholders and communities, D-NOSES, H2020-SwafS-23-2017-789315. Retrieved from: <https://dnoses.eu/wp-content/uploads/2019/01/D4.1-Map-of-Odour-Issues.pdf>

the identification and expansion of information, as well as to create complementary ways to solve the problem.

Following the mapping of the main stakeholders, an **Action Group** shall be defined, which will be constituted by an interdisciplinary team of people and organisms from the above stakeholder groups to develop the main action. It is essential that the action group takes a proactive position, understanding and respecting the different actors within the same group. Additionally, an external person will be appointed as mediator between all the entities involved during the mapping process, which will be the Coordinator of the Action Group.

This Action Group would be responsible for drafting an **Action Plan**, with the aim of proposing actions, meetings and dates, and an overall objective for the project, to be agreed between all participants so as to manage expectations of the expected results. In addition, a **Communication Plan** will be defined, with the aim of creating a roadmap setting out how and how often the group should communicate both internally and externally, together with the key messages and engagement actions to be deployed.



Figure 2. Quadruple helix stakeholders that shall get involved in each project.

In the *transparency section*, the right to access information for any stakeholder is defined through several guidelines, such as the design of open communication tools, a communication portal, project image, the need to provide feedback, etc. Open data is promoted, as the data generated by citizens belongs to the citizens that generated the data, following the 10 principles of citizen science by ECSA (<https://eu-citizen.science/resource/88>). GDPR compliance must be guaranteed and ethics aspects respected at all times (including copyright, intellectual property, data sharing agreements, confidentiality, attribution). This section should also include the design of joint evaluation plans, in order to strengthen the legitimacy of the evaluation group, select follow-up indicators, identify and eliminate conflicts of interest, make the evaluation visible, and account for any social or policy impacts.

4. TG02 Methodology

This chapter describes the work done by the task group TG02, which specifies how and what information to monitor odour pollution should be recorded in the area of study.

The TG02 group worked on the **data collection methodology** including several aspects:

- First of all, the **evaluation area** must be defined and delimited according to the characteristics of the source(s), considering the number of sources.
- Number of **participants**.
- Previous odour complaints should also be taken into account, especially those indicating the location of the complaints.
- Also, a **basic questionnaire** has been developed, considering the minimum data to be reported, trying to make it easy for the citizens, but useful for the analysis. This will guarantee the collection of a minimum data associated to each odour observation for a correct monitoring of the odour impact, and reproducible and comparable data with any other similar project.

Nowadays, there are several apps in the market that allow for collaborative odour mapping such as [OdourCollect](#), [Nasapp](#) or [Ortelium](#), while others are specifically designed on a project by project basis. The D-NOSES experience with the OdourCollect⁷ App has proved relevant to include several aspects about the operation and use of this app in the standard. Besides, the use of the OdourCollect tool in 10 D-NOSES pilots has provided the team with a great expertise in monitoring different odour pollution scenarios, and has allowed to co-create and improve several aspects of the app based on the demands of the citizens, the environmental authorities or the emitting activities involved in the D-NOSES pilots. The aim of the group dealing with the development of the Standard is to specify the characteristics of this kind of apps/tools to be able to fulfill the objectives of an odour mapping project based on the requirements of the standard, while being representative and comparable with each other, repeatable, reproducible and consistent. This standard is not focused on data collection methodologies based on apps, but on **any means of collecting real time information from citizens. Instead, what is defined in the standard is an overall methodology to monitor odour pollution based on citizen science.** The app or tool to be used will depend on the project leaders and on other variables, such as the access to technology of the communities to get engaged in each project.

⁷ OdourCollect is an open data App that allows the collection and validation of odour observations gathered by citizens in local communities affected by odour pollution. It is based on the concept of “**citizen-sensor**” and promotes an **inclusive engagement approach** to build **odour maps collaboratively** by anyone affected. All collected data can be visualised in the map without the need of registering. OdourCollect was conceptualised by [Science for Change](#) and further developed through the D-NOSES project. The intellectual property of OdourCollect belongs to the D-NOSES Project Coordinator, Ms. Rosa Arias.

As explained in the previous section, several roles should be defined inside each project developed under this Standard: a coordinator and participants in the citizen science project from the quadruple helix, whose responsibilities and tasks should be defined. The coordinator must be particularly careful to ensure that participants comply with the established commitments at all times. A minimum number of participants is established according to the population density and the number of existing odour-emitting sources. This number of participants should be maintained throughout the whole project. In addition, the participants should receive training in odour identification or/and on the use of the tools for reporting, on a regular basis to maintain motivation and their engagement throughout the duration of the Project.

Moreover, in order to be completely inclusive, **three different formats are proposed for data collection**, which should be agreed in advance by the action group: On paper, in digital format or through a computer/smartphone tool (app). For this purpose, a form has been proposed to be used in any of the formats to guarantee the minimum requirements in terms of data for each of the odour observations collected, either in digital format, on paper, or when applicable, through an app. This last option automatically provides the real time and position (coordinates) of each odour record, so, when possible, this is the option recommended by this group.

In addition, the action group should define the duration of the project. Depending on the project objectives, the data collection period should be the maximum possible to contain different meteorological conditions (i.e. one year), although this is a long period of time for citizen science projects where volunteers are involved and may be challenging. In some cases, shorter periods of time may be feasible (e.g. three months), which may be selected to account for the maximum impact over the population (i.e. summer period) or for some specific emission conditions related to the operation of the emitting activities (e.g. in cases of non-continuous processes). The [D-NOSES pilot in Barcelona](#) provided an important input so as to not set long periods of time as compulsory for this type of studies. Even though the data collection period lasted for one year in that case, the data consistency was guaranteed from the first month of data collection, since the percentage of the odours mapped remained the same from month 1 to month 12, indicating that longer periods of time do not necessarily provide extra information. At this stage, it is foreseen that the text will recommend a minimum duration, but the final decision has not been taken, as we understand that this could be decided on a case-by-case scenario. The procedure for measuring/verifying the results obtained must be defined in accordance with the task group 3 that deals with the plausibility check.

Finally, the TG02 is trying to establish a scale and classification of “Odour Episodes”, depending on different grades of odour impact. This scale will classify the “Odour Episodes” from low to high impact level, taking into account the number of odour reports received in the area, in which period of time, with which frequency, together with the intensity and/or hedonic tone scales.

5. TG03 Plausibility Verification

This section deals with the work being done by the task group TG03, which is related to available tools to perform plausibility checks for each project, and the minimum criteria for using them.

Odour observations depend on 1) experience, 2) expectations, 3) motivation and 4) alertness. For example, if you play hide-and-seek many times, your experience will tell you that there will probably be someone below the bed. Also you will expect to be hiding in the next go, and for this reason you will be highly motivated to seek anywhere. Also your senses will be more alert to perceive small noticeable differences that will indicate that someone is around.

The observer effect is a type of reactivity in which individuals modify an aspect of their behaviour in response to their awareness of being observed. This can undermine the integrity of the results of a project, that is why, there is a need for a check on the plausibility of the odour observations.

As in any citizen science project, having people experienced, motivated, alerted and with expectations to change an odour-impact situation, will produce a certain bias in the results. The aim of the plausibility checks is not to correct that bias, but to check that the participant's observation could be fairly correct.

The standardized way to check if an odour observation was right or wrong is by checking wind direction/intensity at a suitable weather station. The [German standard VDI 3883-4 : 2017](#)⁸ about processing odour complaints, has been proposed as a basis to start this section of plausibility verification, which checks plausibility according to basic meteorological data (wind directions). However, using just meteorological observations will not be enough, for example, in cases where there is complex topography, unknown or multiple odour sources or changing land uses that are relevant to a case study.

TG03 has also considered other factors to check plausibility observations, such as the group effect, that is, the number of similar reports made at the same time. The minimum number of reports from different participants and the time period in which they are received should be defined by the group members, depending on statistics, learned experiences or by consensus (still to be defined). Also, the radius of application (study area), the odour typology, and land

⁸ VDI 3883 Part 4, 2017, Effects and assessment of odours - Processing odour complaint, German Engineering Association VDI/DIN Commission on Air Pollution Control (KRdL), Germany.

use (rural, industrial, etc.) or whether the odours come from one or several sources, should be considered and defined.

Several thoughts and experiences were shared, in which the validity of complaints was treated according to population size and odour sources number in the studied area and taking into account the quality and intensity of the odour.

Also the possibility of validating meteorology using different methods was proposed by the use of: 1. Weather stations, 2. Weather models, 3. Transport models and 4. Odour dispersion models, and new tools are also being considered to contribute to the plausibility checks (such as Instrumental Odour Monitoring Systems or IOMS).

For all these tools and methods to be used for the plausibility check, a minimum criteria has been defined for its use. Besides, the advantages and disadvantages are numbered and other extra recommendations are described for each method, instead of just recommending or naming any specific tools.

All these proposals derived from the experiences and know-how of the volunteers of the group, who have been working in these areas for years, are on the table and must be treated and approved, based on, first of all, scientific information, and if not possible, in previous and successful case studies.

6. TG04 Terms and definitions

A last group was created in order to homogenise the text and use a common vocabulary that is in line with the structure and work of all the groups.

The task of this group is to create a common vocabulary and abbreviations, based on the work already done at this stage and on previous standards in order to have a proper and coherent language that is understandable for anyone reading and using this document. The group is formed by the 3 coordinators of the previous task groups, as they are the ones that know better the language used in each point of the document, and is coordinated by another person.

As a starting point, a list of keywords and terms was collected from the document; the ones that are similar were homogenised by a voting system, afterwards, a bibliographic search was made through previous European Standards or ISO documents, and a preliminary description was defined for the terms with no previous Standardized definitions. This group would review this list from time to time as news terms appear while the document is open to collaborations and development.

Currently, the definitions are being agreed and, in the following step, terms will be used coherently in all the sections of the standard.

7. Conclusions

The development of a Standard should be considered as one of the greatest achievements of the D-NOSES project to inform evidence-based decision making and future regulations.

The aim of this document is to describe the work being done since 2019 in Spain by an interdisciplinary working group with a wide expertise, both in odour pollution and citizen science, to publish the first standard that will deal with odour pollution monitoring by using citizen science. Although this Standard has started as a national one, the aim of the group is to set it as a reference in any other country, and promote its European uptake, after the results are shown to the world. This has been the case for the main odour standards, such as EN 13725:2003 (dynamic olfactometry, adopted from the original Dutch standard) or EN 16841:2016 (field inspections, adopted from the original German standard).

The methodology developed on this Standard does not have the intention of changing the traditional approaches based on standardized and existing methodologies, but to complement the available methodologies to account for real time monitoring from the receptors' point of view, as explained in previous D-NOSES deliverable D2.1⁹, publicly available. Particularly when other methods can not be used, because the sources are unknown or unmeasurable, in complex situations with several emitting activities, for activities with important fugitive emissions difficult to quantify (e.g. refineries or landfills), or when the results may have a lot of uncertainties or do not match with the actual odour impact on the citizens (due to measurement methods, sources, panelists, dispersion modeling, etc), the alternative methodology proposed based on citizen science may make the difference to reduce the impact over the affected population.

D-NOSES project aims to place odour pollution in the policies agendas in the next few years and to promote this bottom-up approach methodology. In Spain, citizens' perception is mostly recorded through complaints that usually are not studied thoroughly, mostly because of lack of technical knowledge in local administrations. Hopefully, the future Standard will accelerate times between the beginning of an odour conflict and the implementation of solutions. Additionally, the presence of volunteers from all quadruple-helix sectors (public authorities, industries, civil society and academia) in the standardization group will assure that the final document gathers the different perspectives towards the co-creation of improvements.

⁹ D-NOSES Deliverable 2.1 Review on odour pollution, odour measurement and abatement techniques, retrieved from: https://dnoses.eu/wp-content/uploads/2019/10/D2.1_Review-on-odour-pollution-measurement-abatement_v3.2.pdf

8. Acknowledgments

Huge effort from a great team!

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9. References

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