

# CRISIS COMMUNICATION DURING A WATER-BORNE EMERGENCY

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## Glossary of Acronyms

EHA - Environmental Health Authority  
EHO - Environmental Health Officer  
EMT - extended management team  
ERC - Emergency Response Centre  
HCC - Health Care Centre  
HQWDR - Headquarters of the Western Defence Region  
MSAH - Ministry of Social Affairs and Health  
NTD - Nokia Technical Department  
PHD - Pirkanmaa Hospital District  
PHI - Public Health Inspector  
PIO - Public Information Officer  
TRS - Tampere radio station  
WPD - Water Plant (Distribution)  
WWTP - waste water treatment plant  
YLE - Finnish Broadcasting Company

# 1 Introduction

This paper introduces the contamination crisis in the drinking water system in Nokia municipality, Finland (see Figure 1). The crisis was selected for the current practice-oriented case study because it was an emergency situation, in which the primary stakeholders and initial responders, who were not 'crisis and emergency' trained professionals, were overwhelmed by the burden of crisis management. In addition, the community preparedness plans and concomitant training exercises had had very little emphasis on managing communications in a large scale emergency. So the course of events and the results of the actions and inactions provide a good example of the distress that the stakeholders in local communities will face with today's communication demands during emergencies; particularly if the actors are ill prepared.

The water system contamination occurred on November 28–30, 2007. A considerable part of the drinking water network in the town of Nokia, in Finland, was contaminated when technical water (treated waste water usually released into a nearby stream) became mixed with the drinking water supply. The contamination, affecting an area of some 12,000 inhabitants, caused an epidemic of Norovirus and Campylobacter infections resulting in thousands of cases of diarrhea and vomiting. Hundreds of Nokia's inhabitants were hospitalized and the town's administration was forced to give an order to boil all water used for human consumption and at one stage even to ban all use of water. Although the contamination occurred within Nokia municipality, there were cases of Norovirus and Campylobacter infections in the larger Ylöjärvi-Tampere-Pirkkala conurbation due to commuting workers and visitors.

The cause for the contamination was a valve, mistakenly opened, on Wednesday 28 November, between the drinking water and treated waste-water pipes in Nokia's waste water treatment plant (WWTP). Due to pressure differences between the two sets of pipes, the waste water flowed into the drinking water network and caused the contamination. At the same time, there was maintenance work taking place at the Nokia waterworks site (WPD), and the first calls from consumers claiming the water quality was strange were dismissed as being connected to this maintenance work. Only after two days, on Friday 30 November, did the personnel at WPD realize that the water was indeed contaminated and advice to boil the water was issued although the real cause was still unknown. The actual cause was discovered late Friday afternoon, at which time the response activities were started.

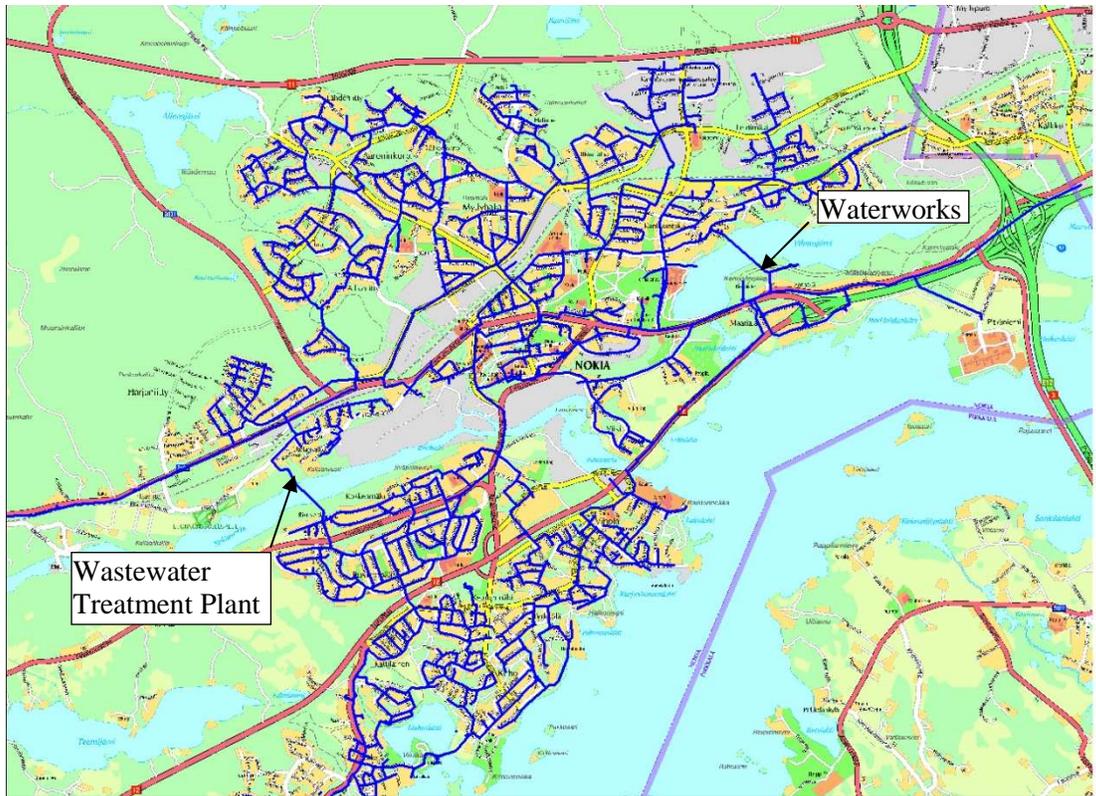


FIGURE 1 Nokia municipality drinking water network (OTKES 2009).

In addition to the slow discovery of the actual cause of the problem, the ability of the community to cope was hampered by the aspect that this was a multi-organization emergency concerning the municipality's WPD, the environmental health sector, the municipality's administration, the medical services etc. and it was not clear who should take the lead. Moreover the crisis communication to the residents was insufficient and delayed (OTKES 2009).

This case study examines the communications between the various actors and different stakeholders before, during and after the emergency. The incident is studied from the emergency response viewpoint and thus the emphasis is on the events leading up to the emergency and the actual emergency response until the situation was stabilized and the management role became more of a routine. This type of accident will naturally affect the community for several months and also there is a need for extended communications throughout the whole duration. In this study we will, however, only briefly observe the communications during relief and recovery phase.

## **2 Communication during the emergency phases in the Nokia case**

### **2.1 Description of the emergency phases**

*The Preparedness Phase* covers the period before the emergency. During this period a range of risk assessments were carried out, which formed the basis of reviewing the validity of the contingency plans. These in turn formed the basis of contingency exercises to train necessary personnel for emergencies and crises.

*The Weak Signals Phase*, in this study, is the period when the waterworks started to receive the initial complaints concerning the water quality. The start of this phase was, therefore, on Wednesday 28 November 2007 at 15.30.

*The Early Warning Phase* started when the understanding developed that the water was contaminated although the cause was still unclear. The precise moment the Early Warning Phase began is not clear but we can determine that the Weak Signals Phase ended and early warning started late in the evening of Thursday 29 of November when the WPD personnel started checking possible sources of contamination.

*The Emergency Response Phase* in this study covers the period which started with the revelation of the actual cause of the contamination around 15:00 on Friday 30 November and ended when the emergency management body had the situation under control around 8 December 2007.

*The Relief and Recovery Phase* in the context of the Nokia water disaster lasted for several months. Once the cleaning of the water pipes had ended, the few remaining restrictions of the use of water were finally removed on 18 February 2008. The steering committee established to oversee the cleaning of the water pipes continued to operate until 12 March 2008. Activities after this date can be considered as routine administration.

### **2.2 Preparedness Phase Activities**

Nokia municipality had valid preparedness plans for most of the utilities and service sectors. While some of the plans were relatively new, those for the technical sector, which included the drinking water and waste water systems were ten years old and produced by a consultancy company. The Nokia municipality preparedness plan also included a crisis communication section stating the responsibilities in emergencies of different levels of seriousness, which included a separate annex consisting of a brief plan for crisis

communications. The annex listed the necessary actions but did not give any specific guidelines on how to manage the tasks. The plan did, however, include an up-to-date list of the main media contacts (telephone and fax numbers) to be used in the case of an emergency situation. The distribution of the annex had been very limited and consequently very few people even knew about the plan.

The municipality had a public information officer (PIO) whose tasks were focused mainly on public relations and providing general information without any direct tasks related to crisis communications. The computer facilities of the municipality, such as email and web servers, were technically adequate but there was a lack of preparations of how to use them in a crisis. Nokia's WPD and Health Care Centre (HCC) had their own email distribution lists but they were again focused on routine communications.

Access to critical information and reliable emergency communications are significant factors in the safety and effectiveness of emergency responders. As the amount of information increases, so does the need for an efficient way to handle this information in a mobile environment. Complex messages, congested voice communications and limited human resources are some of the issues that can be addressed by taking advantage of an advanced and dedicated professional mobile communications system. For this purpose, Finland has developed VIRVE/TETRA, a digital public authority network, for which Nokia municipality had acquired some equipment for use during emergencies.

The emergency communications exercises during the preparedness phase had been insignificant and therefore the competence for managing extensive communications in a complex situation was limited. Before the accident, there had been two recent organizational changes which had a significant effect on local emergency management capabilities. The municipal rescue services in Finland were reorganized into 22 regional rescue departments in 2004. The consequence was that there were no longer any emergency specialists in the municipalities' administrations. The other organizational change was the establishment of the regional environmental health unit at the beginning of 2007. The health inspectors of six municipalities were gathered into a joint organization, the leading office of which was not in Nokia but in a neighbouring municipality.

As this arrangement was still fairly new, collaboration between different stakeholders was still developing and communication was less natural than it would have been with a more established organization. The inability to have the communications systems functioning during the emergency was not Nokia specific, but a common problem. Although many organizations have crisis communication plans available, putting them in action has proven to be problematic (Vos & Palttala, 2009)

## 2.3 Weak Signals Phase Activities

*Wednesday, 28 November 2007*

At the wastewater treatment plant (WWTP) there is a monitoring panel in the control room (Figure 2.), which shows the status of the system including the amount of used technical water. The personnel, however, did not notice the exceptionally high quantity of used technical water. Since the WPD and the WWTP function as independent units, announcements about the quality of the drinking water which were received at the WPD did not reach the relevant operator at the WWTP.

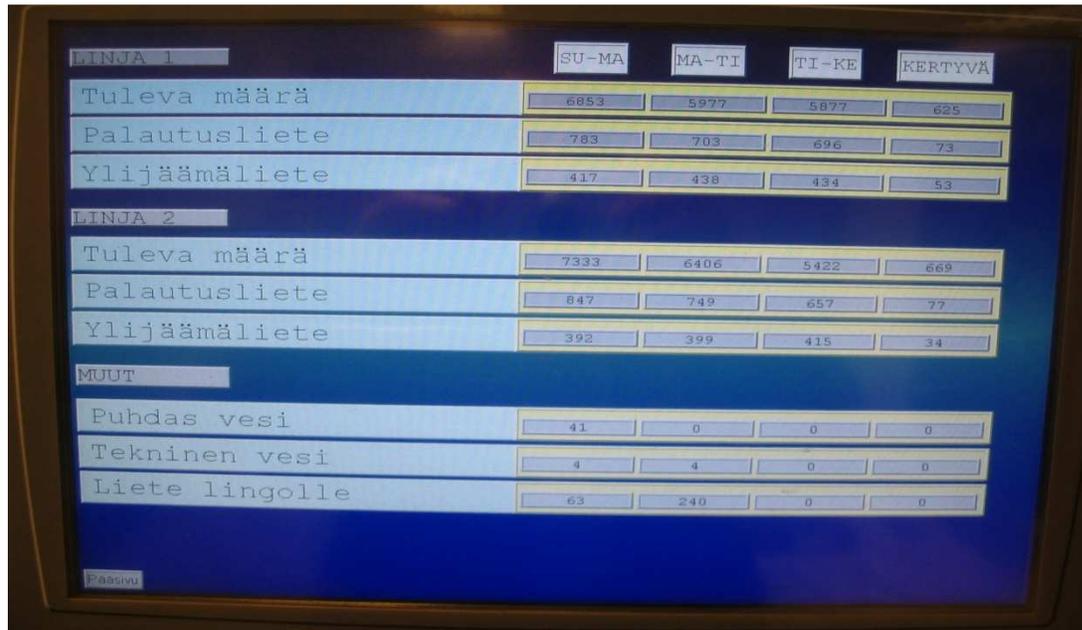


FIGURE 2 The monitoring panel in the control room (OTKES 2009)

Private (as opposed to corporate) consumers were the first to detect the problem with the drinking water. They noticed the drinking water looked and smelled strange and contacted the service number of the WPD. Some housing organizations also contacted their maintenance service companies which then contacted the WPD. The Public Health Inspector (PHI), as well as the media, also received information initially from private consumers.

The first complaint about drinking water quality received by the WPD control centre came from Nuottalahdentie Street on Wednesday, November 28, 2007 at 15:30. WPD personnel interpreted the first complaint as being a normal problem linked to the ongoing water collection from the water supply of the nearby city of Tampere, which was needed due to the maintenance work at Nokia's WPD. The water pipe connection to Tampere had also been under repair during the

summer of 2007 and the quality problems were thought to be caused by the water pressure loosening sediment from within the water distribution pipes.

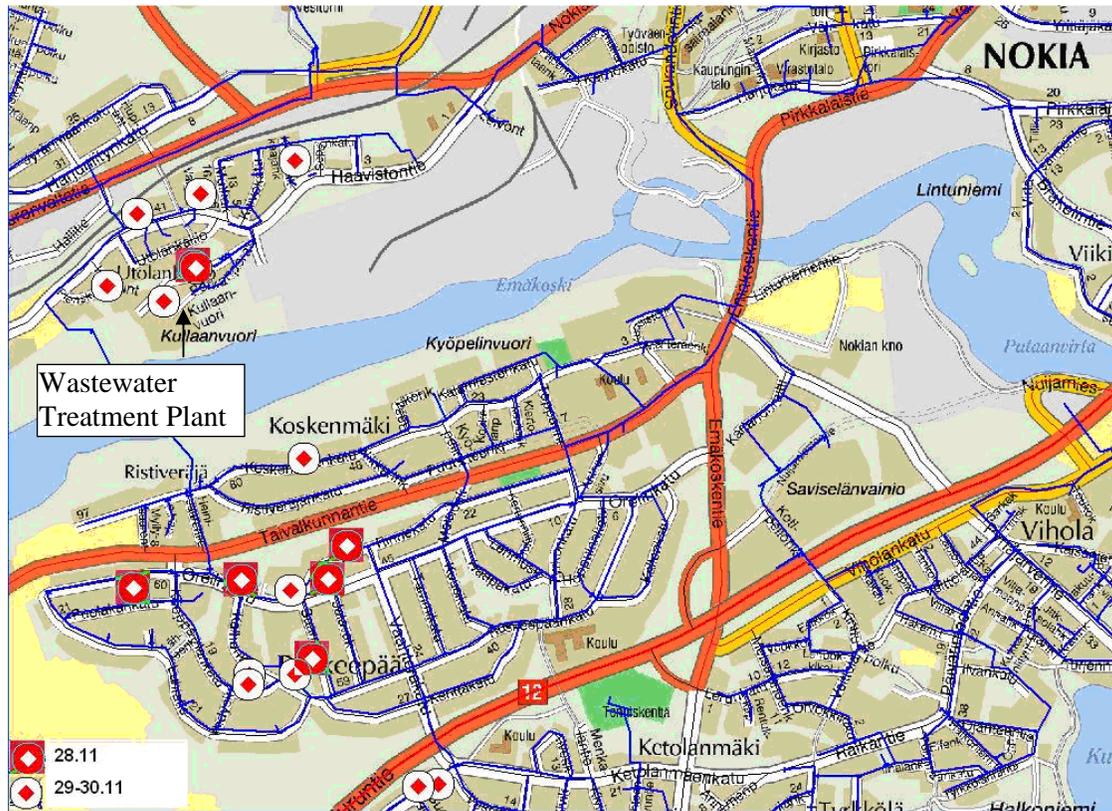


FIGURE 3 The first complaints to Nokia’s waterworks (WPD) about the poor quality of drinking water came from the areas marked by the red and white diamonds (OTKES 2009)

After the first complaint, the WPD received more phone calls about contaminated water mainly from the area of Orelinkatu, Kalhunkatu and Utolankallio streets. The number of calls and the descriptions of the aesthetic quality of the water surprised the WPD’ personnel, since nothing similar had happened before. The situation was, however, still considered to be a normal problem connected with water-pipe pressure changes.

Nokia’s WPD did not make any water-problem related communications to any outside people or organizations during the first day.

Thursday, 29 November 2007

The first contact to the Environmental Health Officer (EHO) came from a resident of Ahovalkamantie Street, in the Tervasuo district, on Thursday, 29

November 2007 at 14:55. As a result, the PHI contacted the WPD, where the operator on duty provided the information that sediments from the water pipes had caused discoloration of the drinking water in south Nokia. The WPD

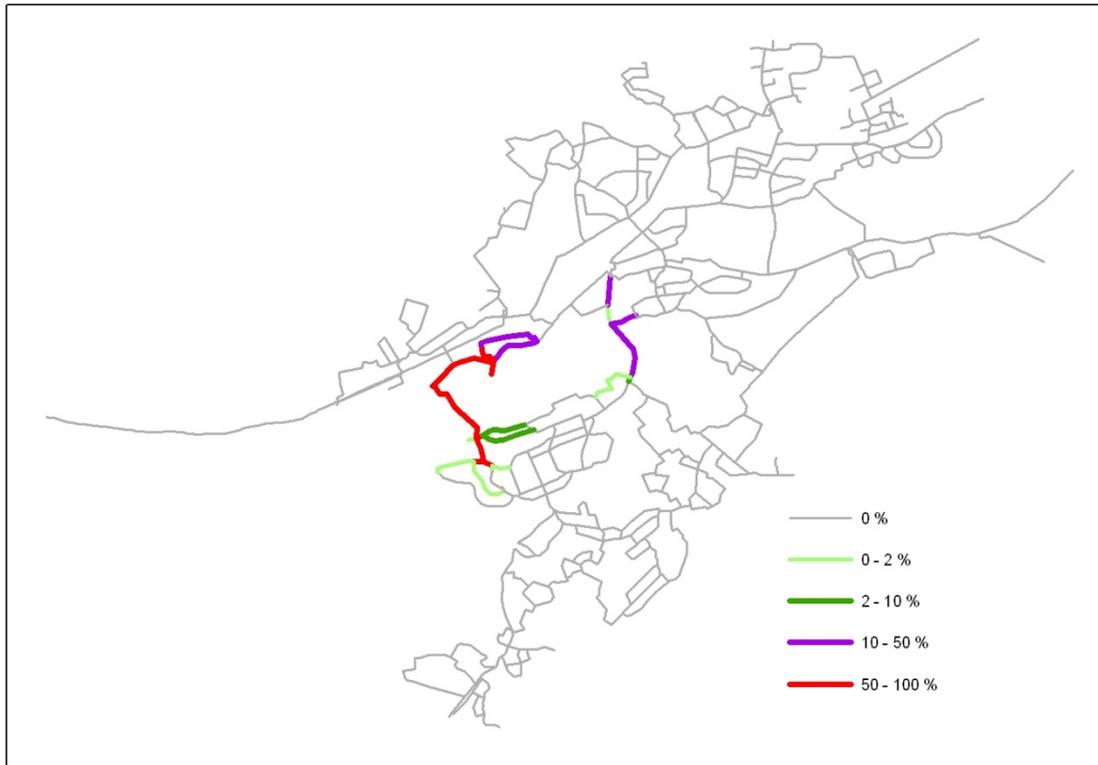


FIGURE 4 Distribution of technical water on Wednesday 28 November 2007 at 19:00 based on a simulation made at the request of the accident investigation board (OTKES 2009)

operator did not specifically mention the numerous complaints the WPD had received. The PHI also called the manager of Tervasuo day-care centre who had not, however, noticed anything strange about water quality or anything abnormal when running water.

Still, on Thursday afternoon, after an increasing number of complaint phone calls, the WPD's personnel thought that the water collection from Tampere was causing the problems. The WPD issued a summary at approximately 16:00, which was sent as a normal email bulletin to Nokia's water supply group, which discussed how the water originating from Tampere could have caused the problem and the decision was to continue flushing the system. The PHI forwarded the summary to the members of the food poisoning task group at 16:39 but with an accompanying note saying that no further actions were expected from them based on the message. On Thursday, the Aamulehti

newspaper received a news tip from a local resident. On the basis of this, the Aamulehti newspaper contacted the WPD and consequently published a two-column news article on Friday 30 November 2007 titled “Iron and lubricating grease mixed in with water in Nokia”. This article stated that according to the representatives of the WPD there was no reason why water should not be safe, and they emphasized that the problem was not serious.

## 2.4 Early Warning Phase Activities

During the evening of 29 November 2007, WPD personnel began to suspect that foreign matter had entered the water mains system and, among other tests, visual evaluations were made of the water. The heat exchangers of apartment buildings were also checked for possible leaks into the district heating water. WPD did not send any emergency information to any out-side actor in the evening.

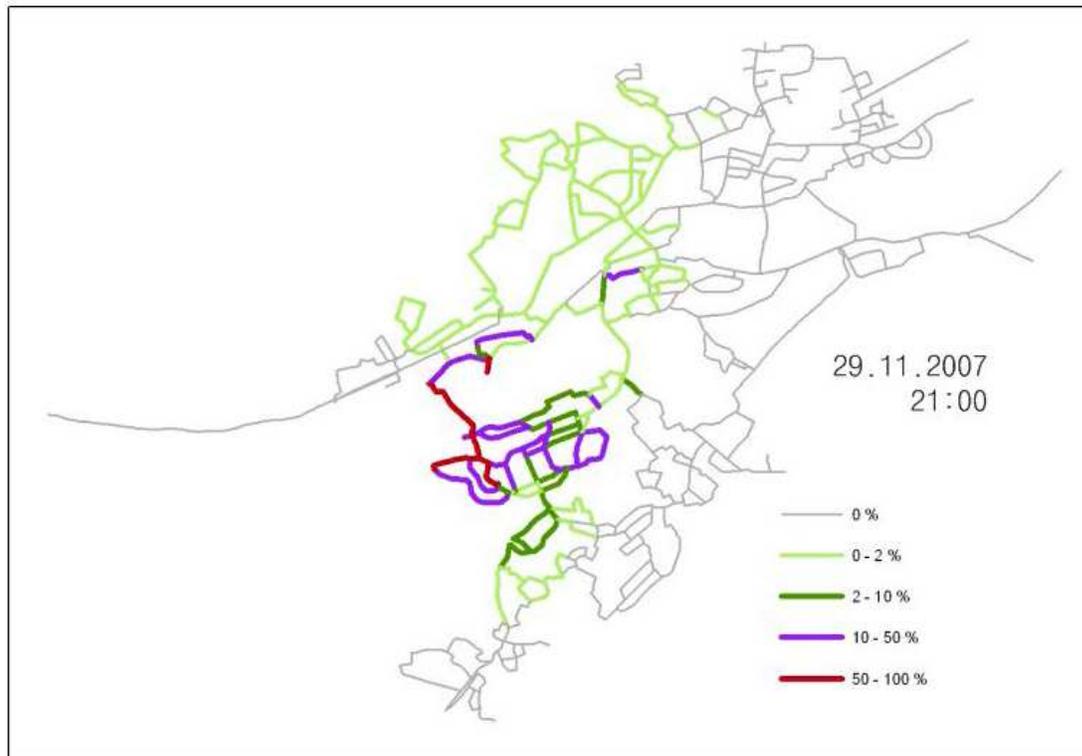


FIGURE 5 Distribution of technical water on Thursday 29 November 2007 at 21:00 based on a simulation made on request of the accident investigation board (OTKES 2009)

*Friday, 30 November 2007*

On Friday morning, the idea that something had indeed entered the drinking water system was confirmed because many complaints mentioned that the water had caused stomach complaints. As a result, the WPD held a meeting with the PHI from 10:40 onwards. The Director, as well as the control engineer, of WPD and the EHO all participated in the meeting. The reason for the problems was still not clear, but based on the number of reports stating stomach complaints the PHI, at approximately 11:30, issued a verbal instruction to boil water before consumption. The PHI stated that the Director of the WPD would be responsible for handling the communication of the instruction.

The first bulletin was posted on the website of the municipality of Nokia at 12:47 titled "Drinking water should be boiled in Nokia until further notice". The bulletin stated that impurities had been detected in tap water and, as a precaution, drinking water should be boiled before use. This bulletin was revised several times with the title and contents becoming more accurate as regards to the region affected but did not elaborate on the cause of the contamination.

The HCC at 13:06 sent a short announcement by email to boil water. The announcement was addressed to the municipal email distribution list for social and health care actors. The PHI informed the food supply units and food industry about the instruction to boil water via direct phone calls. The Director of Nokia's public food services managed communication with schools and day-care centres. The information did not reach every school because at 13:27 the Principal of one school enquired by email to the WPD why there had not been any official announcement that the water was undrinkable. At Nokia's HCC, the operation began during the morning of 30 November 2007, when staff dealt with two patients who had had trouble with the drinking water. Furthermore, when the HCC received the PHI's instruction about the need to boil water, the deputy chief physician cancelled an on-call shift and started making plans to prepare for any imminent events.

At WPD, the cause of the problems was still being investigated and possible industrial leaks were being mapped out. At the same time, the connecting pipe of the WWTP's technical water, the existence of which was unknown to some of WPD's personnel, came under discussion. The WPD was able to gain access, over the data network, to the console of the WWTP, which showed a large volume of technical water had been used during recent days. The Director of WPD contacted the responsible operator of the WWTP, who later revealed that the valve of the technical water line had been open. The cause of the contamination of the drinking water was concluded at approximately 15:00.

The first entry in the communication log at the Emergency Response Centre (ERC) of Pirkanmaa region was made on Friday 30 November 2007 at 12.00,

when a woman from Nokia called because she was worried about the quality of the water and especially the effect on the well being of the day-care centre next door. The caller demanded that the ERC notify the media that the drinking water in Nokia was dangerous, and that there were restrictions on its use. The call was transferred to the ERC's shift manager who instructed the caller to get in touch with the public health authorities.

## **2.5 Emergency Response Phase Activities**

After the cause of the problem was revealed, the Director of the WPD summoned key stakeholders to a meeting, concerning the water-borne viral epidemics, which was held at Nokia's HCC on Friday, 30 November 2007 at 15.15-15:45.

The meeting recorded that communication concerning the health crisis had and would be the responsibility of the Director of the WPD. The meeting did not, however, make any extensive evaluation of the extent of the crisis situation or any other required measures, the resourcing of required actions, nor was the leadership responsibility issue resolved. The next meeting was agreed to be held on Monday, 3 December 2007.

The bulletin posted on Nokia municipality's website at 15:57 still contained practically the same information as earlier with no mention about contamination. At 16:30 a new bulletin titled "Situation regarding household water in Nokia" was posted on the Nokia municipality's website. This bulletin explained that technical water, meaning purified waste water, had been entering the drinking water mains system since Wednesday, 28 November. The bulletin contained an instruction to boil drinking water and included the emergency phone number to the HCC for cases of illness. On Friday evening, bulletins about treatment of stomach complaints (from 19:15 onwards) and water distribution (from 21:45 onwards), as well as new instructions for the use of contaminated tap water, for example, as regards to sufficient boiling time of water (from 21:52 onwards) were added and updated on the municipality's website. There were four people involved in adding and editing the bulletins and the coordination between them was not always seamless.

No actual press release was given separately to the media, but in addition to the bulletins posted on the municipality's website, the Director of the WPD contacted directly the relevant media as regards the situation: Tampere radio station (TRS) of the Finnish Broadcasting Company YLE, the Aamulehti newspaper and the Nokian Uutiset newspaper. The announcement to boil water was delivered to TRS on Friday, 30 November 2007, at approximately 12.00 by a direct phone call to the presenter of the afternoon broadcast at the studio. TRS,

after confirmation calls to the WPD and HCC, drafted a short news bulletin, which was read in the afternoon news broadcasts starting from 12:30, with the exception of the news broadcast at 16:30. The situation changed when, at approximately 16:50, the TRS received a phone call from a listener in Nokia. The caller wondered why the news mentioned nothing about the situation with the water quality and mentioned that people with stomach complaints were seeking treatment at Nokia's HCC. TRS gained confirmation from the HCC, and at the same time a new bulletin appeared on the municipality's website at approximately 17:00.

TRS, at approximately 17:10 called the Director of the WPD and received confirmation that a new announcement had been displayed on the municipality's website. TRS prepared a new news bulletin for the next news broadcast at 17:30 with new information, for example, about the cause of the problem and about patients seeking treatment at the HCC. In addition, TRS forwarded information to the news department of YLE. Also, the regional television news of Häme region started the evening broadcast at 19:00 with the water disaster using stock footage of the WPD. News about the situation also appeared on both YLE's national website and national teletext services during Friday. In the morning of Saturday 1 December 2007 at 9:30, TRS news reported that the water problems persisted and broadcast information about water distribution. YLE's national radio news reported the water crisis and its cause for the first time at 18:00 on Friday. Following this, the situation was reported on nine occasions in different news broadcasts throughout Saturday and Sunday. National television news reported the situation on Saturday, 1 December 2007 at 21:50 on TV2 channel news.

The Aamulehti newspaper received a phone call from the WPD on Friday, 30 November 2007 at approximately 15:00. The call was made directly to the phone of the same reporter who had called the WPD the day before. The reporter was told that in certain areas of Nokia, water should be boiled and that there was a short bulletin about the matter on the municipality's web-site. Consequent to the phone call, the newspaper placed a short news report on the newspaper's website. Once the cause of the contamination was known, WPD started operations immediately to clean the water network and organize water distribution. Information about water distribution was posted also on the municipality's website as soon as the information about the arrangement of water distribution was available. During the evening, Aamulehti personnel, on the basis of contacts in Nokia and checks of information, realized the situation was more serious than previously thought. The newspaper prepared a longer news article, during the drafting of which the situation changed several times. Meanwhile, Nokia municipality had finalized the initial plans concerning the

water distribution, which the newspaper was able to include with information about the start of water distribution and distribution locations in the news article. The news appeared on Aamulehti's website and its morning paper on Saturday 1 December 2007.

The management of Nokia municipality received information about the matter on early Friday evening, 30 November 2007 from Nokia's Technical Department (NTD).

*Saturday, 1 December 2007*

On Saturday morning, 1 December 2007, the situation had worsened because the number of patients at the HCC had increased. The responsible authorities, as a result, held two meetings during the weekend at the HCC, on Saturday at 12:00 and on Sunday, 2 December 2007 at 13:00. The Director of the Environmental Health Authority (EHA) and Chief Physician of Healthcare were present at both meetings, while the Director of the NTD was present at Sunday's meeting.

Discussions of the overall situation and future actions were the key topics of these meetings. By Sunday, 100 patients had sought treatment at the HCC, 40 of whom had needed rehydration treatments. The role of the Director of EHA became more emphasized but still no recorded decision was made about leadership responsibility. Each organization focused mainly on dealing with tasks which were their responsibility, and only communication challenges were dealt as a common issue. It was agreed that the Director of the WPD would be in charge of communications with the instruction to discuss the need for public announcements, if necessary, with the Director of EHA.

On Saturday morning the WPD contacted the Pirkanmaa Regional Rescue Services Department (PRRSD), which supplied a vehicle for live announcements. During the evening the vehicle drove around Nokia giving out information about clean water pickup points. Communication within the WPD, in the context of the PRRSD, was largely inefficient since different people were in contact with the PRRSD unknowingly from each other. Consequently, the PRRSD was only asked for equipment, but not for broader assistance for managing the crisis. When PRRSD personnel enquired if a public announcement had been issued, the WPD's answer was that the information was on the Internet and available in the news. During the weekend, the insufficiency of communication concerning the crisis became increasingly clear and pressure from the media increased.

*Sunday, 2 December 2007*

On Sunday, 2 December 2007, the media actively started to follow the situation and interviewed key authorities. For example, YLE news reported the situation in several news broadcasts on Sunday. An interview with Nokia's town manager

was broadcast at 11:00 and 13:00 and interviews with the Directors of both EHA and WPD on the evening broadcasts. The meeting held by the responsible authorities on Sunday, 2 December 2007 decided that a proper information letter should be drafted. The Director of EHA prepared an information letter to be delivered to the households in the contaminated area and ordered the WPD to take care of its delivery immediately. Personnel of WPD, with their family members, mainly handled the delivery. The meeting also decided to hold a press conference the following day. The Director of EHA also prepared a bulletin to be posted on the website of PIRTEVA (the supervision unit of environmental health for Pirkkala and 5 other municipalities including Nokia).

*Monday, 3 December 2007*

On Monday, 3 December 2007, the first brief press conference was held for the representatives of the media, and afterwards the authorities responsible for managing the crisis held a meeting at which communication needs were emphasized. At this meeting, a request to have more people answering calls was raised, but no solution was reached. The media was not adequately informed about the press conference schedule. Moreover, Nokia's PIO heard about the press conference only after a representative of the media enquired about it on Monday morning. Invitations to the press conference at 11.30 at the HCC, at which individual interviews were given priority over prepared statements, were delivered to the media at 09:30. After the press conference, the responsible authorities held a meeting during which the communication needs were again emphasized. This was the first meeting, at which Nokia's PIO was present. The meeting decided to draft a clear and comprehensible information letter and to deliver it by mail to the whole Nokia area with the exception of Siuro, Linnavuori and Kulju areas, which are connected to a separate water network.

People living in and around Nokia can give feedback and ask questions in a special forum called *kuuma koira* (hot dog) on the town's website. By Monday, about 25 comments had been posted, the first of which were dated 1 December 2007. All the messages had been answered as follows: "Thank you for your question. We have received a lot of questions about tap water, and we will post a general answer on our website later. At the moment, we will primarily focus on assisting people and fixing the situation". Beginning on Monday, 3 December 2007, the media had formed a picture how serious the situation was, and they were gathering information actively and full-time.

*Tuesday, 4 December 2007*

On Tuesday, 4 December 2007, the people in charge started to feel exhausted. The management of the town realized the gravity of the situation and set up a

crisis team in charge of the crisis management. The team was called an extended management team (EMT), and included the management group of the town along with experts selected according to the preparedness plan. The members in the management group varied according to the crisis situation. The first meeting of the EMT was held at the conference room of the town council on 4 December 2007 at 15.00-16:10. The meeting was chaired by Nokia's deputy town manager and outlined the communication issue and set out to make it more effective and coherent so that rumours could be minimized. The use of the EMT brought about a more structured and systematic approach for handling the situation and helped in maintaining a complete picture of the situation

*Wednesday, 5 December 2007*

The breaking of a water pipe on Wednesday, 5 December 2007 caused confusion for the management of the crisis situation which had just become slightly more structured. The WPD did not inform the other management groups in time and the situation became critical. Since it was not clear at first if the contaminated water had also entered the clean area of the water mains system as a result of the pipe breakage, the Director of EHA issued a verbal instruction which banned the use of tap (drinking) water in the whole of Nokia. The total ban caused an increased pressure for communication, and at this stage, it was decided to issue a public announcement. The Director of NTD sent a request for a public announcement by telefax to the ERC of the Pirkanmaa region at 09:37.

The ERC confirmed authorization for a public announcement from the town of Nokia, from its Director of social welfare and health services. The Director of the ERC called the Director of TRS, after which the public announcement was sent approximately at 10:00, and was broadcast immediately in TRS' service area. The public announcement was revised by extending the ban on using tap (drinking) water to also include dishwashing. The revised public announcement was sent to YLE at 10:45. It was broadcast by YLE in the area covering the province of Western Finland, and was added to the text television services, on page 866. The Director of NTD directly contacted the ERC of Pirkanmaa region, which issued a public announcement at 10:00.

The same day the public relations office of the city of Tampere was asked to provide administrative assistance for communication. Tampere's Mayor and the Director of Tampere Waterworks granted permission for Tampere's Director of Communications and Tampere Waterworks' PR specialist to go to Nokia, where they took part as invited experts in the 13.00 meeting of the EMT. Before the meeting, these Tampere representatives had initially agreed to cooperate with TRS in the context of providing public communication, which the EMT approved. In addition, practical actions regarding the communication issue and the dates of

press conferences on the following days were decided at the meeting. The meeting also decided to display signboards informing the frequency of TRS's broadcasts concerning the water distribution sites. The press conference following the meeting was lead by Tampere's Director of Communications. After the press conference, it was agreed that Nokia would be in touch if necessary, in case further assistance is needed. During the next two days, the Tampere representatives and the Nokia's Director of Communications were in touch on a couple of occasions by telephone.

The Director of the WPD informed that their own resources were not sufficient to manage the situation, particularly the water distribution, so Nokia's acting town manager contacted the Headquarters of the Western Defence Region (HQWDR) at 11:40. HQWDR advised that assistance was being prepared. Subsequently the official request for help from Nokia arrived by fax at HQWDR at 12:55. The meeting of the EMT, which the town manager of Nokia chaired, was held at 13:00-14:20. In total 20 people participated in the meeting. The meeting made important decisions regarding the crisis, which were passed to the media, such as setting up a centralized communication system; the deployment of Defence Forces for water distribution; the agreement to employ the voluntary rescue service, VAPEPA; and that the PRRSD based at Tampere was on stand-by. The meeting was followed by a press conference, which was held from 14:30 onwards. The press conference was led by Tampere's Director of Communications.

On Wednesday, 5 December 2007, a regular meeting held by the Heads of Preparedness of various government Ministries discussed the Nokia water crisis. A representative of the Defence Forces participating in the meeting was tasked to discover how they might provide assistance. As a result, the Ministry of Social Affairs and Health (MSAH) decided to request administrative assistance in relation to the Nokia water epidemic to ensure the distribution of clean drinking water for households. The SAH sent the request to HQWDR specifying that the need was immediate, and was meant to ensure the availability of the necessary containers and equipment, as well as the personnel needed in the distribution of drinking water. The Secretary General and the Head of Preparedness of SAH both signed the request. Nokia did not receive any notification of this request for administrative assistance. The MSAH's request arrived at HQWDR at 14:22 on 5 December 2007. Thus there were two separate requests for administrative assistance for Nokia within half an hour from two different authorities, Nokia municipality and the MSAH.

The Pirkanmaa Hospital District (PHD) became involved on Wednesday 5 December because it had the capability and expertise, as well as more effective communications resources, for managing large-scale health related operations.

The PHD issued an additional announcement about infection to the other municipalities within the District because people living in the neighbouring municipalities, but who had fallen ill in Nokia, were seeking treatment. In addition, the PHD published information about the situation in its internal newsletter. At 18:00, on 5 December 2007, the PHD and the management of Nokia agreed that PHD would set up a telephone information service. During the evening and night, Tampere University Hospital with the aid of a telephone company constructed a four seat telephone information point in the PHD's administration department

*Thursday, 6 December 2007*

The PHD's telephone information service for the epidemic began operating at 12:00, on Thursday, 6 December 2007 (which is the Finnish Independence Day and consequently a public holiday) and was, therefore operated by just one hygiene nurse. During the first day, the telephone information service was available for four hours and received 182 calls, of which 69 were answered. The most common questions were about the symptoms and treatment of stomach complaints. Most of the calls came from families with children who had been taken ill

The front page of the Aamulehti newspaper, on Thursday morning, was dedicated to those questions about water which concerned people the most. In addition, TRS was also broadcasting during Independence Day and provided information about the situation with special news broadcasts between 8:20-9:00, 10:04-11:00 and 11:03-12:00. These broadcasts discussed the progress of the water distribution, had live broadcasts from Nokia's nursing home, the WPD and Nokia's information centre, and announced that schools and day-care centres would be closed on Friday.

*Friday, 7 December 2007 and onwards*

On Friday, 7 December 2007 the WPD presented an outline of how far the wastewater had spread. The EMT assembled twice during the day. The first meeting was at 09:00-09:50 and the second at 14:30-15:50. Both meetings noted that the health situation was relatively stable. Furthermore, the state of the water mains system and water distribution was discussed, and plans were made for the weekend. On Friday, 7 December 2007, the PHD telephone information service at Tampere University Hospital started at 09:00 and 426 calls came in during the first hour. The capacity to answer calls was increased by two additional telephone lines enabling four hygiene nurses as well as one pediatric nurse to answer calls. The telephone information service was open nine consecutive days in total.

During the last days of the service, calls were also related to more complicated clinical illnesses, which the service nurses transferred to a doctor.

After Independence Day, the EHA also started a telephone information service, which dealt with the quality of tap water in Nokia and gave instructions on its use. The EHA's telephone information service was in operation for about five days, but only on weekdays between 09.00 and 12.00, and focused on questions about water quality and use of water. After 8 December, managing the situation became more established, but still demanded a lot of work. For example, the EMT assembled 14 times in total during December 2007.

## **2.6 Relief & Recovery Phase Activities**

This phase consisted of four key activities: (i) treatment of the sick, (ii) cleaning of the pipeline, (iii) distribution of clean water, and (iv) settling compensation claims. All these activities required management and coordination and both internal and external communications. One major obstacle for Nokia's administration was the loss of credibility in handling the disaster at the beginning. Although the stake-holders succeeded quite well in dealing with the situation after the initial shock, the local population, as well as the media, remained sceptical and complained about the poor quality of information. Indeed the information was still considered to be haphazard and the population was unhappy that Nokia's administration had not delivered a comprehensive information package.

Treatment of the sick was carried out in three ways: (i) Most people remained home and only needed consultations through either Internet based services, or the PHD's call centre or calling Nokia's HCC, which could only take a very limited percentage of incoming calls (Seeck & al. 2008). (ii) The more severe cases were treated either in Nokia's HCC or at Tampere University Hospital. (iii) The ERC's capacity was sufficient to cope with the slight increase of incoming requests for assistance (mostly ambulances for patient transportations).

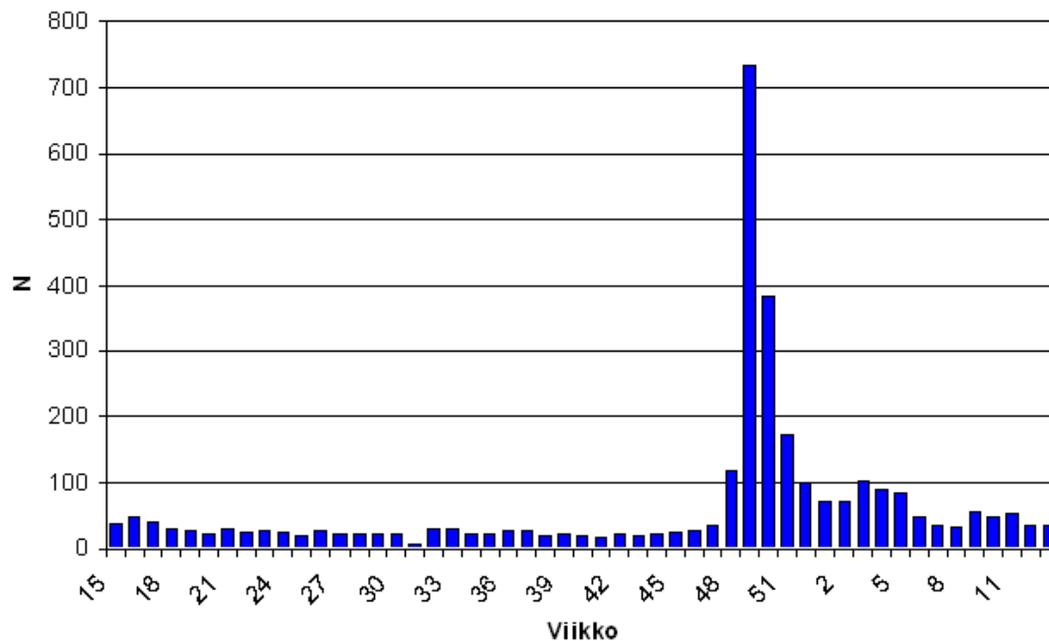


FIGURE 6 Patients' visits (N) to the Nokia Health Care Centre due to symptoms of diarrhea, vomiting etc. during calendar weeks (Viikko) between April 2007 and March 2008 (PIRTEVA 2008).

Cleaning of the drinking water pipeline, residential area by residential area, lasted for several months while laboratories analyzed water samples to confirm a successful operation. Communication with the residents of each area was fulfilled by distribution of a special free issue of a local paper in addition to the delivery of normal newspapers. Mostly the communication was a success, although there were some misunderstandings about who lived in a cleaned area and who in a contaminated area. In order to have the cleaning agent, chlorine, distributed throughout the pipe line, the residents were requested to run water from their taps. Some individuals were reluctant to do this because either they were afraid that the contaminated water would end up in their system (by not opening their taps, it was more probable they would keep the contaminated water for longer in their own system) or of the added cost to their water bills. The latter worry was eased by Nokia municipality's decision to compensate all consumers by not charging them for water for a considerable period of time. Although the cleaning operation was eventually quite a success, there remained suspicions about the quality of the drinking water.

The distribution of clean water was one of the most successful actions during the emergency. Only in the very beginning did the residents gather earlier than instructed to the main distribution site with the consequence the

delivery had to be started before the scheduled time. The water distribution was also a visual episode with soldiers delivering water and therefore attracted media attention. This resulted in good coverage and information in the media which also contributed to the success of the water distribution action.

Settling the demands for compensation is a time consuming process involving insurance policies, legal aspects and possible government support. Nokia municipality had liability insurance and started the process of covering the costs of emergency operations with the insurance company. The municipality arranged information meetings for local businesses quicker than for local residents. The majority of the communication concerning the compensation claims happened a long time after the crisis situation had ended and can be seen more as normal administrative matters than part of the relief and recovery phase.

A positive outcome of the Nokia water crisis was that it was a loud wake-up call for a number of organizations. The lessons learned were indeed used for revising and renewing crisis communication instructions and methods not only for water borne epidemics but for other crisis situations as well.

## 3 OBSERVATIONS

### 3.1 Situation awareness and management

At first, the situation at the WPD seemed to be a common problem related to pressure changes even though the announcements, their numbers, content and locations could have caused a different interpretation. Something similar to a brainstorming session was used to solve the problem, and people relied on their expert knowledge without specifically analyzing the problem. The problem was revealed gradually in a four stage process. First, there was the explanation that the problems were caused by the acquisition of extra water from Tampere. Second, it was suspected that foreign matter might be in the water. Third, foreign matter was found to be problem and, fourth, the cause was discovered. Prior to the fourth stage, the rising number of stomach complaints caused a number of measures to be taken: (a) the instruction to boil water was given, (b) water sampling was increased, (c) flushing of the water mains network was started and (d) water distribution was organized.

The primary actors had the misconception that the situation was under control and that they knew what to do. However, the operation was disorganized and the investigation task group (the food poisoning task group) was not assembled and no-one assumed leadership. No analysis was made of the situation in order to form both a clear picture of the extent of the problem and to determine the kind of actions and resources that were required. Experts in either of both crisis management and communications, e.g. the RRSD, should have been consulted immediately.

Several factors contributed to the operation model that was created. The management of the WPD had no experience of this kind of problem and they had not prepared for this eventuality in any way by training. The preparedness plan of the WPD was lacking, insofar as it did not offer a proper operational model for handling a crisis situation. Nokia management had not prepared adequately, and only compulsory plans had been made and very little training had been done. Nokia management thought that the preparedness plan would only be used in situations falling under the Emergency Powers Act. Consequently, the plan was not followed even though it would have been useful in organizing the operation. The model of the Regional EHA was quite new and cooperation with Nokia was not clear. Furthermore, national regulations and instructions on handling a water epidemic are varied and allow for different interpretations. The supervisory unit of environmental health for Pirkanmaa region PIRTEVA, for example, did not assume its role in handling the situation although according to the legislation

PIRTEVA's role as the lead agency was indisputable. The founding of the 22 RRSDs removed expert rescue knowledge from local the administrations of municipalities like Nokia's. The cooperation between the primary stakeholders (particularly the WPD and the EHA) was not wholly seamless, which hindered both effective communication and forming a clear picture of the situation.

On the whole, the operation started out disorganized and in a limited way. The lack of both a clearly designated lead organization and a clear picture of the situation meant that the initial communication concerning the crisis was haphazard, which quickly had a detrimental effect. Furthermore, a lack of resources meant that key personnel were overworked and partly engaged in doing secondary tasks. Since there was a need for great haste there did not seem to be sufficient time, even at later stages, to either analyze the situation or organize the operation or even transfer additional resources from neighbouring units. The role of the RRSD was passive and while the crisis was not technically their domain, their skills and resources would have been useful at the beginning. The establishment of the EMT on Tuesday, 4 December 2007 and inviting experts to support its work brought about a clear change in managing the situation. When the pipe broke on the morning of 5 December 2007, the WPD failed to inform the other stakeholders immediately and as the EMT had only held one meeting there was a danger of losing control of the situation. However, the EMT did manage during the day to bring a sense organization to the crisis and from then on the management of the operation was centralized and leadership became more organized.

The Defence Forces' ability to react quickly, the resources for planning and the organizational skills necessary for demanding operations were characteristic requirements for a crisis management organization. The Defence Forces created a Command Team at HQWDF to lead the operation of water distribution. The Command Team also estimated, planned and started the implementation of the administrative assistance, at MSAH's request, to be carried out under Nokia leadership. The Defence Forces had also, at the beginning of the operation, sent three liaison officers to Nokia, whose presence ensured cooperation with the town worked out well. Another well organized actor was the voluntary rescue service VAPEPA.

### **3.2 Analysis of the communications**

The delivery of the communication plan for emergencies, which was attached to the preparedness plan of the town of Nokia, was limited and was not available for the first stage actors. Also in other respects, Nokia was poorly prepared for

emergency communication. The town and the WPD had mailing lists but no crisis communication lists or any means to ensure that the recipients read emails. Also contactability outside of office hours and arrangements for substitute contacts were insufficient. Internal communication was based on emails, direct telephone contacts and text messages. VIRVE/TETRA, Nokia's Radio Network was not used at all. Reliance on direct means of communication meant that as phones were becoming increasingly busy and answering machines and voicemails became full, communication became difficult. Moreover, there was not a system in place for knowing which messages had been delivered, to whom and whether they had been read.

The communication issue was not embedded seamlessly in the crisis management and also communication was, at least in the beginning, one-way traffic. Professionals were not used for the initial communication, but the Director of the WPD was assigned and took charge of it. Nokia's administration did include a PIO whose role was small and limited to updating websites and giving out general advice. Although the PIO's job description includes regular community communication, the post-holder cannot be considered to be an expert in emergency or crisis communication.

Communication to the public during the accident can be perceived as a process with four steps: (i) danger warning, (ii) basic information and instructions, (iii) meeting individual information requirements and (iv) other additional information.

The danger warning was achieved in two parts. First, information was sent out on Friday, 30 November 2007 in the instruction to boil water on account of a suspicion of an epidemic. Then, after a few hours, when the cause of the problem had been discovered, the same message together with the cause of the problem was sent out. The initial announcement to boil water was delivered, for example, very quickly to YLE. A public announcement would have been an efficient way to communicate the danger to citizens but the first stage actors were not familiar with the public announcement mechanism and so it was not used. During the initial warning, based on the information at that stage, the instruction was considered to be a precautionary measure and, even in hindsight, use of a public announcement cannot be considered to be compulsory. The internal communication to schools, day-care centres and other institutions of Nokia was, however, insufficient.

After the cause of the problem had been discovered, a clear change in communication was required but did not happen. Transferring the information to the media was in fact slower than broadcasting the original announcement to boil water. At this point, a public announcement should have been issued. Since there was a direct threat to citizens' health, the most effective form of public

announcement, an emergency announcement, would have been justified. Also immediate actions should have been taken to inform the public about the situation. In addition, the announcement given to the public and other stakeholders should have been more descriptive. Use of the term ‘technical water’ gave an impression that the incident was not as serious as the presence of human pathogens denoted. The following diagram drawn on the basis of a survey made by the National Health Institute of Finland illustrates when and how the public received information about the accident for the first time.

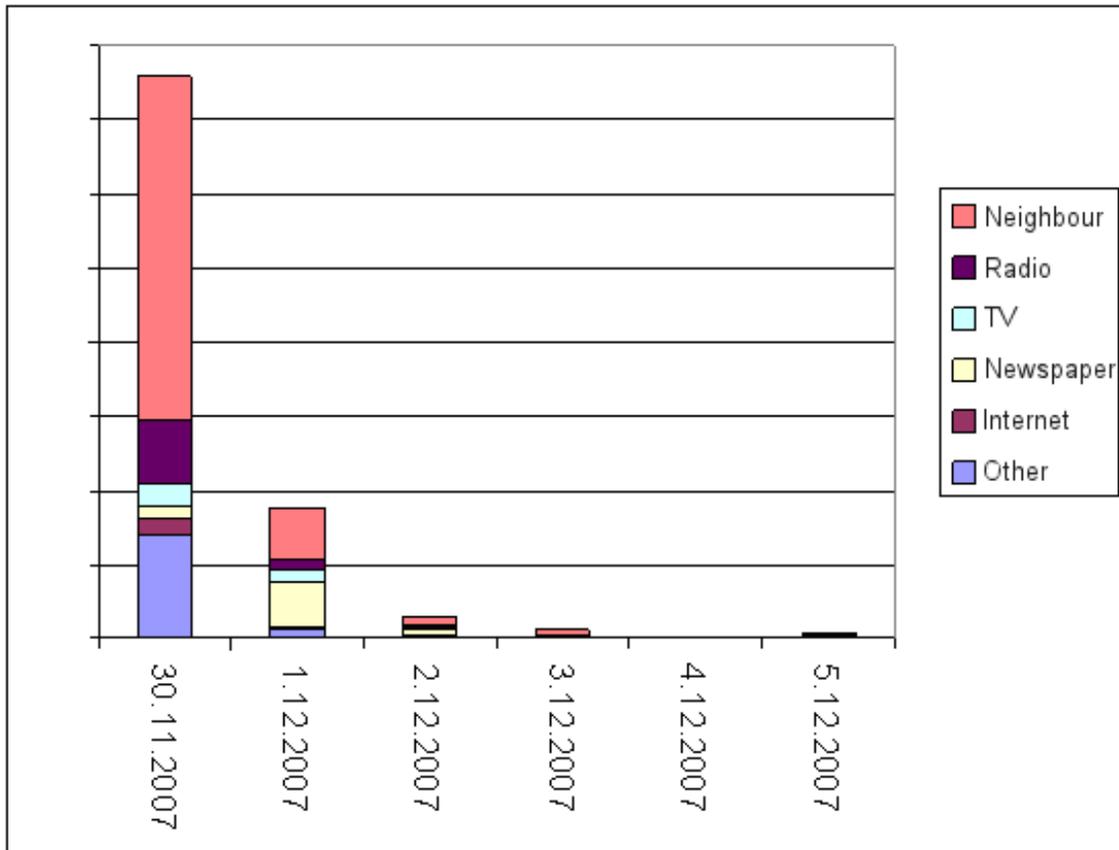


FIGURE 7 Diagram based on the survey made by National Health Institute of Finland shows when and how information was received of the accident for the first time (OTKES 2009)

Figure 7 shows that a large proportion of Nokia residents did not receive information until Saturday, and a significant proportion received it even later (2 and 3 December). Neighbours were the most significant sources of information every day whereas the radio and “other source” (unspecified) were quick sources of information on Friday, 30 November 2007. On Saturday, newspapers also formed a significant source.

We could ask, on the basis of the data presented in Figure 7, whether and to what extent effective communication would have succeeded in spreading the information throughout the affected community by Friday 30 November. The answer is complicated for two reasons: (i) even if all methods of communication are used, it is not possible to reach every citizen and (ii) the majority of exposures to the contaminated water had occurred on Wednesday 28 November. Nevertheless, the existence of efficient basic communication at the start of the crisis may have minimized the epidemic.

The pipe breakage on 5 December 2007 was followed by a corresponding step in the crisis communication. At this stage, the announcement, which placed a total ban on the use of water and the hurriedly issued public announcement had a disturbing effect on the communication process. Since there was not adequate knowledge about the procedures related to emergency and public announcements, the responsibility for updating the public announcements fell to the ERC. For many days the public announcements on the page of the text television services were out-of-date and thus did not fulfil the role of a public announcement, as an immediate source of information about an emergency.

*Basic information and instructions* were delivered mainly via Nokia's website and later via PIRTEVA's website. The information was initially both limited and inaccurate, particularly the information for chronically ill residents and pregnant women. Because the operation was disorganized, not only was the Internet information delivered by the authorities scattered, but the same information was also provided by different actors. Internet communication would have benefitted from being delivered on just one website and the media should have been used more efficiently in delivering information by organizing a press conference on Saturday, 1 December 2007 at the latest.

*Individual information requirements* can be met through two basic channels, telephone and Internet services. Nokia did not organize or allocate resources for a centralized telephone information service from the beginning of the crisis but only provided the telephone numbers of key personnel for further information enquiries. This was a mistake which was quickly noticed and rectified. At first, only Nokia's HCC had a telephone information service, which rapidly became severely overloaded. Later, several telephone information services were set up particularly by PHD at Tampere University Hospital, which was not only established professionally, but was also allocated sufficient resources to enable it to react flexibly when the demand rose. Nokia did not make use of interactive Internet services, and there was not any time to answer the messages posted in the *kuuma koira* forum. The discussion forums of local papers were in active use but mainly as a way to blow off steam rather than acting as sources of information.

*Other additional information* includes relevant information, which is not relevant for all parties. Internet and the media are the most important channels for delivering this type of information. Nevertheless, the content delivery of additional information via the Internet had the same defects as basic information - being overlapping and haphazard. The role of the media consisted of three stages. The first stage consisted of basic reactive journalism, which perceived the crisis as news worth reporting. The information gained from the WPD was forwarded immediately to the public. The second stage consisted of a proactive and critical media investigating both the identity of those responsible for the crisis and the reasons for the failures in the operation intended to solve the crisis. This stage did not help the overworked key personnel to handle the crisis, but the issues the media raised did help the actors to notice and detect defects in their operation. The third stage consisted of the media noticing the crisis was a real emergency and their role changed to providing assistance to the community. This assistance mainly happened in cooperation with the objectives of the authorities, but in some cases the media acted in a way that emphasized their own role, which did not help to clarify the situation but only served to add confusion. Pertinent to the role of the media was the problem of interpreting the consumer marketing guidelines in the context of an emergency crisis. The guidelines stipulate that, irrespective of the contents, newspapers should not be delivered against the wishes of the mailbox owner. Yet, Nokia municipality tried to deliver information via a special free issue of a local newspaper which was supposed to be delivered to all mailboxes, some of which were labelled "no free distributions".

### **3.3 A review of alternative means for communication**

Post-crisis feedback consisted in part of suggestions that a public warning siren or mass text messages should have been used to warn citizens. This section discusses the methods available to authorities to warn citizens of imminent danger.

#### *Public announcements mechanism*

Finnish legislation allows in cases of emergencies and imminent danger for authorities to use two categories of public announcements (LVM 2008).

Category 1: An Emergency announcement, which is issued to prevent imminent danger impinging on human life, health or property or an imminent threat of considerable damage to property or the environment;

Category 2: Other public announcement, which is an announcement issued to protect people and property when there is no imminent danger to human life.

Category 2 announcements are delivered directly by telefax to YLE in one of two scenarios – national or regional. If the situation will impact on the nation the announcement goes to YLE’s central broadcast centre. If the situation will have only a regional or local impact the announcement goes to either or both one of YLE’s regional radio stations (e.g. TRS in the Nokia case) and a private local radio station. Category 2 announcements are issued to citizens as quickly as possible without causing unreasonable disturbance to the radio broadcaster’s program service. The format issued to citizens is an exact copy as that delivered to the media.

The authority in charge of communication is responsible for the content of the Category 2 announcements. The authority decides whether to issue the announcement regionally or nationwide. The regulations do not specify clearly, which organization is responsible for communication in cases of serious emergencies related to public infrastructure. However, the regulations are quite clear in that municipalities do not have the authority to issue Category 2 announcements.

The announcement sent by Nokia to the ERC of Pirkanmaa region was quite clearly an unregulated Category 2. This forced the ERC’s shift manager to assess the status of the announcement as a press release, a Category 2 or a Category 1 announcement. The ERC’s guideline for operational communications does not specify how to respond in this type of situation, but does state that ERCs may act independently and issue either Category 1 or Category 2 announcements in exceptional circumstances and situations. A prime example of the former occurs when the authority in charge cannot be contacted due to a failure in communication. In such circumstances the ERC’s shift manager is required to assess the status of the situation before issuing a Category 1 announcement related to any emergency situation.

Prime examples of exceptional situations are serious failures in public infrastructures, energy supplies or other critical infrastructures, for which a Category 1 announcement is necessary to protect human life or property. This guideline enabled the Pirkanmaa ERC to issue a Category 1 (Emergency) announcement in the Nokia case. The quantity of information relating to the situation enables the ERC to assess whether or not a Category 1 announcement is necessary. For example, an ERC may decide that a crisis in a remote situation, for which there is scant information, would not warrant a Category 1 (Emergency) announcement.

Text messages on mobile telephone networks were used in the Asian tsunami catastrophe of 2004. Normal text messages (SMS, Short Message Service) were used in Finland for sending emergency announcements to the owners of Finnish telecommunication (telecom) providers' mobile phones who were in the disaster area. The sending of the text messages was accomplished by using the telecom providers' systems. Transmission required manual operators because there were not any automated routines ready for the purpose. However, telecom providers' do have a standardized transmission system for text messages, the Cell Broadcast Service (CBS), which can be used for transmission of emergency announcements. Following an initiative of the Ministry of the Interior, an expert group of the Finnish Communications Regulatory Authority produced a report in 2005 about the requirements needed for warning citizens by using these two systems (Viestintävirasto 2005).

The implementation of an emergency text message service based on the SMS system has been planned in Finland mainly because the system is established and the start-up costs are moderate. Negotiations are in progress with all the telecom providers and the objective is to have the service up and running within 2-5 hours of the onset of a crisis. Key aspects of any implementation of an emergency text message service, which require careful planning are the avoidance of any possible misuse and other adverse effects. Furthermore, the service would require a significant information campaign so that citizens can gain an idea of the new service beforehand and are aware of procedures involved when they need to use it.

An emergency text message is only the first signal that a crisis has happened so in addition to the basic message, the message must include sources of additional information (for example, radio stations/television channels, a page on the text television services, phone number, website address etc.).

## **4 CONCLUSIONS**

This practice-oriented case study on the water contamination crisis in Nokia illustrated that planning and preparation are vital for efficient emergency communication. A key feature is an active relationship between the different actors so that responsibilities and tasks can be agreed upon beforehand. In the Nokia case, failures in communication were caused by coordination problems in management, insufficient delivery of situational awareness, a low level of ability to see the alarm signals inherent of the incident, and insufficient knowledge and resources for emergency communication.

While the nature of planning should be understood as a social process (Dynes 1994), in this case like in many communities, planning was viewed as the production of a detailed document, prepared by consultancy experts, who by default had little knowledge of the community and its overall circumstances. This was particularly the case with the technical sector preparedness plans. The reorganizing and streamlining of local and regional expert offices into larger organizations resulted in most of the organizations' resources being exhausted at the onset of the crisis, in trying to have the day-to-day work running smoothly. Preparedness plans are often obsolete, or indeed non-existent, for a considerable period of time.

The different methods of communication have varying degrees of significance during an emergency. The first warning should employ every channel available, although radio and direct contacts will probably reach most of the target population. During a prolonged crisis, the role of the media will increase and the ability to exploit new Internet based interactive methods will be crucial. In the best case, both media and the Internet may help the authorities and stakeholders in disseminating correct and valuable information to those in need.

Modern society will become increasingly fragmented and the needs and expectations of individuals will be even more diverse in the future. This brings additional demands for those in charge of planning and exercising for crisis communications methods.

The main challenge in the future will also be to assist organizations and stakeholders that are not emergency professionals, when they face a crisis suddenly on a Friday afternoon and do not recognize the magnitude of the situation and the special communication needs.

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*The research project 'Developing a crisis scorecard' leading to these results has received funding from the European Community's Seventh Framework Program (FP7/2007-2013) under grant agreement n° 217889.*