

IMPARTIAL SCIENTIFIC ADVICE FOR CITIZEN PARTICIPATION IN DECISION MAKING PROCESSES

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Abstract

The Chemistry Shop of Groningen University has a history of more than 25 years of opening scientific research to civil society. It gives (mostly free) advice to the non-profit side of civil society, such as citizen and neighbourhood groups, workers associations, patients groups, environmental organisations, et cetera.

In many of our cases there is some kind of dispute between citizens, and companies or local authorities. Often, all parties refuse to talk because of mistrust and not understanding each other's motives. In this paper I will describe the role that we play in these disputes. There are different stages in which our science communication has an influence. This ranges from advise on scientific reports that are used by other parties, to doing additional research, and participation in the discussion with stakeholders. I will describe a number of cases, mostly focusing on the issue of 'odour pollution'.

In our work, we maintain our impartiality as scientists, and integrate other knowledge domains such as law and health. Sometimes we can achieve absolutely nothing for our client group, sometimes we achieve more than they hoped for. In general, our scientific support allows the citizens to discuss on an equal level with the other parties, because they can better handle the scientific and technical details of the issue. In many cases, our involvement benefits all actors involved, since in the end trust is restored. Therefore, the science shop is a good practice to involve citizens in the political decision making process, especially in local and regional issues. The citizens get the information and support that they need to participate (empowerment). By the way, for a scientist, communicating science with 'real people' in real troublesome situations is also very rewarding.

Keywords: risk communication, trust, university, civil society, science shop

1. Introduction

Science shops provide independent, participatory research support to civil society. They both use traditional science communication techniques to produce usable results, and they are part of an interactive science communication system. Civil society groups can approach a science shop to have research done on their behalf, to improve living conditions, tackle environmental or societal issues, etc. Science shops work demand driven, and usually free of charge. They normally do not work for companies, since there are sufficient other facilities and subsidies for companies to have research done. All research results will be made public for wider dissemination and use. Science shops help to articulate civil society issues, putting citizens' requests on the research agenda, and supporting citizens in the subsequent use of research results. The process includes more than two one way flows of 'questions' and 'answers', there is a lot of interaction and co-production of knowledge. As an independent, trusted source, science shops can have a special position as facilitators in risk communication. Science shops currently exist in a number of countries (www.scienceshops.org), and are often part of a university. That way, science shops can benefit research, higher education and civil society simultaneously [3].

The Chemistry Shop of Groningen University has a history of more than 25 years of opening scientific research to civil society (in co-operation with the other eight science shops at the University of Groningen). It gives (mostly free) advice to the non-profit side of civil society, such as citizen and neighbourhood groups, workers associations, patients groups, environmental organisations, et cetera.

In many of our cases there is some kind of dispute between citizens, and companies or local authorities. Often, all parties refuse to talk because of mistrust and not understanding each other's motives. In this paper I will describe the role that we play in these disputes. There are different stages in which our science communication has an influence. This ranges from advise on scientific reports that are used by other parties, to doing additional research, and participation in the discussion with stakeholders. I will describe a number of cases, mostly focusing on the issue of 'odour pollution'. I will elaborate on the role of impartial advice in making decisions.

In our work, we maintain our impartiality as scientists, and integrate other knowledge domains such as law and health. Sometimes we can achieve absolutely nothing for our client group, sometimes we achieve more than they hoped for. In general, our scientific support allows the citizens to discuss on an equal level with the other parties, because they can better handle the scientific and technical details of the issue. In many cases, our involvement benefits all actors involved, since in the end trust is restored. Therefore, the science shop is a good practice to involve citizens in the political decision making process, especially in local and regional issues. The citizens get the information and support

that they need to participate (empowerment). By the way, for a scientist, communicating science with 'real people' in real troublesome situations is also very rewarding.

2. Case examples

The next two case examples show clearly that sometimes we achieve absolutely nothing and sometimes we achieve just about everything for our clients in decision making processes. I will describe some less black and white cases thereafter.

2.1 No success

A family lived directly (15 m) next to an industrial laundry. What they smelled was a washing machine/ironing odour. Also moisture was an issue. After their retirement, they were home more often and annoyance started. A consultancy firm made a standard calculation and a report, which stated that there was no problem, except maybe at a window on the first floor. However, the calculation models used for air pollution dispersion do not have this accuracy! We did a manual calculation, with all required corrections for the vicinity-effect, but unfortunately we could not firmly state that there was a violation of applicable limits. This is where science can not provide answers. Since the consultancy company originally involved did claim exactness, the local authorities decided to believe them and hold on to their report. In oral communications to me, the company director was more open, but in official meetings he did not change the official outcome written down by an intern in their report. The family eventually had to move themselves. For the other people in the street the annoyance was less and they are still coping with it.

This is a clear case of not understanding 'scientific uncertainty' by local authorities and there was not a thing we could do to change that. The company had a certificate to do odour analysis, and we did not. However, this certificate reflects their certification to do actual empirical measurements (measuring odour units in an amount of air to calculate emission per hour). Once this emission has been established, any consultancy company is allowed to do (model) calculations. We based ourselves on the consultancy firm's emission data, but decided the model was not appropriate in this case (therefore we did the manual calculations). Still, we were not believed because we were 'not certified'.

The local authorities' attitude was strengthened by the fact that there was only one family complaining, which made them look suspicious; they had lived there for some time without complaining (which was because they were mostly at work during the day, before retiring), and odour annoyance is not automatically seen as an infringement of health. However, according to the WHO's definition of health as 'not merely the absence of disease, but a state of complete physical, mental and social wellbeing', odour annoyance clearly constitutes a health issue, which should be taken more seriously by local authorities. Dutch odour policy was decentralised and left to local authorities in 1995. It is them who must now assess the "acceptable annoyance level". From our work we can see that this often leads to heated discussions. Local authorities sometimes classify odour issues as "subjective" and lack insight in the technical and regulatory aspects of odour annoyance.

2.2 Immediate success

In another town, a family lived directly (5m) next to a small bakery. When I met them for the first time, after the Bureau for Legal Aid had asked me to get involved, they were in a terrible depressive state. They were seeing a psychiatrist and were on sedatives. The husband confided in me that he would not mind 'not being there anymore tomorrow'. What had happened to this nice elderly couple?

They had bought their home after retirement, because it was in a nice and cosy little town, far away from the big city in the west where they originally came from. It seemed an ideal place to settle down. After an alteration in the bakery, their neighbour, the odour problems started. The exhaust fumes were emitted right next to their bedroom window. Also, there was noise from bakery plates being lifted and put down in the ovens. All from very early in the morning.

The family did not get much response on their complaints. The bakery claimed to have been there for a century, and the family had "just" moved in. The authorities claimed that 'bread smells nice' and there were no other complaints. The couple tried to sell their house, but because of new situation (new chimney), their home lost approximately 50,000 euro of its value, which made it financially impossible for them to sell it. Thus, the couple could neither escape nor change the situation (since no one listened or took them seriously). It is this combination that causes stress, with all the psycho-somatic effects that I had noticed.

Based on a branch survey on larger bakeries, which was used in the legislation of those, we made a tentative model calculation to show to the local authorities that a problem was very much possible. Also we explained that even if fresh bread smells nice, this is different when this odour is all around from 4 a.m. The local authorities negotiated with the baker, and even before we had a formal meeting at Town Hall our technical recommendations to the chimney, an investment of over 5,000 Euro, had been implemented! In the meeting at Town Hall to discuss the situation, the alderman present was a bit surprised by our role as scientists, and was amazed that the University took on this

responsibility, and liability as well (the science shop is not a legal entity in itself, but is part of the university). It must be clear that for me, the scientist involved, this case was very rewarding personally as well.

2.3 First things first: create trust

Quite often we have cases such as described above. One of the first steps in our involvement is to make ourselves become trustworthy for our 'client' (which comes before trying to become a trusted partner for the other stakeholders as well). We have the advantage of only being paid by the university, but as such that is not enough. Also here, we sometimes fail – though we usually succeed. I will give some examples below.

One lady called us and complained about someone who had deposited a used strip light near a glass recycling container. Of course, the glass had (been) broken and heavy metals contained in it (like mercury) could enter the environment. The local environmental agency removed the glass and swiped the pavement. Still, the lady was afraid of mercury poisoning 100 metres further on. When I tried to convince her not to worry, she accused me of not being sensitive and not taking her seriously. It may well have been that she caught me at a very busy time and I did not put enough empathy in voice. Small things like that can make a difference. On another occasion when we did not agree with pollution fears of local citizens, we were even accused of being part of the 'capitalist system' (which is one of the rare occasions that someone accused us of not being independent).

In similar cases, however, we also indicated that there were probably no problems, and then got very nice replies. One old lady send us a sample of drinking water and was worried about the brown residue. Also, she was afraid of possible asbestos in the drinking water. Messages about old, asbestos drinking water pipes had been on the radio, and the drinking water company did not want to give her information. This caused her not to trust the authorities. To be thorough, we had the residue checked by one of our laboratory technicians, who –with a smile- accused us later of playing a trick on him by giving a pure drinking water sample (the colour coming from normal traces of iron). So, we could reassure the lady by stating that it was iron that caused the colour and at these low concentrations it was not harmful. Clearly, the colour made the perceived risk become visible, the link with asbestos made her fear large consequences, the media perpetuated this fear, and the reaction of the water company caused mistrust in them as a source. She thanked us and explicitly stated that she was happy that we had taken her seriously and that 'our faculty offered this service in a world that was becoming ever more paranoid'. She felt totally reassured by our message, as coming from an independent source.

Another lady send us a long list of illnesses in her street, and linked these to an asbestos factory that seemed to have been located in the area, and a US Air Force base as well. Both give a strong 'dread' factor to the perceived risk. Also, all the ill people were very well known to the lady, among them a number of children. After a quick scan by us, the Air Force base turned out to be at least 10 kilometres away. The reported diseases were all very different, which made them unlikely to be caused by the same agent, and none of them was typical for asbestos. We reassured the lady, and were very emphatic in our letter to her. Also we gave her addresses of the Regional Health Inspectorate, who are in a position to check if a certain disease is statistically more present than average. We also gave the address of an NGO that would be of help in case there should be communication problems with the Regional Health Inspectorate. We clearly stated that we saw no reason whatsoever to do soil research at this stage (which was her original request). We got a reply from her that our message was very reassuring.

It seems that usually creating trust is possible, because of our official position as university staff, and by choosing our words and approach carefully. Even though the examples above are rather black and white, all or nothing, mostly the outcome of our involvement is a little more nuanced, and we play a role in advancing communication between those involved. I will elaborate more on one such case.

2.4 A long running case

In 1998, citizens of a nearby city approached the Chemistry Shop Groningen. They were looking for experts to help them assess the health risks from two local carpet factories. The science shops were recommended to them by Monitoring Network Environment and Health, a nationwide NGO.

The two factories had been operational since the 1960s. At first, it had only one neighbourhood next to it. In the 1980s and 1990s, however, three new neighbourhoods were built. Combined with a changing role of citizens from the 1960s to now, citizens started to speak up and protest, and question their health risk from the factories. These situations are quite common in our densely populated country. There had been a citizen group active in the early 90s, but they had achieved nothing to mitigate the issues of air pollution. After many disappointments, they gave up.

In our talks with a newly formed citizen group, in what we call the problem articulation phase, the citizens described the problem as 'toxic emissions that cause cancer, smell ugly, and cause visible water pollution'. The cancer risk was considered dreadful and involuntary, the source was industrial, and the victims were identifiable (neighbours, relatives). The outrage caused by authorities' unresponsiveness to these fears was in line with the results produced by Slovic over the years [6]. The fact that the three issues were considered together as one big problem had made it impossible to discuss them individually with the other stakeholders (local authorities and companies). The only communication had

been through newspaper interviews (and especially headlines, cf. figure 1). In fact, the problem, as we saw it, was at least partly a problem of communication. We decided, after discussing it with the citizen group, to try and improve the communication instead of trying to win a legal case. If we would put the issue before a court, we feared it would be 'expert A' versus 'expert B' and nothing but delays would come out of it.

To find a way out of the stalemate, we decided to make three separate research tracks: cancer (past emissions, current emissions), smell, and water pollution (which later proved to be a minor problem and easy to handle with some sewage system renovations). Later on, also the issue of a potentially higher rate of asthma among school children would become part of the investigation.

Bewoners van Gagels/Gagels 2 willen snel onafhankelijk onderzoek
Onrust over uitstoot fabriek

STEENWIJK — Een grote groep bewoners van de wijken Gagels en Gagels 2 is hevig verontrust. De stankoverlast van twee bedrijven aan de Meppelerweg, Betasp en Crilux, is zodanig, dat bewoners zich moeten opsluiten in hun woningen of overwegen elders woonruimte te zoeken. Daarnaast rijst al jaren de vraag wat er uit de schoorsteepijpen van deze bedrijven komt. Zijn het stoffen die gevaarlijk zijn voor de volksgezondheid? De bewoners willen een onafhankelijk onderzoek.

Naar aanleiding van eerdere berichten in deze krant over klachten van bewoners in de wijk Gagels, zocht Robert Stokkers contact met de wijkvereniging. 'Ook in onze wijk Gagels 2 zijn klachten over stank en kam-

pen bewoners met gezondheidsproblemen', aldus Stokkers. Besloten werd de krachten te bundelen, vervolgens werd bij het meldpuntennetwerk Gezondheid en Milieu in Hengelo advies gevraagd.

De afgelopen maanden werden vragenlijsten rond gestuurd, waarvan de resultaten 26 augustus samen met woordvoerders van de gemeente en de directies van Betasp en Crilux zullen worden besproken. Stokkers: 'We hebben veel reacties gekregen. Het was geen eenvoudig formulier. De mensen moesten er energie in steken om de vragen te beantwoorden. Voor alle duidelijkheid: we streven niet naar sluiting van de fabrieken. Werkgelegenheid is voor Steenwijk van groot belang. Dat beseffen wij ook. We willen duidelijkheid over: of de stankoverlast teruggedrongen kan worden en wat er eigenlijk uit die pijpen komt. Soms zie je grote rookpluimen. Dan komen er wellicht stoffen vrij, die niet helemaal jofel zijn. Wij willen weten wat voor stoffen dat zijn!'

Vluchten

Uit de binnengekomen reacties blijkt, dat veel bewoners last hebben van de stank. Sommigen vluchten naar buiten uit of overwegen elders woonruimte te zoeken. Daarnaast zijn er nogal wat gezondheidsklachten. Deze variëren van ademhalingsmoeilijkheden tot het volgen van chemokuren. Stokkers: 'De conclusie, dat dit alles te wijten is aan de industrie is veel te voorbarig. Daar zijn we heel voorzichtig mee. Dat moet eerst aangetoond worden, maar dat is ook de reden waarom wij een strikt onafhankelijk onderzoek willen.'

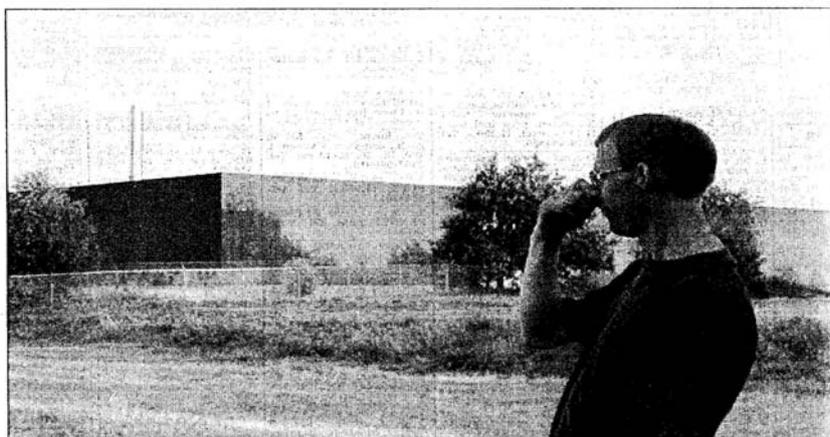
De werkgroep Gagels/Gagels 2 wil dat dit onderzoek wordt gedaan door een onafhankelijk bureau. 'Er zijn twee onderzoeken, die gedaan moeten worden', aldus Stokkers. 'Allereerst een gezondheidsonderzoek en ten tweede of de bedrijven aan de milieu-eisen voldoen. Zelf heb ik geen vertrouwen in de GGD en een ingenieursbureau. Want in hoeverre zijn er belangenverstrengelingen? Een GGD werkt samen met de gemeente en ook een ingenieursbureau wil bestekken kunnen toekenen voor gemeenten en bedrijven, dus zo'n instelling is niet onafhankelijk. Het is niet de eerste keer dat bewoners klagen over stank en gezondheidsproblemen. Stokkers: 'Er zijn mensen die al twintig jaar klagen.' Eind jaren tachtig werd bij de gemeente aan de bel getrokken door bewoners van de wijk Gagels met klachten over stank en gezondheidsproblemen. Stokkers zegt daarover: 'In 1990 werd de bewoners te kennen gegeven daarmee op te houden. Ze stonden met hun rug tegen de muur. In die jaren is er ook een onderzoek geweest. Daar kwam niets uit, maar de klachten bleven.'

Frisse lucht

Het woonhuis van de familie Stokkers is gelegen op een mooi plekje aan de rand van de wijk Gagels 2. 'We zitten hier prachtig, maar als we dit geweten hadden, waren we hier niet naar toe gekomen. Vorige zomer kon je niet buiten zitten wegens de stank. Afgelopen week nog zette mijn vrouw 's morgens de ramen open voor wat frisse lucht. Ze heeft ze snel weer dicht gedaan.'

De geplande bijeenkomst van de bedrijven, de gemeente en de werkgroep moet duidelijkheid gaan verschaffen over de toekomstige stappen. Stokkers: 'Als we alles moeten geloven, voldoen de bedrijven aan de normen. Daar gaan we voorlopig ook vanuit. De bijeenkomst zal allereerst een soort kennismaking zijn. We moeten van elkaar weten, wie we tegenover ons hebben. Verder willen we afspraken maken over een bevolkingsonderzoek en wie dat gaat doen.'

'Ik heb goede contacten met de milieubeweging', vervolgt Stokkers, 'en verder heb ik een adres van een buitenlands bedrijf, die veel vaker wordt ingezet voor het verrichten van een onafhankelijk onderzoek. We hebben wel ideeën, maar laat de andere partijen maar eens komen. Ze hebben in principe toegezegd mee te werken in het geheel. Dat wachten we af. Ik ga er niet vanuit, dat er de 26e augustus direct een oplossing is. Het zal wel een langdurig proces worden.'



● De stank van de fabriekspijpen zijn voor bewoners van De Gagels en omgeving een grote ergernis. (Foto: Frens Jansen)

Figure 1. Communication through newspaper headlines.

We conducted some methodological work to find the right assessment frame for the odour. The chemistry shop is not in position to do odour analysis, since this takes specialised laboratories. What we can do, however, is make model calculations to see how the odour spreads through the surroundings – and we can do a lot of sensitivity analyses. The assessment of the odour issue was complicated, because two companies were involved and they had fluctuating emissions. We listened carefully to the citizens, who mentioned 'peak emissions' (occurring during product changes, which had never been investigated before). A student worked for three months on this issue as his bachelor's research in environmental studies.

For all our work, we had to base ourselves on previous reports. There had been some investigations before. The first one, in the early nineties, had focused on carcinogeny. It was done by the National Institute of Environment and Health. The citizens did not trust the outcome, for two reasons: it was a state institute, so not independent, and one of the chemical substances had not been analysed because the sample had been contaminated with water. When I explained that this can sometimes occur when there is no standard methodology (accidents happen), and that I did not believe that the approximation they gave in the report for this single substance was inappropriate, the citizens were somewhat reassured – though not completely. Other research on odour, late nineties, was reported without any detail (and paid by the factories). One report also indicated an odour level potentially being above standards. This is typical for reports by consultancy firms; there is usually no time to do sensitivity analysis and the reports are not written for non specialists. Finally, an independent investigation had been promised by the local authorities, for which one factory hired a German laboratory. When it became clear that this company was a daughter company of the European Carpet

Factory Association, its findings were immediately put aside by the citizens – no matter how thoroughly the analyses were done. We decided to use the data from the various reports. Even when we applied a worst case scenario, we did not think that the emissions of carcinogens would pose a problem. The odour was a different issue and probably above the limits. The waste water was as said a minor issue. In presenting our findings, we said that independent analysis of a few substances could confirm the previous data – if this would hold for a number of substances we did not see the need to analyse all possible components again, which would have been quite costly.

Because the science shop is independent, and paid only by the university, we were considered as a trustworthy source by the citizens. Only in our second meeting, I first challenged the citizen's own investigation of the cancer risk (if I had done this during our first meeting they would probably have thought that I was not taking them seriously). I made my explanation very personal, including tales from my own relatives that had suffered or even died from cancer, thereby showing the citizens that I understood their feelings. Thus, the citizens believed our explanation that the cancer occurrence that they had noted did not differ from the average (and also that their statistics had serious flaws). They also accepted our explanation that current emissions were a factor of 1000 below the strictest limits. We explained the toxicity by comparing it with the risks of smoking (living for more than a century next to the factory would be the same as smoking one cigarette). Coming from a trusted source this comparison was accepted, even though it compares a voluntary with an involuntary risk. However, because there were no data on past emissions, the Regional Health Inspectorate set up a cancer monitoring programme. Previously, the local authorities had given only the bare figures of the emissions, without a clear explanation - covering only the first few out of nine steps in risk communication that Fischhof [1] says should be taken.

We supported citizens in their discussions with the other stakeholders. I still remember the first meeting we had with all stakeholders, at Town Hall. The companies had brought their lawyers. When I started our presentation by stating that the cancer risk was no issue according to us, their faces showed disbelief. One could see them thinking 'well, what the are we doing here'? Our separation of the three problems opened the way for research and debate on the smells, which we calculated to be above the legal limits in this case [7]. Because of our impartiality, we were considered as serious discussion partners by the other stakeholders as well.

The local authorities then agreed to set up a steering committee to supervise smell mitigation research. The committee included representatives of all stakeholders: local authorities, including the regional health inspectorate and environmental inspectorate; both companies, with their technical consultants (no more lawyers needed); and the citizens, assisted by two science shops (chemistry and medicine). In this way, the citizens became 'partners' instead of merely receivers of expert results, in a partnership consistent with current recommendations for risk communication [1].

Then we started out on the long journey together. As a steering committee, we asked for offers from various companies to do the analysis and research, which we assessed in a committee meeting. A company was selected, and a detailed plan could be made. Meanwhile, also an investigation on the asthma risk for schoolchildren was beginning, on which my colleague from the science shop at the Medical Faculty was keeping an eye. Occasionally, there would be disputes with the regional health Inspectorate, who were reluctant to do the research (which was their legal task, however). At first they stated not to have validated questionnaires for asthma and children. Our university could produce three. Then they did not want to register postal codes because of 'privacy' – which would render the research useless, since the 'distance to the factory' would be the most important parameter to see if there was or was not a correlation. These disputes sometimes stopped citizen participation in the odour committee, causing delays (see Figure 2: the communication went through newspaper headlines again).



Figure 2: The debate on the asthma surveys once more led to communication through news paper headlines.

After the postal code issue crept up, it took a lot of arguing to get the citizens back at the table for the odour committee. Other delays were caused by the local authorities, who were not organising the meetings very well – they forgot to check possible dates and proposed dates on which important stakeholders could not be present, they sometimes forgot to invite someone altogether, and they even lost the notes from one of the meetings. These notes were very important, since all parties had committed themselves to the outcome of the smell mitigating research, provided they would be involved every step along the way. The notes could be important proof. This meant that meetings occasionally were postponed more than half a year. One silly incident also caused delays. When the hired consultancy firm started its measurements at one of the factories, a hole had to be made in the chimney. The contractor hired to do this was not aware of volatile gasses being present at the drilling location and set the whole chimney on fire. It took a long time to get the liability dispute settled. However, every time we managed to get the committee back together and we made progress.

Finally, the findings were there. The analysis of the carcinogenic compounds confirmed previous reports, so we did not need to change our conclusions. Regarding odour, a production change in the largest company, and some changes in wastewater treatment in the other, had reduced the emissions to just below the limit. However, in odour analyses there is an allowed error margin of a factor two. This meant that the companies could not be fined (they were not proven to have exceeded the limits), but neither could one say that there was no problem. We managed to explain this scientific uncertainty and its consequences to all stakeholders (we used the comparison with speeding on the high way; everyone is aware that the police needs to subtract a few km/h from the measured speed because of imperfect radar equipment – we all go a few km/h fast because of this). This avoided possible further outrage, which in our view would have arisen if the authorities (again) claimed that there was ‘no problem’. However, it also meant that no technical solutions could be implemented—the companies could not be compelled.

Therefore, we suggested making a complaints telephone line available 24 hours a day, 7 days a week (the city’s general service phone line was only available mon-fri from 9 to 5). The citizens had complained about peak emissions and felt they were not taken seriously, so we saw a 24/7 line as a solution to mitigate their stress—which mainly occurs when people can neither escape nor influence the source of stress (as seen in the previous example of the bakery). The phone line, and the subsequent action and feedback of the regulators, would again give citizens some control over the situation. The provincial authorities helped to implement this solution. The director of one of the factories even asked if our regular meetings could continue, since he now saw the value of more contacts with the neighbourhood. One of the meetings had been held at the factory, and this took away some of uneasiness as well; if one knows what is behind the fence it may become less threatening. The other factory did not want to open up to the public; its American owners were afraid of liability when someone would get hurt inside the factory. They also were more afraid of discussing openly, probably with the idea that any discussion on them would be negative. As such, they even did not mention the fact that they had totally renovated their wastewater treatment, leading to much less pollution.

In an external evaluation by Neubauer [4], all stakeholders stated that the involvement of the science shop started the communication process that led to the resolution of a lot of the annoyance and fear in the neighbourhood. In fact, this could be described as a case of scientific mediation (as in conflict resolution). For the citizens, it meant that they were able to discuss the issues on equal terms with the other stakeholders. Our ‘science communication’ had consisted of explanations, interpretations, discussion of implications; a lot of interfacing, next to being involved in the societal context of the whole issue.

After the project, we reported our findings in the Platform for Odour, in which we participate. This platform is a working group for research and policy advice of the Dutch Association of Environmental Professionals. Also representatives of consultancy firms, the Ministry of Environment, and industry participate. We managed to get the experience of the citizens a prominent place at the association’s biannual national odour conference. This is a trend-break, since normally the focus is rather technical. The conference was even opened by a speaker from a citizen group. We also involved speakers from the Regional Health Inspectorate, social-psychologists and representatives of local authorities. Some of our technical concerns have also been taken up in the long term planning of the Platform, which is an example of communicating science from citizens to research (the antenna function of science shops).

All in all, this has been a good example of how citizens can be involved in a decision making process, based on impartial scientific backup. Had we been a commercial consultant, we probably would not have been able to play this part.

2.5 Societal cost-benefit analysis

The examples above indicate that impartial scientific advice to citizen groups can speed up decision making procedures, and thus avoid societal costs. To illustrate this once over, I will give a final example.

Citizens from a city nearby approached the science shops for chemistry and physics, because a truck factory that had been out of use for three years would become operative again. However, where originally trucks were assembled, they would now be painted. The citizens feared odour annoyance (and noise as well). The truck building company delivered environmental reports, claiming that their odour pollution would resemble that of the production of food additives

production. The claimed that a limit of four Dutch odour units around the factory would be appropriate. To us this was strange, since for regular car paint units this legal limit is only one Dutch odour unit. We dug into the report and found out the line of reasoning was based on a survey held at a Dutch odour seminar. At the seminar, people were asked to rank a list of 20 odours from bad to nice. This was only done on paper, there were no real odours to be smelled. Of course, when filling in such a questionnaire, every person thinks differently. One might think “I like coffee, so I grade it as ‘nice’”. Another may think “living next door to a coffee burning factory is not nice, so this a bad smell”. By coincidence, the smells of ‘food additive production’ and ‘car-paint’ ended up next to each other on the overall list. It may be clear that this in no way means that the smells are comparable. Normally, one can only compare different odours from laboratory analysis focusing on the ‘hedonic value’ of odours. And even then, it makes a difference whether one is often or only occasionally exposed to the odour. We helped the citizens convince the company (and the local authorities) that there was a mistake in the advisory report. As a scientist, removing an unscientific line of reasoning felt good (consider it a form of raising awareness of science). Our advice led to the following events: a procedure towards a court-case at the Council of State was stopped, and the citizens, company and the local authorities signed a covenant in which the right limit for odour was agreed upon. This covenant made it possible for the company to its investments without having to start a new licensing procedure. So our involvement, which only took a few working days, led to investments (and employment) not being delayed for a year, prevented the local authorities from making costs for a new procedure, and saved the citizens not only from a long turbulent period in a legal procedure, but also from living in a unpleasant odour. The company hired a different consultancy firm from then on.

The societal cost-benefit ratio of our involvement in the examples above seems very good. In my view, this makes it worth the tax money spend on it through our salaries from university. It is both citizens and companies that have paid these taxes to begin with.

3. Conclusion

Science shops play a special role in science and technology communication. They can interact with citizens to articulate problems and potential research support, and make sure that research results are fit for the context and presented in a usable way. This is clearly a two way, interactive approach, raising both public awareness of science and scientists’ awareness of the public. Science shops can also have a special, trusted position in risk communication processes, where they can help make the public a partner. It works if scientists involved understand both the expert and the public, are independent, and can act as facilitators (as in the case examples above).

The impartiality required for this job is the main good of the science shop. Therefore, a position in a university (at least, in public universities) is very well suited. If one does not have this position, in some cases one may end up in the common dispute of expert A versus expert B, and it becomes much more difficult to achieve something for citizen groups. Also a position at university makes it possible to employ students to do part of the work, thus keeping costs down (students are rewarded through course credit points). Also, it allows us to work thoroughly, doing as many sensitivity analysis as needed, not satisfied with just one calculation.

This impartiality has to be safeguarded. We had some occasions that our results were challenged, but so far they always stood, since we maintain our scientific quality standards. The only way in which we sometimes act more as an advocate than a scientist is when we think about strategy with our clients. However, it is clear that in disputes like those described above, citizens usually have the weakest position – so, some strategic support to help them make the best use of research results is sometimes needed (which could also come from Bureaus for Legal Aid or NGOs by the way). Finally, of course our selection of topics comes from citizens, which does mean we approach a case from their view and put their wishes on the research agenda. In our view, this is not a subjective approach (since what follows is a scientific research that is as objective as possible). It is merely a question of balancing the scales; companies and local authorities can normally afford scientific and technical backup.

If science shops are part of university, they combine all its three missions: education, research and outreach. They have an impact on scientific research (finding interesting research topics, raising science’s awareness of the public), on education (giving valuable skills in communication and project work, raising the social awareness of students, curriculum reform) and on civil society (media attention, policy influence, empowerment of civil organizations to better shape their own living environment). Science shops demonstrate partnerships of science and society. From the examples given in this chapter, it is clear that interaction is more than the sum of two one way flows, and is not a simple matter of questions and answers. Science shop practice includes interactive articulation, research and dissemination phases. The many small steps that are made in regional projects make a big step in science communication: citizens are given some upstream involvement in science.

As indicated above, impartial scientific advice can make citizens participate in decision making processes. This can lead to better decisions, since more knowledge is taken into account if citizens can participate. This is a form of Mode 2 science-society interaction [5]. It mostly also leads to faster decisions, thus preventing economic damage and periods of outrage. What is needed is the interactive science communicator, who has a good view on science, technology, and has learned to be sceptical towards ‘scientific’ argumentations, who can explain these findings to different stakeholders, who can rephrase stakeholders questions and comments into scientific research projects, and who understands the broad

societal context of the issue. In our university, we recently started a science communication master program, in which we also pay attention to this aspect of science communication [2]. At our university, the science shops also give a third-year bachelor's course on 'research for society', in which we train students to be sceptical whenever they read that 'research as pointed out that'. We show them they way scientific research questions are derived from societal issues, how independency of the researcher is sometimes an issue, how data are (mis)interpreted and how the media play their role. We hope that many other science communication courses and programs will include these topics as well. Perhaps they already do.

At the time of writing this paper, the science shops at our faculty are under severe pressure. A large budget deficit of the faculty may lead to their closure. This would come after a quarter of a century of sorely needed academic outreach service to the rest of society, especially to those who cannot afford expensive consultancy. This development took us by surprise. We quite often needed to argue with those who see 'knowledge transfer' and science communication only from an economic motive. We feel a knowledge society is something more than a knowledge economy, but mostly other people agree with that in words only. At other moments, we have to defend ourselves against those that see science shops as the ideal outlet store for big research results; dissemination being the new buzzword, with sometimes a fixed percentage of the research budget necessarily allocated to it. We always have to explain that upstream involvement of citizens is something else than confronting them with ready results of big scientific research projects.

Even in these days it seems that at least some scientists and science policy makers prefer science to stay in its ivory tower, to only allow citizens a view from the top by sending pictures from above or by occasionally opening the door for a guided tour. We hope that one way or the other we can still keep open the door of the science shop. Unfortunately, our universities are no democracy and citizen involvement in this decision making process is out of order.

4. References

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