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REPORT

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WP5 - SOCIO-ECONOMIC IMPACTS OF REHABILITATION STRATEGIES

D14 report: Rehabilitation impact on social quality of life

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CARE-S - Computer Aided REhabilitation of Sewer networks

COMPUTER AIDED REHABILITATION OF SEWER NETWORKS

Research and Technological Development Project of European Community

CARE-S

WP 5 – SOCIO-ECONOMIC IMPACTS OF REHABILITATION STRATEGIES

Task 5.2- Rehabilitation impact on social quality of life

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August 2005



SANITATION AND QUALITY OF LIFE

workpackage 5 | task 5.2

SUMMARY

This Report is the product of a research pursued under the EU project *Computer Aided Rehabilitation of Sewer Networks* (CARE-S), Workpackage 5, Task 5.2.

Aiming to deepen knowledge on social impacts of both sewer rehabilitation and non-rehabilitated vulnerable urban scenarios, the above-mentioned research implied the pursuit of a strategy directed to know individuals experience, attitudes and views about sewer renewal works and sewer failures.

The above-mentioned strategy stood on a case-study type of approach, which comprehends two target-areas: Nantes metropolis and two municipalities of Lisbon metropolis, Amadora and Oeiras. On both areas two types of studies were pursued: an exploratory one and a survey, through which a questionnaire was applied to a sample of target-populations.

This research results indicate that sewer failures and rehabilitation works are events that, in general terms, induce on disturbances to individuals quality of life, specially in what concerns to the areas of *housing* and nearby *surroundings*. Nevertheless, being distinct type of situations, disturbances are lived in different ways as well as differently tolerated. Besides, this study also showed that, apart from impacts at the level of social well-being, those *critical events may* provoke, under certain circumstances, *trust* erosion of costumers towards sewerage utility.

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This research was pursued with contribution and participation of several individuals and institutions, both in Portugal and France.

Particularly important were the contributions of both Amadora-Oeiras and Nantes metropolis end-users. In what concerns to the first, the team thanks eng. Julieta Marques and Helena Silva for their support on providing the necessary data for research pursuit. With regard to Nantes Metropolis, the team thanks Michel Blanche and all the staff of the sanitation department for their permanent support, their patience and their kindness.

Apart from the above-mentioned institutions, the research implied the colaboration of several representantives of Amadora and Oeiras local districts. The team is grateful to all them, especially to the local district of Brandoa, who gave a vital contribute on focus groups preparation.

Finally, this project involved the participation of an amount of young and recently graduated social scientists, which must be signalised. On the portuguese side, we would like to emphasise the engagement of Sara Almeida, Pedro Serafim and Bruno Guarita along field work. A special expression of gratitude to Sara that, after field work, continued to work with us on data treatment and analysis tasks. On the french side, we would like to mention the contribution of Virginie Waechter who managed with a professional effectiveness the preparation and the beginning of the survey in Nantes.

5.2 TEAM AND COLLABORATORS

Technical and scientific team

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[1] Besides other research related tasks, Alvaro Pereira participated on Amadora-Oeiras results analysis as well as methodology section of this report.

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1. INTRODUCTION

Framing: the CARE-S Project

Research subjacent to this Report was developed under the Project *Computer Aided Rehabilitation of Sewer Networks* (CARE-S). Sponsored by the fifth European Union Framework Programme, key-action *sustainable management and quality of water*, CARE-S aims to establish a rational framework for sewer network rehabilitation decision-making. At the end, such framework should be able to assist sewerage managers, the end-users, on decision-making about *when*, *where* and *how to rehabilitate*, *at a minimum cost* and *before serious failures do occur*.

CARE-S is composed by ten workpackages (WP), through which diverse features of the phenomena are approached. Those features are, more specifically, related with performance indicators for sewer rehabilitation (WP1); validation of structural condition (WP2); hydraulic performance (WP3); technological information system for rehabilitation (WP4); socio-economic consequences of rehabilitation related issues (WP5); multi-criteria decision support (WP6); sewer network rehabilitation management tool (WP7); its testing and validation (WP8), jointly tasks directed to results dissemination and project management (WP9 and WP10).

The present Report is part of WP 5 and constitutes the deliverable task 5.2. This WP main aim is to feed the above-mentioned CARE-S rational framework with information about socio-economic impacts of rehabilitation as well as impacts of failures on sewer systems. Most often, these particular impacts are excluded from decision-making about *when*, *where* and *how to rehabilitate* or they are addressed in an either partial or implicit way.

WP5 comprehends three tasks. Task 5.1 aimed at the conception of a criteria framework, representing social costs, for guidance along decision-making processes about sewer rehabilitation. Task 5.2 was conceived in order to allow a systematic knowledge about impacts of both sewer failures and rehabilitation works on individuals and communities quality of life. Task 5.3 main aim is the conception of a guidance for communication with the public, namely under rehabilitation works or failures circumstances.

Task 5.2: sanitation and quality of life

Knowledge about impacts of both sewer failures and rehabilitation works stands on a methodology especially designed to capture experience, attitudes and views of individuals who suffered from those events, at their residential or work area.

Given this, on the basis of a theoretical framework, a case-study type of approach was developed, on two pre-selected sites. Such an approach stood on two interrelated empirical studies: a exploratory one, where exploratory interviews and *focus groups* discussions were undertaken; and a survey, which implied the pursuit of an amount of tasks, namely in what concerns to sampling, questionnaire construction, field work and data analysis.

The above-mentioned pre-selected sites belong to the territory of French and Portuguese CARE-S end-users. We refer, on the one hand, to Nantes metropolis and its Department of Sanitation and, on the other hand, to two Lisbon metropolis municipalities, Amadora and Oeiras and their respective water and sewerage utility.

Under this specific research, sewer systems are envisaged as *expert systems,* deeply embedded on modern industrialized societies daily life. Costumers are, in turn, seen as compulsory users of those systems, maintaining a relation of unquestioned *trust* on their good performance. Sewer failures and rehabilitation works are events that may threat such equilibrium and induce on disturbances to individuals' quality of life.

Structure of the report

Three Parts compose this Report, each one containing a set of chapters. Part I provides a detailed overview of this research theoretical framework. Departing from a short history of the way societies have dealt with sewage, this Part presents the theoretical foundations underlying the assumption of sewer systems as *expert systems*.

Part II contains two chapters, exclusively dedicated to methodological framework presentation. Given this, the first chapter presents the two case study' target-areas, namely in what concerns to their demography, urban characteristics and sanitation sector. Afterwards, a description of both methods and procedures of this study is pursued.

Part III exposes and discuss the results of the survey into two chapters, a first one dedicated to Amadora-Oeiras case-study and a second one circumscribed to Nantes results presentation. This Part finishes with a brief comparative analysis of both target-areas main trends.

PART I

Sewerage in the context of modernity

Research about impacts of sewer failures and sewer rehabilitation implied the construction of a theoretical framework, which primordial aim was to allow a more accurate comprehension of phenomena under study as well as to orientate the whole process of research. Part I of this report privileges its presentation.

This theoretical framework stands on assumption of sewer systems as *expert systems*, among a multiplicity of others that colonize modern industrialised societies. Vital to social quality of life and environmental sustainability, such physical artefacts are object of a compulsory use on the part of users, based on a kind of unquestioned *trust* or faith on its good performance. Failures and rehabilitation works are viewed as *critical events*, once they can disturb individuals' well being as well as the relation between costumers and sewerage utility.

After a short History about how sewerage became "invisible" in the context of modernity, the above-mentioned vision of sewer systems will be presented and discussed. Part I finishes with a synthesis of this study approach to failures and rehabilitation works impacts.

2. SEWERAGE AND THE ROUTINE OF DAILY LIFE

2.1. A short socio-historical perspective: how sewerage became invisible on social daily life

Modernity initiated a new way of coping with sewage. From a scenario where sewage was almost (un)handled by individuals and households, modern industrialised societies went gradually through a scenario where waste became a matter of experts, being the face of organizations, charged of water and wastewater management and service delivery to inhabitants, in exchange of regular payment.

In pre-modern societies, cesspits predominated as method of domestic sewage disposal and streams were, in great part, waste repositories[2]. The spectacular rise of urban population, around 19th century, turned this practice intolerable. Unplanned expansion processes induced on unsanitary and unhealthy patterns of housing in European cities. Cholera events, which occurred for several times in Europe, can be viewed as one of the most dramatic expressions of such unsustainable way of dealing with sewage[3].

Indeed, these events were certainly at the origin of the development of the so-called *hygienist current*[4]. This current proclaimed the need of a tube infrastructure that had as main aim to allow "la circulation incessante de l'eau qui entre pure en ville et le movement également continue des résidus et qui doivent en sortir." (Ward: 1852, cited by Matos, 2000).

Under the auspices of this current, a process of canalisation of water and wastewater, through drainage networks, got started in Europe. As far as History allows us to know, the first modern sewerage network was firstly built in 1843, at Hamburg, Germany. The destruction of a part of the city, as consequence of a big fire, created conditions for the installation of a sewer network

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[2] Concomitantly, accumulated sewage was removed periodically for eventual use on market gardens and farms around cities. Nevertheless, in poorer areas, cesspits went unempitied for years on end (Petts, G. et al, 2002).

[3] The worse cases of cholera epidemics occurred between 1823 and 1837 (with particular incidence in Mediterranean region) as well as between 1846 and1851. Death estimative, induced by such events, are of around 37 000 individuals (Matos, 2000; Petts, G. et al, in ibid).

[4] A part from such epidemics events, ninetieth century Europe specific social and cultural environment provided, in our view, an appropriate context for the development of the above-mentioned current. Such Iluministic environment can be, in short, synthesised as human reliance on Man, science and scientists for the comprehension and resolution of problems of human nature and physical environment.

system. Meanwhile, engineers such as Bellegrand in Paris, Garcia Faria in Barcelona and Ressano Garcia in Lisbon, launched sanitary projects on their own cities, following *hygienist current* principles (Matos, in ibid).

The effects of such human endeavour were so ubiquitous that sewer networks became trivial infrastructures, completely internalised on daily life of most citizens and modern industrialised cities. Its central function of human needs fulfilment contrasts with the rather non-reflexive daily use, on the part of individuals.

The above-mentioned function of human needs fulfilment is strictly related with quality of life. In fact, modern sewerage induced on, what it may be called as, a silent revolution of urban and social quality of life, which oozes the satisfaction of human physiological basic needs.

By quality of life, we mean the capacity of a society to satisfy (or not) its members material and non-material needs, in a set of areas of life which range from health, housing, work, family to education, leisure, politics, religion, safety and sustainable physical environments (Setien: 1993).

In our view, modern sewer system induced on positive direct impacts at the health, safety, housing, and physical environment levels. In what concerns to the two first-mentioned areas, its contribute to the reduction of diseases, namely the epidemic ones, is unquestionable. On the other hand, sewer network type infrastructure induced on a significative improvement of urban drainage capabilities. Such improvement also had effects at human health and safety components of quality of life, namely because it gave an important contribute for the mitigation of urban flooding risk. Connection of houses to public water and sewer networks is at the basis of huge domestic changes, which go beyond the simple fulfilment of basic physic needs, embracing non-material needs. The upgrading of individuals and households comfort constitutes an example of such non-material positive impacts, at housing level. Such comfort upgrading is also patent at the level of physical environment. In parallel with the progress at public space cleanness conditions, modern sewer system transformed cities' public spaces on more friendly and safe ones[5].

Besides the above-mentioned changes, modern re-organization of domestic sewage and water delivery induced on transformations of water and wastewater governance. The responsibility of management displaced from inhabitants by themselves to the State. The governance of such

[5] Nevertheless, it should be emphasised that, concomitantly with this improvement without precedents of sanitation, modern industrialized world is at the basis of huge pressures on rivers, coastal areas and physical environment in general. Although differently, watercourses continued to be treated as waste repositories. Development of technology applied to wastewater treatment has given an important contribute for an inversion of such unsustainable scenario. Furthermore, the influence of ideological re-discovery of watercourses on such inversion should not be neglected. In fact, along twentieth century aesthetical, ecological and social dimensions of rivers and streams gained meaning for urban inhabitants.

issues is rather diverse in Europe, but the underlying philosophy is common. Either through local associations or municipalities, either through private or public administrations, what prevails, in the context of modern industrialized societies, is the delegation of sewerage issues to socio-technique or expert individuals and organizations, created to delivery a service to communities and its inhabitants. The relationship between the first and the second is, at some extent, equidistant. Its maintenance or equilibrium is founded, as we shall see, in some of faith or lay trust in the normal functioning of sewer systems.

2.2. Sewerage as expert systems

The sociologist Anthony Giddens (1994) elects what he calls as “discontextualisation” of social systems as one of the most important marks of modernity. This term intends to name the disconnection of social relations from local contexts and the possibility for them to occur across vast expanses of time and space.

Such process of “liberating” human interactions from local and face-to-face contexts became possible through two mechanisms, as follows: *symbolic guarantees* and *expert systems*. Especial attention will be given to the second-mentioned mechanism, due to its centrality under this study.

E*xpert systems* correspond to the multiplicity of physical artefacts and technologies that colonize modern societies and individuals daily lives. They result from modern Era scientific and technological exponential advance and require specific forms of knowledge or expertise. By this, we mean that its conception and functioning implies some kind of expert knowledge, contrarily to its use, which may occur on the basis of ignorance or poor levels of knowledge. Giddens (in ibid) exemplifies such modernity trait with the building where we live, the car or public transport we use to go to work, the plain we take whenever we need to displace to other territories. These artefacts are examples of *expert systems* that colonize our daily lives. We use them in a compulsory or non-reflexive way and, at the same time, know little about the expertise involved on it. As we shall see bellow, *expert systems* compulsory use is possible due to lay *trust* on them and their performance.

Taking into account this sociologist perspective, we postulate that modern sewer systems are among the multiplicity of *expert systems* that colonize individuals’ daily lives. Its conception as well as its management requires expertise and expert knowledge. These systems daily use occurs in a context of *trust* in their normal functioning.

2.2.1 Trust as the cement of relationship lay users and sewerage-*expert* systems

Indeed, *trust* is a key-factor in the relationship between lay individuals and *expert systems*. As mentioned before, such *trust* feeling is not based on some kind of specific knowledge about those systems, but on a kind of faith that they will function in a normal way.

Belief on *expert systems* trustworthiness stands on three parameters. First, experience[6] through which lay individuals daily confirm those systems correct operation. Second, faith on scientific knowledge or quality of expertise, involved on those systems. Third, trust renewal through periodical, but irregular, encounters with who represents each particular system. This last parameter deserves a more cautious attention.

It is worth to emphasise that *expert systems* don't involve only physical artefacts or technologies, but also the organisations that manage or represent them. In this sense, sewer *expert system* goes beyond the network in strict terms, as it also embraces public or private company responsible for its management.

These organisations are the face of *expert systems* and they play a role on the above-mentioned *trust* renewal. The relation they maintain with lay people and systems' users stands on two types encounters or commitments. We refer, on the one hand, to *non-presential encounters* and, on the other, to *presential* ones. The first concerns all the type of situations that, although referring to a certain *expert system*, occur without the physical presence of both parts, system' representatives and lay individuals or users. For example, the bill that sewage costumers periodically receive on their homes configures a *non-presential* type of encounter. Although extremely automatized, they signalise the continuity of a certain service delivery system, contributing for *trust* maintenance on it.

Presential commitments correspond to encounters based on the co-presence of *expert system* delegates[7] and lay individuals. In parallel with their function of trust renewal, these are privileged ways of conferring a context to discontextualized social relations.

Giddens (1990) names as *access points* the places[8] where *presential commitments* do occur and through which connection between *expert system* delegates and lay individuals happen. In favour of *trust* renewal, it is important for such meetings to involve demonstrations of trustworthiness and integrity on the part of experts or system' delegates. Given this, *presential commitments* and *trust* maintenance is extremely dependent on delegates behaviour.

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6 Which also involves familiarity.

7 Which may be experts or mere system representatives.

8 Or situations.

In sum, centrality of *trust*, in parallel with the role of *presential commitments* on its renewal, transforms the so-called *access points* into crucial "places" of vulnerability. Through them trust on *expert systems* and who represents them may be reinforced. Nevertheless, they can instigate distrust syndromes. These, when happen, are difficult to invert.

As mentioned before, under present research sewer systems are visualised as a kind of *expert system*, deeply embedded on individuals' daily lives. Individuals use them in a very compulsory and non-reflexive or unconscious way. Their faith on system functionality relies on the belief that who conceived it knew what was doing, on the daily confirmation of its correct operation and, finally, on a kind of unconscious *trust* on the entity that manages sewer system.

It is worth to emphasise that *trust* not always implies some kind of awareness. In fact, the most usual is for individuals to reproduce a kind of unconscious, unquestioned and automatized *trust* on *expert systems*.

Presential commitments at *access points* between users and delegates of sewer *systems* can be characterized as intermittent and irregular. An aspect that turns such type of encounters even more important on their role of *trust* renewal.

3. BREACHES ON THE EXPECTED COURSE OF DAILY LIFE

According to Giddens (1990), *access points* become particularly vulnerable "places" in face of, what he calls as, *critical events*. This term intends to name abnormal situations, which induce on some kind of disruption to individual daily life or community routine.

Here, interactions between experts and individuals, namely the ones established under *presential commitments*, gains absolute centrality. Such interactions can open breaches on individuals' level of *trust*.

3.1 Critical events associated with sewerage

Concerning sewerage type of *expert system*, we advance with two types of *critical events*, as follows: sewer failures and sewer rehabilitation works, particularly those that involve digging techniques. What confers them the quality of *critical event* is, as we shall see bellow, the fact that both guard some potential for inducing on some kind of disruption to individuals' daily lives and community routines.

3.1.1 Failures as critical events

Following Task 5.1 theoretical framework, sewer failures are defects or misfunctions, which impede a certain pipe or network of achieving the required level of performance. Notwithstanding its great variety, it is found as acceptable to state that blockages, structural pipe collapses, combined sewer overflows, infiltration and exfiltration phenomena are among the most common type of sewer failures.

Such type of events may induce on *external effects*. By this, we mean abnormal physical changes on the "world outside", due to a defect or misfunction. For example, the presence of rainwater on a street due to a blockage or decrease of hydraulic capacity of a certain pipe or network (Wery et. al, 2005).

In turn, sewer failures *external effects* can or not induce on impacts to individuals, activities, public or private properties and environment. Its occurrence depends on the type and intensity of underlying failure as well as of a set of built environment and community characteristics. If the above-mentioned rainwater on a street doesn't' gain the proportion of a flood and occurs on a non-populated area, impacts will tend to be minor or even none. On the contrary, if it happens on one of the main thoroughfares of a city, the most probable is to provoke traffic disturbance type of impact.

We hypothesise that sewer failures may provoke impacts at two levels, as follows: relation users ↔ sewerage utility, based on *trust*; and individuals' quality of life.

Concerning the first mentioned type of impact, there is little to add to what has already been said. Users are fundamentally costumers and sewerage utilities service providers. The relation between both relies on a kind of unconscious *trust* or faith on sewerage-*expert system* normal functioning. Failure events may introduce a breach on that equilibrium. Here, sewerage services performance, under *critical events*, has an important role of avoiding *trust* erosion syndromes and slowing down impacts on individuals' well being[9].

At the level of quality of life, it is hypothesised that impacts may be felt on five areas, namely health, safety, housing, work and physical environment.

In general terms, social consequences of sewer related failures might generally range from temporary feeling of discomfort[10] to financial losses, due material damages, loss of working hours or temporary closure of business.

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[9] Tapsell (1999) study on health consequences of Easter 1998 floods in England reported that loss of trust of residents on authorities and institutions related with flood control explained, on great part, the manifestation of health impacts such as worry and anxiety associated with future flooding.

[10] At home or when using public space.

3.1.2 Sewer rehabilitation works as critical events

Similarly to sewer failures, what makes rehabilitation works[11] *critical events* elapses from the potential of disturbance they can cause on individuals' quality of life as well as on their view about organisation that promotes works.

Nevertheless, it should not be disregarded that failures and rehab works have their own specificities. Given this, it is plausible to anticipate that they might have distinct type of impacts and, above all, to be experienced in different ways, on the part of who bears its effects.

Rehab works external effects embrace all the type of physical changes on the "world outside", caused by works. The presence of trenches on a street is among the most common type of effects[12]. Such scenario implies, in some cases, the temporary closure of road lanes. Besides these, other also common effects are dust and temporary dirtiness, noise and service interruption may also occur (Wery et. al, in ibid).

The occurrence or not of impacts is rather dependent on a set *rehab works* characteristics, namely its duration, size of the work area, date of occurrence, among other aspects. Concomitantly, target-areas social and urban characteristics should not be disregarded as also influencing factors. The intensity of impacts is probably low on an area without economic activity, with only a few residents and not crossed by vital roads of access to important urban poles.

We foresee that, whenever occurring, rehab works' impacts will fall upon the same general areas as for failures, that is: relation users ↔ sewerage utility, based on *trust;* and individuals' quality of life. However, distinctiveness of both types of *critical events* will certainly express itself at the level of the impacts.

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[11] We will make the option of to use the term "rehab works" as an abbreviation of sewer rehabilitation works.

[12] In face of digging type of technique.

4. MANAGING THE RELATIONSHIP WITH USERS, IN FACE OF CRITICAL EVENTS

Sewerage-*expert systems* are fundamentally providers of a service to the community. Given this, their relationship with users appears as relevant and constitutes a feature of quality of service, which should not be disregarded.

The above-mentioned relationship assumes particular centrality in face of *critical events*, such as sewer failures or rehab works. Its configuration dictates, in great part, whether abnormal events open a breach between the costumer and the utility, or not.

But, in what parameters should a costumer' policy stand in order to prevent such breaches?

This questioning leads us to emphasise two aspects of sewer systems management. We refer, on the one hand, to the importance of investing on *pro-active* modalities of management, instead of reactive ones; and, on the other hand, to the relevance of establishing a specific policy of relation with costumers, namely under abnormal circumstances.

Pro-active modalities of management would have the advantage of preventing the occurrence of *critical events*. The existence of a specific costumer' policy allows, in turn, a better mitigation of unavoidable events consequences.

In schematic terms, an adequate costumer' policy is the one that ensures the following parameters: existence of appropriate mechanisms of public *accessibility* to the services[13]; regular delivery of *information* to the costumers, about sewerage related issues[14]; guarantee of *commitment* on solving costumer problem, even if that only implies to give an answer to him; guarantee of a *satisfactory explanation* to the costumer, namely on something abnormal happens (OFWAT, 2001).

Such policy underlying procedures should enjoy from a certain dynamic, through which costumers' requests are dealt at a reasonable time. Concomitantly, it is found as pertinent to insure one sole channel of communication with the costumer, avoiding situations where user repeats his problem to a different person every time he enters on contact with the utility.

One of main differences between sewer failures and sewer rehab works concerns the possibility of anticipation of both occurrence and impacts, in time and space. Sewer failures are events

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[13] *Accessibility* concerns the guarantee of an easy access to the services in strict terms, but also to assure that costumers enter on contact with the right department or individuals.

[14] Namely, in what concerns to the procedure a costumer should follow in case of whatever *critical event* occurrence.

more disposed to sudden and unexpected manifestations. A fact that doesn't occur with sewer rehab works, where almost everything can be planned and anticipated.

This *critical events*' specificity should have repercussions on any costumer' policy. The suddenness of some failures, jointly with its potential of disturbance for the user, confers higher importance to *access points*, in its role of transmitting trustworthiness and sense of professionalism.

Here, apart from the *accessibility* issue, it also emerges as important to be efficient on problem solving and clear on the explanation to the client. Situations of intervention' delay or of temporary and fragile solutions for the problem are risky. The re-occurrence of a certain failure, in time, is troubling, in terms of credibility and *trust*. On the other hand, not to maintain the costumer informed along the process of problem solving, can be tricky.

In what concerns to rehab works, primordial efforts should go on the direction of potential impacts anticipation and avoidance. Whenever they are unavoidable, the best way of mitigating it is through regular communication with the public.

5. APPROACHING TO FAILURES AND REHAB WORKS IMPACTS

Under present research, sewer systems are viewed as a specific type of *expert system,* designed to allow an adequate management of sewerage (disposal & treatment), in the context of modern industrialised societies.

As mentioned above, e*xpert systems* are physical artefacts or systems of technical realisation, which involve expert knowledge and expertise. Such systems are deeply involved on individuals' daily lives and organise vast areas of social and physical environment. It is worth to mention that *expert systems* don't only concern physical artefacts in strict terms, but also embrace who manages or represents it.

By managing wastewater, sewerage-*expert systems* provide a service to community. Users of such systems are, in turn, costumers, who usufruct from that service and pay for it.

Moreover, costumers are fundamentally lay users of sewerage-*expert systems*. Their relation with this specific *system* is not based on any kind of expert knowledge about it. Instead, it relies on some kind of non-reflexive *trust* or belief on those systems' reliability.

As already discussed above, lay *trust* maintenance on sewerage-*expert systems* elapses fundamentally from users experience, through which systems' normal functioning is confirmed; from a kind of faith on the good quality of technical expertise involved[15]; and, finally, from the so-called *presential* and *non-presential commitments*.

As far as we can envisage, relation between users and sewer systems has its own specificities. In fact, such relation may have inherent a kind of paradox. Modern sewerage is absolutely determinant for individuals' quality of life and environmental sustainability and simultaneously object of a compulsory and unquestioned use, without particular awareness of its vitality and risks.

At least three characteristics of sewer systems are, in our view, at the basis of the above-mentioned paradox and non-reflexive attitude. We refer, on the one hand, to its deep acuteness on routines of daily life and to its "invisible" nature. On the other hand, these systems' high

[15] Either when it was conceived or along its management.

standard of technical performance makes them generally well-functioning artefacts[16], a fact that contributes, on its own way to deepen its "invisibility".

It is found as worth to mention that sewer network seems to be even more "invisible" than water network, fundamentally due to the distinct function they both play. As long as water network primordial function is the delivery of a vital resource for individuals, sewer networks exist to allow individuals' throwing out of domestic waste. Here, the most important is the guarantee of disappearance of something not wanted by individuals. Meanwhile as far as it concerns to water, one of most important aspects for individuals, as users, is the guarantee of access to an irreplaceable good, in adequate conditions to be consumed.

Alegre and Almeida (1995) envisage individuals as *reactive users*, in their relation with sewer-*expert systems.* In our view, the three above-mentioned characteristics explain, in great part, why individuals are fundamentally reactive.

Such reactive attitude and behaviour may manifest itself, with particular accuracy, under *critical events*, such as sewer failures and sewer rehab works.

As emphasised on above sections, this study departs from the presupposition or hypothesis that those type of *critical events* induce on impacts to individuals quality of life, namely in the areas of *health*, *safety*, *work*, *housing* and *physical environment*. A set of questionings emerges, attached to this central hypothesis, as follows: to what extent are such impacts lived as disturbing for individuals' daily life? Are they perceived as acceptable events or not? What is at the basis of eventual unacceptability attitudes? Does experience of failures induce on more awareness towards the importance of sewer rehabilitation investments?

Allows us to clarify that, under present research, acceptability is a synonymous of tolerance. It has implicit an attitude of indignation towards a certain event or, on the contrary, an attitude of comprehension.

Not every failure or sewer rehabilitation induces on impacts to individuals and, consequently, on a declining of quality of life. Furthermore, even when occurring not every impact is experienced as disturbing for individuals well being. Two general types of parameters may influence the above-mentioned occurrence and degree of disturbance of impacts: *characteristics of critical event* and the socio-ecological context where they happen. The first were already object of discussion on previous sections, so it won't be retaken again[17]. But the second deserves a more detailed look.

The so-called socio-ecological context embraces dimensions related with land-use and a set of "subjective" and individual dimensions. C*ritical events* imacts will certainly vary whether it

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[16] Especially in what concerns to its strict social ends.

[17] Cf. Sections 3.1.1 and 3.1.2.

happens in a rural and low population area or in an urban highly populated one. They will also tend to vary whether we are on a residential or shopping or services area.

Concerning "subjective" and individual dimensions, it is hypothesised that the way failures and its impacts are experienced may be influenced by the following variables: a) economic status or social class, age, level of school attendance; b) attitudes towards environment and expectations towards quality of life standards[18]; and c) past experience of critical events.

Besides impacts on quality of life, this study also aims to explore the eventual consequences of *critical events* experience at the level of the relation between users and sewerage utility, based on *trust*. Given this, it is hypothesised that bad experiences at the *access points*, following *critical events*, tends to generate trust erosion on services level of performance. Besides, such bad experiences can also induce on a worsening of impacts at the level of quality of life.

But, what is meant by a bad experience at the *access points*?

As seen above, *access points* are privileged places of interaction between sewerage-*expert system* delegates and users, playing a fundamental role of *trust* renewal. A good experience at such places, namely under the circumstance of *critical events,* is the one that responds to costumer needs and simultaneously guarantees *trust* maintenance. The contrary confers naturally a bad experience.

Good experiences are, in turn, dependent on the type of utility's procedure, as well as on sewerage delegates' behaviour and attitude. This one must be able to transmit sense of credibility and integrity, along the meeting.

In general terms, an adequate procedure of relation with users, in the quality of costumers, is the one that, firstly, insures an easy and fast access to the "right department or person" at sewerage utility; Secondly, guarantees previous information to costumers, namely on the way to proceed when something abnormal happens or in case of public works; Third, ensures the commitment of solving the problem of costumers, even though it only implies a clearing up with the user; Finally, an adequate procedure is the one that guarantees an explanation to the costumer.

Nevertheless, it should not be disregarded that bad or good experiences of interaction with *sewerage-expert system* are always mediated by each individual' subjectivity and expectancies.

[18] It should be mentioned that quality of life expectations item was not empirically tested. Nevertheless, its potential pertinence justifies its reference.

PART II

Methodology

Knowledge of social impacts of sewer failures and rehabilitation works implied, as known, the design of a case-study type of approach. In order to favour exchange and interaction between CARE-S research component and project end-users, it was made the option of carrying out the study on the areas of intervention of Portuguese and French end-users.

Approach to social impacts stands on two case-studies, as follows: Amadora and Oeiras, two municipalities of Lisbon Metropolis whose water and wastewater sectors are managed by one sole public company; and Nantes metropolis, where those sectors are of the responsibility of a public organism, the Department of Sanitation.

Part II of this report contains two chapters. The first one provides an overview of case studies' target-areas, namely in what concerns to its demography, urban characteristics and sanitation sector. Afterwards, a description of methodological framework, underlying the study, will be presented. As we shall see, such framework stands on two interrelated empirical approaches, which are the following: an exploratory type of approach, which privileged *focus groups* technique; and the survey type of approach, which implied the pursuit of an amount of tasks, namely in what concerns to sampling, questionnaire construction and field work.

6. CASE-STUDIES

This chapter comprehends two sections, a first one where Amadora-Oeiras Portuguese target-area will be presented and a second one circumscribed to Nantes metropolis target-area. As we shall see, the territory of each area and its specificities will be firstly described. Afterwards, a brief presentation of sewerage sector and services, either at Amadora-Oeiras or Nantes, will be pursued. Here, special attention will be given to the type of user related policy on each target area.

6.1 Amadora and Oeiras territory

6.1.3 The territory: brief description

Oeiras and Amadora are among the eighteen municipalities that compose Lisbon metropolis (cf.Figure 1).

Figure 1 – Lisbon metropolis

Bordering with each other and with Lisbon city, those municipalities are rather different, a fact that is mainly a consequence of distinct patterns economic and social growth, along past century.

Amadora has in its History a confused process of urbanisation and population growth. Along decades a receiving territory of migrants, this municipality is today marked by its high levels of urban concentration and population density. Indeed, as we can envisage through

Table 1 such levels population density contrast with Oeiras and Big Lisbon area[19] levels, which are considerably lower.

INDICATORS	AMADORA	OEIRAS	BIG LISBON	UNITY
Total surface	23,3	45,8	1,090,0	km^2
Buildings - Total	13 445	16 052	249 649	nº
Dwelings - Total	80 581	75 616	932 565	nº
Classical dwelings	98,2	99,3	99,0	percentage
Non classical dwelings	1,8	0,7	1,0	percentage
Dwelings - conected to public sewerage network	96,0	97,0	92,3	percentage
Dwelings - conected to public water network	98,9	99,2	97,9	percentage
Population - Total	175 872	162 128	1 947 261	individuals
Families	67 235	61 717	742 658	nº
Population - density	7375,5	3543,0	1704,0	$inhab/km^2$
Population - aged 0 and 14	14,9	14,0	14,7	percentage
Population - aged 15 and 24	14,3	13,8	13,7	percentage
Population - aged 25-64	56,8	57,3	55,8	percentage
Population - aged 65 or over	14,0	14,9	15,8	percentage
Ageing index	95,5	97,2	105,3	percentage
Population - no level of education	11,3	9,4	11,1	percentage
Population - primary education	30,0	22,3	27,8	percentage
Population - lower secondary education	9,7	8,0	9,3	percentage
Population - upper secondary education	12,0	10,1	11,1	percentage
Population - secondary education	21,8	21,7	21,0	percentage
Population - Politecnic	1,2	2,2	1,5	percentage
Population - University degree	13,8	26,3	18,0	percentage
Illeteracy rate	5,5	3,7	5,3	percentage
Population - employed in agriculture, foresty and fisheries	0,3	0,6	0,8	percentage
Population - employed in industry, construction and energy	24,3	17,7	22,5	percentage
Population - employed in services	75,5	81,8	76,8	percentage

source: National Institute of Statistics

Table 1 – Territorial overview of Lisbon case study target areas

[19] Big Lisbon area doesn't correspond to Lisbon Metropolis, but includes ninth of the eighteen above-mentioned municipalities. It was found as methodologically more appropriate to settle comparative analysis, whenever necessary, on a more shorter Lisbon' territory unit, so called as Big Lisbon, due to its homogeneity in urban terms. Lisbon metropolis reunites a diverse set of areas, some of them urban, others markedly suburban. Furthermore, there is a small amount of localities that reveal a rural dynamic.

Oeiras municipality was, in turn, object of a more controlled and planned process of social and urban growth.

Differences between these two municipalities also stand out at the level of population sectors of activity. Amadora is a territory where industry sector historically occupies a non-negligible place. As can be seen in Table 1, although the majority of Amadora population is employed at services sector, around 25% works at industry and construction sector. The significance of industry sector in Oeiras is lower than in Amadora (17%), being at the services sector where almost every people work. In fact, this municipality reveals an interesting level of economic vitality, being a pole of attraction for the installation of an amount of enterprises. Such vitality seems to be also reflected at school attendance level of resident populations. Oeiras municipality concentrates the double of individuals with university degree, by comparison with Amadora, which reveals less vitality at this level.

One of common traits of these territories sends us to the age structure of population. In fact, data trend reveals that the areas in question express considerable levels of population ageing.

6.1.2 Water and wastewater sector and services

In general terms, patterns of urban planning and growth of a certain territory influences the state, nature and performance of water and wastewater systems.

Such influence is, at some extent, patent at portuguese target-area. Amadora confused pattern of urbanization and population growth[20] is, at least in part, at the basis of performance wastewater system deficiencies. These are of at least two sorts: a) difficulties of drainage of wastewater and storm water networks, due to a structural discrepancy between network capacity and the volume of buildings it serves[21]; b) incidence, in some localities, of wastewater open drainage in streets, due to the existence of non-classical dwellings, without any type of connexion to public sewer network.

In spite of the above-mentioned problems, it should be emphasised that almost every dwelling, either in Amadora or Oeiras, is connected to public sewer system. The referred irregular situation of dwellings, although qualitatively harmful, corresponds approximately to 1% of

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[20] It is found as pertinent to mention that Amadora was, until the fifties of last century, rural periphery of Lisbon city, being afterwards target of rapid processes of occupation, as a result of high levels of migration to the city. The low cost of this periphery land, combined by the lack of land-use planning, was, in short, at the basis of such rapid and uncontrolled process of building construction. An appropriate process of sanitation infrastructure construction did not, in turn, accompany this one.

[21] Apart from this, it worth to mention that combined sewer systems still are a reality on some localities. Such situation also induces on drainage problems.

Amadora total of inhabitations. At Oeiras municipality, the amount of non-connected buildings to public sewer network is even smaller.

Apart from urban specificities, organisational structure of water and wastewater services seems to be unfavourable for Amadora territory and population. As mentioned elsewhere in this report, water and wastewater sector of these two municipalities is managed by one sole public company. Such present situation remounts a period where Amadora territory was part of Oeiras municipality. Its institutionalisation as a municipality, around the seventies of past century, did not have effects at water and wastewater sector, which stayed under one unique administration.

It is found as pertinent to emphasise that the above-mentioned unique type of water and wastewater management is not a bad solution *per se*, but it seems to have become so when operationalised in the field. In fact, apart from the circumstance of company headquarters to be settled at Oeiras, management of water and sewerage sector in this municipality stands on a structure composed by a set of departments. Meanwhile, at Amadora municipality, governance of water and wastewater is of the responsibility of a small service, as if it was a small extension of the company. This small sector heads up many of the activities that, in Oeiras, are distributed by several departments and services.

As far as it was possible to infer along fieldwork, such organisational setting seems to induce on some constraints for Amadora water and wastewater sector, not only at the level of operational and daily management but also in what concerns to strategic planning and investments.

Globally, the user and costumer seem to occupy a subaltern place on Amadora-Oeiras general policy and management. In other words, user' policy is not on the list of company main worries and priorities. Instead, operational and "hard engineering" tasks seem to fill company daily routine and medium-term planning.

Assurance of a proper relation with customer under *critical events* circumstances is particularly important. Given the aims of this particular research, knowledge about the way Amadora-Oeiras services manages such type of situation appeared as especially pertinent.

Concerning sewer rehabilitation works, relation with residents, which may be temporally affected by works, stands on previous public meetings. Such meetings aim to inform population about the type of works it will be pursued, its costs and benefits[22]. A low level of attendance of citizens to such type of initiatives was something frequently emphasised by Amadora-Oeiras representatives.

In case of failures type of *critical events*, sudden and unexpected nature of many of them sends to the user-customer the initiative of informing the services and asks for their support. In general terms, management of such type of events can be viewed "cycle", which starts with user claim

[22] It was not possible to infer if such meetings occur every time a sewer related work, either minor or bigger, is done.

or request to the services. Afterwards, a head of service analyses the request and situation. Often, such analysis implies the sending of a picket of operational officers to check and/or solve the problem. With the support of a short report made by operational team, sewerage services inform (by letter) the claimer that problem is solved[23].

According to data collected along fieldwork[24], *accessibility* and *satisfactory explanation* components of the above-presented cycle seems to need some improvements. Not every user and claimer knows to whom to contact in case of failure problem. On the other hand, if the user chooses another municipality organism, that not sewerage one, to claim or ask for support, he may not receive a written response from his sewerage service. On such situations, the service answers to the intermediary organism of the claim, instead of directly to the claimer.

6.2 Nantes territory

6.2.1 The territory

Located in the west of France, Nantes Metropolis became an Urban Community in 2001, joining twenty-four cities (cf. Figure 2). Presently, around 550 000 individuals live in this territory. Population growth has been fast, to the order of approximately 10%, between 1990 and 1999.

Within a framework of *proximity policy*[25], Nantes Metropolis has been divided into 10 sectors, named as *pôles de proximité*. At the level of Nantes Sanitation Department, such division implied the placing of one or two sanitation agents on each sector.

Although globally responsible for the whole sewer system, it is worth to mention that eight networks (cities) are directly operated by Nantes Sanitation Department. The remaining, sixteen in all, were delegated to a private company, who is presently responsible for its operation.

Similarly to other European regions, Nantes metropolis sewer network is composed by combined sewer type of system as well as the separate one. The first mentioned is specially prevailing at the center of Nantes city[26].

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[23] Or, if the problem origin is at private network, the services informs that it has to be the user to solve the problem.

[24] More concretely, on empirical analysis of written claims, arrived to sewerage services, along the year of 2002 (an amount of 138 claims related with sewer failure problems). This analysis was pursued under 5.1 Task.

[25] Underlying philosophy of this policy is, in short, to approximate regional and local public administration from the citizens and voters.

[26] Total length of Nantes metropolis is 2000 km.

Figure 2. Urban Community Nantes Metropolis

Sewer rehabilitation is not at the top of technical and political agenda. The main reason concerns the need for network's extensions in some cities of Nantes metropolis.

Indicators	Nantes	UNITY
Total surface:	523	Km²
Dwellings – Total	253 223	N°
Population - Total	554 601	Individuals
Population – density	484	Inhab/km²
Population aged 0 and 20	25%	Percentage
Population aged 20 and 39	32%	Percentage
Population aged 40 and 59	25%	Percentage
Population aged 60 and 74	12%	Percentage
Population aged 75 and over	6%	Percentage

Table 2 - Territorial overview of Nantes case study

6.2.2 Water and wastewater services and relation with users

As far as it was possible to observe along fieldwork, the user seems to have a place on Nantes Sanitation Department policy and sector management. Such circumstance has its origin in the recent implementation of a new policy, which is settled on two general principles or parameters, as follows: *management through quality* and *investment on proximity*, through the redeployment of municipal departments.

The above-mentioned *quality* parameter implied, in practice, the reorganization of department' activity, viewing it as a process. This is, in turn, defined as a "constant flow of activities directed to provide a product or a service to a customer". A certification of conformity, awarded by a third party, is the ultimate aim of such process-based approach. Without underestimating the effects

of fashion or emulation among local authorities and/or among services boards and companies, certification could be interpreted as a confidence device that strengthens the traditional "pragmatic confidence", instilled by the daily observation that the technical system generally works well.

On the side of the user and costumer, *quality* approach manifests itself through department commitment on guaranteeing service delivery and a proper satisfaction of users' demands. Such demands, when expressed by costumers, must be dealt within a given time span, which start to count at the moment the user enters on contact with sanitation department. Such type of procedure has underlying performance objectives. They were internally defined and result from what the sociologist Max Weber would name as *service knowledge*. That is, objectives and procedures, which, at least in part, proceed from experience of contact officers[27] with costumers and may be, object of periodical readjustments.

As already mentioned, apart from *quality*, Nantes Sanitation Department new policy also stands on *proximity*. Such parameter rendered concrete through the implementation of proximity centres. Composed by one or two sanitation officers, these small centres have as main aim to deal with sanitation and costumers daily problems and to report occurrences to Sanitation Department. Taking into account our theoretical model, we may say that proximity centres correspond to *access points* of first instance, where costumers and representatives of sewerage-expert system meet, aiming the resolution of whatever problem.

The above-synthesised user policy is periodically submitted to revision. Such task follows organization own rules as well as it takes into account past experience and related needed adjustments.

It is found as pertinent to emphasise that user policy is not rolled out in a raw context. Instead, it is developed in a sensitive surface saturated with references and multiple expectations, which crystallise around a few key words that are all the more stirring because they can have several different meanings. The most obvious ones concern the concepts of equality of treatment for users and public welfare, with which the proximity officers' professional identity is strongly imbued. In this light, the goals that are quality and proximity can be seen as a means of prioritising "the concern with the individual". Nevertheless, this is a potentially contradictory project for both the users and the proximity officers, with "the concern for the general" that must traditionally motivate public service. In a more subtle way, the very logic of quality, and all it implies in terms of measure, inevitably tends to reduce the scope of performance assessment to

[27] By contact officer, we mean the staff that manages face-to-face relationship with the public, whether it be presential (i.e. physical or telephone contact) or not (i.e. mail letter). Contact officers are generally middle-level executives and non-executives. Upper-level executives may also from time to time deal with such issue, especially when they imply management of conflict situations.

easily quantifiable dimensions (technical, economic and human features), in detriment of dimensions such as the « civic contribution » of the service.

Once presented general user policy framework, it is found as pertinent to present Sanitation Department's way of manage *critical events*, namely sewerage rehabilitation works and failures.

Management of relation with the user and resident, under the circumstance of rehab public works, is mainly carried out through public meetings, organised prior the beginning of works[28].

As far as it was possible to infer along the fieldwork, such meetings were systematically held in the case of sewer extension works. These ones implied extra costs for users. This fact, associated with users specific demands or restrictions, may have reinforced the importance of previous public meetings.

However, previous public meetings also seem to be relatively systematic when rehabilitation works are at stake. This was the case of recent rehab works carried out in the Nantes urban area. The weight of potentially affected shopping streets, in parallel with lengthy character of such works, advised the need of previous public information and meeting.

Although valued and based on tested methods, such public meetings have invariably inherent a paradox, related with the potential for public participation. Theoretically they are viewed as fundamental and the user or member of the public asks for it, as a form of being informed. Nevertheless, the low adhesion of citizens and users is, in practice, a usual reality.

Unlike the works, the sanitation department staff's actions aimed at solving network failures are mostly non-programmed. Approximately 90% of them result from user's phone call, as opposed to 10%, which emanate from programs of systematic intervention (i.e. rat extermination, network cleaning)[29].

In case of failure, the user is invited to enter on contact with his area proximity centre. This service has as main responsibility the carrying out of a pre-diagnosis of the problem, sometimes with assistance from the sanitation department. The aim of such task is to specify how urgent the problem is, but above all, to locate the origin of the failure. Failures induced by private network malfunctions are of the responsibility of the user.

Pre-diagnosis demands frequently on-site inspections, especially if information provided by the user is insufficient or when user's specific situation requires (i.e. a distressed elderly person will not be asked to go and check their connection).

Based on all the information collected, a request for intervention may be drawn up and forwarded for processing either to a proximity centre staff member or to the sanitation

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[28] Such meetings are of the responsibility of local representatives of the Nantes Métropole communes.

[29] A total of 800 of such interventions were done during the year of 2003. These intervention requests have been dealt with within an ISO 9002 certified « process » framework since November 2001.

department, depending on the type of public network in question (secondary or structural) and of the technicality of the problem to be solved. From this point of view, as is probably the case with all service organisations, the sanitation department is confronted with a dual difficulty: the time and means necessary to acquire all required skills may be lacking (for example due to staff rotation for certain positions), just as it may be difficult to implement the required cross-skilling required by the extremely interdependent nature of the management of failures (for example, relations between staff in charge of operations and staff in charge of works in the sanitation department).

7. METHOD

Methodological framework was designed to assure a gradual approaching to target-sites and research subject. Such gradual approaching was, in practice, achieved by splitting data collection on two stages, as follows: a) an exploratory stage, designed to uncover the maximum of features of the field; and b) a survey type of approach, conceived to deepen empirical knowledge.

Next, a synthesis of underlying techniques and procedures of both stages will be pursued. Special attention will be given to second stage' methodological design, once results, to be presented on Part III of this report, elapse from what was done under this phase.

7.1. The exploratory stage

Besides its role of first approach to failures and rehab works social impacts, exploratory stage intended to be a support tool for survey preparation.

This stage implied the pursuit of two interrelated procedures: semi-directed interviews to privileged informers and *focus groups* (FG) discussions with victims of sewer failure events and individuals with experience of rehabilitation works on their residence or work area.

Privileged informers were selected according to their role and position on each target-area. Individuals with responsibilities on sewerage management as well as those involved in city-municipality management were our main targets for the interviews. All interviews were supported on an interview guide[30].

Besides the information gathering about target-areas specificities, the above-mentioned interviews aimed to establish contact with individuals and local entities that could play a role of support on FG preparation.

This technique can be briefly defined as an oriented discussion with a group of individuals around pre-defined themes. Often used for exploratory aims, such technique allows the knowledge of perceptions and experiences in a quite relaxing setting. Indeed, the setting is one of the main advantages of Focus Groups. It favours the confrontation of opinions. It stimulates other participants to describe their own experience, give their own opinion and commentary

[30] See Annex 1 for interviews' main themes.

about what is at stake. The main disadvantage concerns with the risk of discussion monopolization on the part of one or two participants[31].

Preparation of FG implied decision-making around a set of issues that can be synthesised into four questions: Which themes will orientate the discussions? How many discussions will be promoted on each target-area (Oeiras, Amadora and Nantes)? How many individuals will participate on each session? What type of individuals will become eligible for the discussions?

Themes identification proceeded from research aims, being afterwards operationalised into FG discussion guides.

Concerning failure events' FG discussions, the main themes were: past experience of failures and perceived impacts on daily life; failure problem solving and relationship with wastewater company; degree of acceptability towards failure events and willing to tolerate rehab works; general expectancies towards the residence neighbourhood and attitudes towards environment.

Focus groups on rehab works were oriented explore a set of themes, namely: experience of rehab works and perceived impacts; evaluation of rehab works management; perceived benefits of sewer rehab works; general expectancies towards the residence neighbourhood and attitudes towards environment[32].

In what concerns to the FG discussions, six were initially planned. Three of them with failure victims and the remaining with individuals with sewer rehabilitation works. Nevertheless, fieldwork demonstrated to be impracticable to pursue such aim. Given this, a half of the six initially FG was done. Two of them occurred in Amadora (Lisbon metropolis), one with failure victims and the other one with rehab work subjects. The third FG was done with Nantes victims of sewer failures.

Participants' selection was made with the support of a profile group typology, previously constructed. Having into consideration research aims, personal experience of sewer failures or rehab works was a basic criterion. Apart from this one, it was established as important to assure the presence of residents and shopkeepers as well as to try diversity in what concerns to gender, age and economic status.

FG procedure revealed to be harder to prepare and to have engendered less adhesion, than expected. Several factors and site specificities are at the basis of such situation. One of most relevant factors sends us to the nature of this research subject. Indeed, rehab public worries and sewer failure seem not to be at the top our target-group' concerns. The ubiquitous character of sewerage services and infrastructure turns it invisible and banal. Its real importance

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[31] Moderators play a crucial role on avoiding this or other risks and to turn to advantage the "group setting" condition.

[32] A brief demographic questionnaire was conceived in order to allow the characterisation of each FG session participants.

for people is fundamentally remembered only when something goes wrong on those systems. In our view, the low levels' of participation are, in great part, explained by such fact.

7.2. The survey

Survey type of approach implied, in short, to go deeper on the effort of turning theoretical model and research aims on something operational. This section intends to synthesise decision-making and procedures underlying such effort. We will start by describing the procedure and criteria underlying sample construction. Afterwards a presentation of the framework under which the questionnaires stood, will be done. As we shall see such framework results from an "exercise" of turning operative the concepts and propositions underlying analytical model. Finally, this section will finish with a brief synthesis about the way fieldwork and data analysis was pursued.

7.2.1 Sampling procedure

Having into account this study research aims, two types of individuals appeared as fundamental to integrate on the sample. We refer, on the one hand, to individuals with experience sewer failures[33] on their own home or workplace and, on the other hand, to individuals living or working on areas, recently target of sewer rehabilitation operations. Besides these two target-groups, it was made the option of including a third group of individuals on the sample. We refer to individuals without experience at any of the above-mentioned *critical events*[34]. This last group intended to function as a control group along data analysis, allowing a more complete gauging about the influence of *critical events* experience on individuals' attitudes.

The lack of a robust basis concerning the universe of victims of both type *critical events* advised to follow a nonprobability sampling procedure. More specifically, the option was to adopt the so-called purposive type of sampling. One of main disadvantages of this type of sample procedure, by comparison with probability samples, is its low external validity. In other words, nonprobability samples don't allow extrapolation of results to the universe, due to its lack of statistical representativity.

Under purposive type of sample sites and individuals are not chosen by chance, but according with pre-defined criteria. Apart from the above-mentioned criteria experience of *critical events*, it was established that sample should include:

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[33] Due to public network malfunctions.

[34] For practical reasons, this target-group was named as "non-victims".

- Victims of *structural* type of failures and victims of *occasional* sewer *failures*;
- Individuals living at the "*epicentre*" *of sewer rehabilitation works*[35] and individuals living on *surroundings* streets;
- Individuals whose main and unique bond with target-sites is the fact of being *residents* and individuals whose link with sites is of *professional* order (cf. Table 3)

The introduction of this last criteria result from the interest on assessing the extent to which individuals who are shopkeepers or that carry out other liberal professions feel higher impacts, by comparison with residents.

	Failures			Sewer rehabilitation works			Non-victims	
	Struct.	Occasi.	TOTAL	Epicent.	Surroun.	TOTAL		**TOTAL**
Residents	20-25	20-25	40-50	20-25	20-25	40-50	20-25	100-125
Professionals	15-20	15-20	30-40	15-20	15-20	30-40	15-20	75-125
TOTAL	35-45	35-45	**70-90**	35-45	35-45	**70-90**	**30-40**	**170-220**

Table 3 – The sample

As can be seen through the above Table, the sample stands on intervals for each sub-group. The main objective of such option was to confer some flexibility to data collection, once there were doubts about the degree of receptiveness of target-population.

Once on the field, all previously established intervals were achieved on target-areas, Nantes and Lisbon metropolis. In the first mentioned city, 219 interviews were done, 91 with victims of failures, 79 with rehab works subjects and 49 with non-victims. In what concerns Amadora-Oeiras target-area, 201 interviews were done, 85 of them with failure victims, 80 with rehab works subjects and 36 with non-victims.

7.2.2 Questionnaire construction

Being three the number of target-groups in this study, it was made the option of conceiving three questionnaires with some common parts.

[35] By this, we main individuals living or working on the street where digging rehab works occurred.

The process that gave birth to the questionnaires can be seen as an exercise of decomposition of theoretical framework concepts and propositions into dimensions and indicators, having research hypothesis as background.

In short, dimensions correspond to the components or aspects of a certain concept. Through them the concept is better specified and gains objectivity. The risk of such procedure of decomposition is to ignore some features of the concept and underlying phenomena. In our view, this is an inevitability of any procedure of this sort, especially if the concepts with which we are working have never been operationalised, through other studies (cf. Table 4).

The attachment of indicators to dimensions intends to get to the bottom of above-mentioned process of concepts' decomposition. They are categories designed to confer measurability to dimensions, ready to be transformed into questions.

Table 4 lists the dimensions attached to this study concepts and propositions. Having into account research aims, the constructs **impacts of sewerage related *critical events* on quality of life**, **experience at the access points**, **trust** and **acceptability** play a central role.

Dimensions underlying impacts on quality of life represent the four areas where we postulate that consequences of sewerage *critical events* may be felt. Each dimension has attached a set of indicators, which differ according to the type of event, as follows:

- Sewer failures – A) **Housing**: material damages; temporary unfeasibility of WC, Kitchen or other; discomfort; temporary unfeasibility of house for living. B) **Health**: anxiety, stress or worry; appearance or aggravation of physical problem. C) **Immediate environment:** difficulty or impossibility of using public space; unwilling to use public space. D) **Works & finances:** loss of working hours; extra-financial expenses; interruption of commercial activity; loss of clients[36].
- Rehabilitation works – A) **Housing**: discomfort[37]; Difficulties of accessibility to home or workplace; temporary unfeasibility of house for living. B) **Health**: Irritability or stress; health problems i.e. headaches[38]; C) and D) *the same indicators as for failures*.

[36] The two last indicators are exclusively for shopkeepers.

[37] Related to noise, dust, odours or other type of effect.

[38] Related to noise or other type of effect and inconveniences.

	DIMENSIONS		
CONCEPTS / PROPOSITIONS	FAILURE VICTIMS	REHAB WORKS' SUBJECTS	NON-VICTIMS
Critical events experienced effects	Type of failure' felt effects Number of failures occurrence Perceived failure' causes	Type of works' felt effects Past experience of sewer failures	Past experience of sewer failures
Experienced impacts quality of life	Housing area Health area Immediate environment Income & work Perceived seriousness of each impact	Housing area Health area Immediate environment Income & work Perceived seriousness of each impact	
Experience at the *access points*	Accessibility to the sewerage services Financial compensation & perceived justice Importance attributed to aspects of quality of service, in what concerns to problem solving & claim handling procedure	Accessibility to the sewerage services Financial compensation & perceived justice Importance attributed to aspects of quality of service, in what concerns to problem solving & claim handling procedure	Importance attributed to aspects of quality of service, in what concerns to problem solving & claim handling procedure
Trust on services	General trust on service performance & technical corps Opinion about performance *ex ante* & ex post contact Perceived efficacy of problem solving	General trust on service performance & technical corps Opinion about performance *ex ante* & ex post contact Perceived efficacy of problem solving	General trust on service performance & technical corps
Acceptability towards *critical events*	Tolerance towards experienced failure event Perceived importance towards sewer rehab investments	Tolerance towards rehab works event Perceived importance towards sewer rehab investments	Tolerance towards hypothetical failure event Tolerance towards hypothetical rehab works Perceived importance towards sewer rehab investments

(Proceeds in the next page)

	DIMENSIONS		
CONCEPTS / PROPOSITIONS	Failure victims	Rehab works' subjects	Non-victims
Lay representation about sewerage & environmental issues	Perceived impacts of sewerage malfunctioning Attitude towards water related issues (ecocentrism vs. anthropocentrism)	Perceived impacts of sewerage malfunctioning Attitude towards water related issues (ecocentrism vs. anthropocentrism)	Perceived impacts of sewerage malfunctioning Attitude towards water related issues (ecocentrism vs. anthropocentrism)
Individuals demographic characteristics	Age Gender Level of scholarity Profession Situation in the profession Type of dwelling Juridical bound with dwelling (Renter vs house owner) Area of activity (professionals target-group) Number of employees (professionals target-group)	Age Gender Level of school attendance Profession Situation in the profession Type of dwelling Juridical bound with dwelling (Renter vs house owner) Area of activity (professionals target-group) Number of employees (professionals target-group)	Age Gender Level of scholarity Profession Situation in the profession Type of dwelling Juridical bound with dwelling (Renter vs house owner) Area of activity (professionals target-group) Number of employees (professionals target-group)

Table 4. Questionnaire Framework of concepts/propositions and dimensions

The above-mentioned quality of life indicators were operationalised into closed questions, with exception of one final question, where interviewees were invited to make reference to other impacts.

Perceived seriousness attributed to impacts[39] was operationalised into an ordinal type of variable, through which subjects were invited to express how serious or important were such events to their own lives.

Three types of dimensions compose experience at the *access points*. The *accessibility* one embraces several indicators, as follows: to whom the subjects asked for help, in the sequence of a *critical event*; method used for contact/claiming; evaluation of easiness of contact with sewerage services. Financial compensation item was directly transformed into questions. Perceived importance of a set of aspects of quality of service, in what concerns to problem solving & claims handling, was operationalised into the following indicators: easiness of contact with sewerage service; speed of problem solving; efficacy on problem solving; courtesy along contact handling; satisfactory explanation for what happened; financial compensation. The gauging of such dimension was pursed by asking individuals to select the aspects of quality of service they considered the most important.

As seen in Part I of this report, experience at the *access points* and *trust* on sewerage services are hypothesised as being interrelated. For that, three trust related dimensions were created. One of them intends to gauge individuals' general feeling of *trust* on sewerage services. The remaining was designed to assess the impact of experience with the services on individuals' trust. We refer, on the one hand, to the indicator directed to assess the extent to which individuals' services opinion changed in the sequence of contact with services and, on the other hand, to their personal evaluation about services' efficacy.

In what concerns to acceptability towards *critical events*, such item was operationalised into a ordinal type variable directed to assess the extent to which individuals considered experienced events as abnormal or not, jointly with importance attributed to rehab works investments.

The above-mentioned dimensions and indicators are, at some extent, first order ones. Besides these, the framework contains a small set of other dimensions. A couple of them are, as can be seen through Table 4, directed to get information about individuals' attitudes about sewerage & environment issues. The others are fundamental descriptive dimensions, namely in what concerns to individuals' characteristics and critical event' type of experienced effects.

Sewerage & environment dimension was operationalised into an open question and a set of closed questions. The first invites individuals to freely state what, in their opinion, might be the

[39] At each dimension of quality of life.

consequences of sewerage malfunctioning. The set of closed questions elapse Catton and Dunlap (1978, 1993) attitudinal typology. This one comprehends two general types of attitudes towards environment, as follows:

- Ecocentric
  Attitude that stands on values and environmental representations that appeal to the finite nature of resources and consequently to the need of (re)adequate social and economic development to its finite nature.
- Antropocentric
  Attitude based on the belief that natural resources are infinite. Societies mission is to exploit them, through science and technology, in order to satisfy human needs.

Having such typology as background, a set of sentences was constructed with the aim of invite interviewees to express their agreement or disagreement. All sentences concerned water & sewerage issues.

It is found as pertinent to emphasise that environmental issues dimension will only allow taking general and careful conclusions about individuals' positioning. Knowledge about individuals' attitudes towards environmental issues guards a certain complexity, due to the risk of arriving to results mainly based on "politically correct" answers, instead of on subjects "real" belief. Given this, a more steady data collection on this issue implies a reasonable amount of questions, some of them with a function of control. Under this study, it was made the option of not going into the bottom of this issue in order to avoid a too big questionnaire. Indeed, big questionnaires may transform interviews into tiring moments for who answers as well as for who asks the questions. This situation may, in turn, result into poor quality data. Having this risk into account, the team opted by being minimalist on some second order dimensions, namely the one related with environmental issues.

The three questionnaires that emerged from this process of theoretical model decomposition are composed by closed and open questions. The first comprehend ordinal and nominal type of variables (cf. Annex 2. Questionnaires).

7.2.3 Fieldwork

Besides sampling and questionnaire construction related tasks, the survey implied, as any other, the pursuit of specific fieldwork related decisions and procedures. These can be shortly synthesised on two questions: who to inquire and which sites (in Amadora, Oeiras and Nantes) to privilege? How to inquire?

Decisions taken, on such issues, were not the same for both target-areas, due to their own specificities.

Given this, Nantes failure-victims were randomly selected through 2004 file on occurred failures of Sewerage Company. In what concerns to Amadora-Oeiras target-areas, a different procedure was adopted, due to the inexistence of systematic method of sewer failures' registration. In Amadora, it was made the option of concentrating inquiry on a site, Brandoa, known as suffering from structural sewer problems. Such problems elapse from an inadequacy of public sewer network capacity to present urban settlements. Oeiras interviewees emerged from a random selection procedure, done through a data basis of 2003-2004 claimed failures, conceived by the research team, under 5.1 Task.

Concerning sewer rehab works, the inquiry followed a "site" type of procedure. In other words, three sites, where sewer rehabilitation had occurred, were previously chosen at Nantes, in Amadora and Oeiras, for inquiry aims. At Lisbon target-areas, it was particularly difficult to found an area with a recent history of sewer public works. Such constrains obliged to concentrate most of the interviews on a site, Alfornelos, where works had occurred during the year of 2003, finishing at the first months of 2004.

The so-called group of non-victims — that is, individuals without direct experience of sewer failures or sewer rehab work — were randomly selected one each target-area, but outside the sites where the other interviews were to be done.

The interviews were carried out by a group of trained interviewers. The great majority of them were face-to-face interviews; with exception of some Nantes interviews that were done by telephone. On this last case, the questionnaire was previously sent to the potential respondent, so that this one could see the questions by him and respond to them.

The fieldwork occurred almost simultaneously at Nantes and Amadora-Oeiras municipalities, during the months of August and September. Afterwards, collected data were inserted on a previously constructed database and data analysis got started.

PART III

Results

Once presented theoretical framework and methodology in which this research stands, survey results presentation will be privileged.

Part II contains two chapters, a first one circumscribed Amadora-Oeiras case study and a second one channelled to Nantes' survey results presentation.

Each chapter will give an overview about individuals' experience of *critical events*, its perceived impacts, its degree of disturbance to individuals' quality of life and levels of public acceptance towards such events. Besides, we will analyse the extent to which sewer failures and rehab works induce on breaches on individuals' *trust* on sewerage services performance. Concomitantly, public expectations towards sewerage services will be presented.

8. AMADORA-OEIRAS CASE STUDY

8.1. Target population

As already mentioned, portuguese target-area comprehends two Lisbon municipalities — Oeiras and Amadora[40]. One of the few common aspects of these two municipalities is water and wastewater management structure, which is the same for both.

Three types of subjects compose the sample: victims of sewer failures, individuals who experienced rehab works on their work or residence area and the so-called non-victims[41]. Victims of failures are mainly individuals with experience of sewer flooding; half of them are from Amadora and the other half from Oeiras. No distinction will be made between structural and occasional type of failure. Poor nature of fieldwork information on this subject does not allow a safe distinction.

	Failures	Rehab works	Non-victims	**TOTAL**
Residents	52	50	22	**124**
Professionals	33	30	14	**77**
TOTAL	**85**	**80**	**36**	**201**

Table 5 - Amadora-Oeiras sample

Rehab works interviewees are fundamentally individuals from Amadora, neighbourhood of Alfornelos[42]. Most stated disturbances were: problems of car accessibility and parking, dust & dirtiness and noise problems. Interviewees are individuals who live or work in the street(s) where works occurred as well as individuals living in the intermediate surroundings.

Concerning non-victims, all subjects are from Oeiras municipality.

[40] Cf. Part II Methodology, chapter 6.

[41] That is, individuals without experience of sewer failures or sewer rehabilitation work.

[42] The scarceness of sewer rehabilitation works in Oeiras turned impracticable the accomplishment of a relevant number of interviews on this municipality.

The inquiry embraced residents and individuals whose tie with target-sites is mainly professional[43]. Unlike Nantes case study, professionals at Amadora-Oeiras are exclusively retail owners. The high preponderance of this professional on the sites justified such option.

In what concerns to individuals' demographic characteristics, we might say that a kind of equilibrium was achieved. In fact, a half of the interviewees are female and the other half is mail. A relevant volume of individuals is on plenty working age, ranging from 40 years old to 50 years old. Nevertheless, there is also a non-negligible volume of younger individuals as well as older ones[44].

Most of Amadora-Oeiras interviewees reproduce a modest economic status, carrying out undifferentiated professions, especially at services and retail sectors (cf. Annex 3). Levels of school attendance also tend to be modest. Approximately a half of the interviewees didn't exceed the obligatory school level[45] and only 15% possess the graduation level.

There seems to be no general awareness of how crucial sewer systems are for environmental sustainability. In fact, almost all subjects mentions "the individual and his inhabitation" as the area of life where more nuisance will be felt, in case of sewerage bad performance. Environment and public space is completely withdrawn from subjects' discourse[46].

Figure 3 – Potential consequences of public sewerage network malfunctioning (%)

[43] Corresponding to the so-called sub-group of professionals.

[44] Around 25% of the individuals have an age between the 21-39 years old and a similar percentage has more than 59 years old (cf. Annex 3).

[45] Which in Portugal is of 9 years of school attendance.

[46] Questions designed to assess whether subjects general attitude towards environment (anthropocentric *versus* ecocentric) did not produce sufficient and reliable information. Given this, it won't be possible to have such population trait into account on Amadora-Oeiras data analysis.

8.2. Critical events: impacts on individuals' life quality

As mentioned before, one of public inquiry main aims was to know to what extent *critical events*, such as failures and rehab works, induce on relevant impacts to individuals' quality of life. Given this, this section will be especially devoted to the presentation of the extent to which those *critical events* disturbed Lisbon subjects quality of life, namely in what concerns to the areas of housing, nearby surroundings use and usufruct, individuals' health status and personal well-being and work & finances.

Understanding the degree of acceptability — here envisaged in terms of tolerance — towards such events appears also as a parameter to explore. Such knowledge will be important at several levels, namely in what concerns to the gauging of the influence of acceptability on the degree of awareness towards the importance of sewer rehabilitation.

The inquiry comprehends three target-groups — victims of failures, individuals with experience of rehabilitation works and a group of individuals without experience of both types of critical events (non-victims). Such group is, in methodological and analytic terms, a control-group.

8.2.1. Sewer failures

Almost every victim of failure stated to have experienced some kind of negative consequence. House space or workplace[47] appears, jointly with health status, as the areas of quality of life where more individuals felt impacts. Besides, there is a non-negligible amount of subjects who revealed to have suffered from financial consequences as well as inconveniences in using public space, near their home or workplace (cf. Table 6).

	Areas of quality of life							
	Housing | work place		Health & well-being		Surroundings		Finances & work	
	n	%	n	%	n	%	n	%
	79	92	78	91,8	57	67,1	50	58,8
Most referred	Discomfort Material damages Temporary usefulness of WC, kitchen or other		Irritability, stress and worry		Impossibility of public space usufruct Unwillingness of public space usufruct		Extra-expenses Loss of clients …	

Table 6 – Failures perceived impacts, by area of quality of life (N=85)

[47] In the case of sub-group of professionals.

Such housing' impacts predominance elapses fundamentally from the type of failure. As mentioned above, failure group is mainly composed by individuals with experience of sewer flooding. On the other hand, there is an amount of subjects victims WC overtopping (22,4) situations[48].

Housing related impacts concern fundamentally general discomfort (89%); damages to the house or/and its contents (47%), followed by the reference to temporary usefulness of parts of the house (i.e. WC, kitchen) and/or infrastructures (i.e water, electricity)(27%).

In what concerns to health & well-being status, impacts at such level are almost circumscribed to feelings of stress or worry. Only a few individuals (12%) mentioned the "appearance or worsening of some physical problem (disease or injury)".

When affecting public space, failures are mainly felt as a detractor of public space use and usufruct.

Felt impacts at finances & work levels are several and disperse. Some residents refer the involuntary loss of working hours; some retailers state that they were obliged to temporally close their business or/and lost some clients. But, extra-expenses appeared as the most referred finance-related consequence, stated by both sub-groups. Still concerning retailers, it is found as pertinent to refer that, although residual, some retailers emphasised damage to their own business image as a consequence of sewer problem (cf.Table 6).

But, so or more important than the type of sewer failures' impacts is knowledge of whether such situations had some relevance on individuals' lives or not. In other words, <u>are they perceived as something that induce or not on disturbance to subjects' daily life</u>?

In fact, Lisbon sample contains the two types of attitude towards this type of *critical event*. Approximately a half of the interviewees perceive sewer problem as an event that induced on disturbance. The other half views it as a minor problem.

Impacts on nearby surroundings[49], followed by those affecting subjects' house/workplace, are the ones perceived as more significant or disturbing. In fact, approximately a half of those that experienced impacts on one or other area of quality of life, attribute significance to it. Concerning house space, it is found as pertinent to emphasise that discomfort *per si* is not a factor of disturbance. It becomes so when associated with other impacts, mainly material

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[48] Apart from the above situations, there was a residual volume of individuals who stated to have had odour problems (3,5).

[49] Besides unwillingness or impediment of using public space, there were some subjects that mentioned difficulties entering or going out from their home/workplace.

damages or temporary usefulness WC/kitchen, as if discomfort feelings were a cause of such inconveniences.

	Significance of sewer failures' impacts							
	No significant		Little significant		Significant		Highly significant	
	n	%	n	%	n	%	n	%
Housing | work place	11	12,9	35	**41,2**	16	**18,8**	23	**27,1**
Health & well-being	3	3,5	73	**85,9**	6	7,1	3	3,5
Surroundings	24	28,2	16	18,8	21	**24,7**	24	**28,2**
Finances & work	28	**32,9**	34	**40**	13	15,3	10	11,8
Residents	17	32,7	22	42,3	9	17,3	4	7,7
Professionals	11	33,3	12	36,4	4	12,1	6	18,2

Table 7 – Perceived significance of failures impacts, by area of quality of life (N=85)

Although mentioned by a majority of interviewees, health & personal well-being type of felt impacts were not especially disturbing. Almost all subjects view it as having been little significant. Although not so marked, a similar pattern can be found on finances & work area. If we exclude those to which finance impacts are perceived as insignificant, what prevails is the perception of them as "little significant". (cf. Table 7)

8.2.2. Sewer rehabilitation works

Experience of public sewerage works near individuals home or workplace doesn't seem to have induced on great consequences to their living. Although a great majority of interviewees mention some kind of impact (80%), such reference doesn't have a great expression in terms of the four areas of life quality.

Indeed, there is a non-negligible volume of subjects that refer impacts at 'housing/workplace' and 'surroundings' levels, but such impacts are almost circumscribed to a general feeling of discomfort and to difficulties of accessibility to commerce or services. In what concerns to health status, feelings of irritability or impatience appeared as an impact, stated by 41% of subjects. At finances & work level, those (27.5%) who mention impacts are mainly retailers that state to have lost clients, during works (cf. Table 8).

There is an amount of other works' related aspects, spontaneously stated by individuals, which are not properly impacts, but it is found as pertinent to mention. They were the following: public works too long duration; open trenches without any type protection, inducing on risk of falls and injury for residents; works poorly signalized and occurring, for several times, out of officially

allowed hours/days; incivility and rudeness of workers; lack of public information; delay on pavement reposition and public space re-gardening[50].

	Areas of quality of life							
	Housing | work place		Health & well-being		Surroundings		Finances & work	
	n	%	n	%	n	%	n	%
Most referred QL items	55	**68,8**	33	41,3	48	**60,0**	22	27,5
	Discomfort		Irritability		Difficulty of access to services/ commerce		Loss of clients	

Table 8 – Impacts of sewer rehabilitation works, by area of quality of life (N=80)

Data concerning perceived degree of disturbance corroborates the above-mentioned modest impact of sewerage works. As can be seen through Table 9, apart from the volume of individuals who didn't suffered from any impact and classifies works as a non-significant event, those who detach are the ones that evaluate it as little significant. Indeed, a half of interviewees state that experience of having had public works near their "own backyard" or on their work area did not induce on great disturbance to their quality of life.

	Significance of sewer rehabilitation' impacts							
	No significant*		Little significant		Significant		Highly significant	
	n	%	N	%	n	%	n	%
Quality of life: Housing | work place	24	30,0	45	**56,3**	9	11,3	2	2,5
Health & well-being	45	**56,3**	29	**36,3**	6	7,5	0	0,0
Surroundings	31	**38,8**	17	21,3	8	10,0	24	**30,0**
Finances & work	56	**70,0**	15	**18,8**	8	10,0	1	1,3
Residents	42	**84,0**	6	12,0	2	4,0	0	0,0
Professionals	14	**46,7**	9	**30,0**	6	20,0	1	3,3

*Correspond to those who did not felt impacts

Table 9 – Sewer rehabilitation works perceived disturbances, by area of quality of life (N=80)

[50] These aspects come from "other impacts" and "observations" parameter of the questionnaire, where interviewers wrote what spontaneously was mentioned by interviewees and was found as pertinent for the research. Most of individuals' impressions are residual, in quantitative terms. Nevertheless, the exploratory nature of this research advises to retain such type of information.

Impacts at each dimension of quality of life are, when felt, mainly classified as little significant. Anyway, an exception may be found at 'surroundings' dimension. In fact, there is a non-negligible amount of individuals (30%) that view public space temporary use impediments as having been highly significant to their own lives.

Another aspect that may have some pertinence concerns finances & work dimension. Although mainly classified as not significant at all, impacts are felt as slightly more disturbing for retailers, when compared with residents. Such inter-group difference is statistically significative.

Such modest perception of sewer works impacts deserves a methodological remark. In our view, the fact that rehab sample is almost composed by individuals living or working on areas where public works had occurred one year a half before, such sample trait may have had the effect of slowing down rehab impacts related perceptions (cf. Annex 4).

8.2.3. What disturbs more?

The above-mentioned methodological remark as well as critical events' specificities advises some caution when comparing these two target-groups. Anyway, putting aside any ambition of results' extrapolation, a comparative data look reveals some interesting trends.

At Lisbon sample, there is a statistically significative difference between the way target-groups perceive their own experience of *critical event*. Indeed, the higher volume of individuals manifesting disturbance towards failure impacts indicts that such type of *critical event* provokes more nuisance in individuals' quality of life, than sewerage public works (cf. Figure 4 and Table 10).

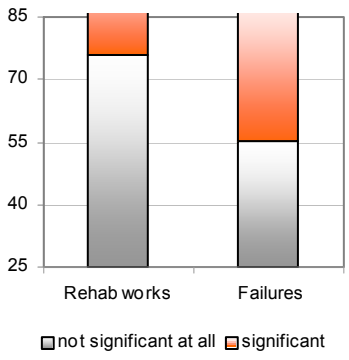

Figure 4 – General perceived disturbance induced by critical events (%)

	Target-group	N	Mean rank
Global QL disturb	Rehab subjects	80	70,77
	Failure victims	85	94,51
			Global quality of life disturbance
Mann-Whitney U			2421,500
Wilcoxon W			5661,500
Z			-3,510
Asymp. significance			,000

Table 10 – Mann-Whitney *U*, for inter-group differences analysis between target-group and perceived general disturbance

Such inter-group difference is not only evident at general level, but also *per* area of quality of life. Victims of sewer failures manifested higher levels of disturbance towards impacts at *house/workplace* level, *finances & work* and, at some extent, *health* level. The unique exception concerns *surroundings* area of life quality whereas temporary impediment or unwilling to use it is perceived has having been equally disturbing for both target-groups[51].

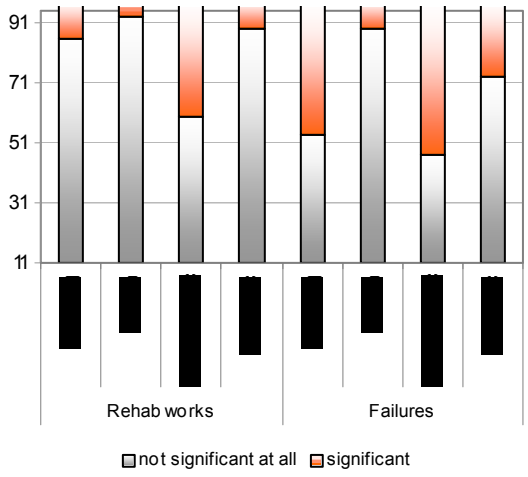

Figure 5 – Perceived disturbance induced by critical events, according to the area of quality of life (%)

Concomitantly, failures are also viewed as more unacceptable than rehab works type of critical event. Acceptability dimension was operationalized into a question that invited subjects to ponder if the critical event they had lived was something normal, which could happen whatever

[51] See Annex 5 for Methodological Note on Man-Whitney *U* test and for results of this test in what concerns to impacts on each quality of life area.

the circumstances, or, on the contrary, an abnormal and intolerable event, that should never happen.

Results indicate that sewer failures are hardly bearable events. In fact, most failure victims classify them as abnormal events, which should not ever happen. Rehab works are, in turn, viewed more bearable situations. As can be seen through Table 11, rehab subjects tend to view them as normal temporary situations, with which it is necessary to cope with.

Differences between target-groups are quite marked and statistically significative (cf. Table 12). This means that failure victims classify their own experience of sewer problem in a more unacceptable way than rehab subjects. These ones assess the circumstance of having had public sewer works on their neighbourhood as tolerable event.

	Failures	Rehab works
Normal events [1]	3,5	**46,8**
Events not so normal [2]	10,6	**24,1**
Abnormal events [3]	18,8	17,7
Totally abnormal events [4]	**67,1**	11,4
TOTAL	100 N =85	100 N =79

[1] Something that happens, whatever the sewerage network type or wastewater service.

[2] An unpleasant event that can always happen and with which we "have to cope with".

[3] An event hardly tolerable that should not happen.

[4] Unacceptable events that cannot happen and should be definitely avoided.

Table 11 – Degree of acceptability towards critical events, according to the target group (%)

	Target-group	**N**	Mean rank
Degree of Acceptability	Rehab subjects	79	52,49
	Failure victims	85	110,39
			Degree of acceptability
Mann-Whitney U			986,500
Wilcoxon W			4146,500
Z			-8,183
Asymp. significance			,000

Table 12 – *Mann-Whitney* U, for inter-group differences analysis between target-group and degree of acceptability towards critical event

The effect of *time* on its role of *slowing down* impacts on individuals' memory is certainly playing a role on rehab works trend for tolerance. In spite of that, what such results show is that both *critical events* guard their own specificities and they may be also influencing results' general trend. The one that is certainly the more obvious has to do with what we may call as benefits. Sewer failures haven't any type of implicit benefit. Indeed, if they have some kind of

consequence for individuals' life such consequence is always negative. When it comes to rehab works, they, on the contrary, have underlying benefits. Although not always present on people minds, public works, namely the sewer ones, have implicit the idea that can bring some kind of benefit and are being done for community improvement.

It was hypothesised that acceptability towards *critical events* could be influenced by impacts and its degree of perceived disturbance as well as by experience of critical event, in the case of failures. The more episodes of failures, the more would be the degree of intolerance towards such events.

Globally, degree of acceptability towards critical events is not particularly influenced by perceived disturbance of such situations on individuals' quality of life[52] (cf. Table 13). The sole exception goes to residents' sub-group, where it was a found a moderate statistical correlation between the above-mentioned dimensions. Putting aside retailers sub-group, correlation shows that, for residents, unacceptability increases as it increases the degree of perceived disturbance of *critical events* on individuals life quality (ρ = .43; p <.0001).

	1 – 4 times		5 –10 times		more than 11	
Normal events	3,6					
Events not so normal	7,1		**5,3**			
Abnormal events	21,4		31,6		10,0	
Totally abnormal events	**67,9**		63,2		90,0	
TOTAL	100	28	100	19	100	10

Table 13 – Degree of acceptability towards critical events, according to the target group (N=57)

Amadora-Oeiras failures sample is fundamentally composed by individuals who stated to have experienced from sewer failures more than once[53]. Results indicate no influence of experience on perceived acceptability. In other words, failures are mainly viewed as intolerable events, either for those who experienced failure less than four times or for those who stated to have suffered from such events more than 5 times.

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[52] Exploration of relationship between these variables was done through simple crosstabulation analysis as well as through statistical correlation testing. Correlation analysis stands on Spearman rho (ρ) non-parametric test, which is one of the most suitable methods for examining the relationship between pairs of ordinal variables or when one of the variables is of nominal type. Computed coefficient of this test varies between –1 and +1, providing information about the strength and direction of relationships. Spearman rho ρ showed a low correlation between degree of acceptability and perceived disturbance of impacts on quality of life (ρ = .20; p <.0001). Nevertheless, once the test has attached of degree of statistical significance lower than 0.05 such relationship shouldn't be completely disregarded and taken into account on future studies.

[53] Only approximately 28% of failures subjects suffered from failures only once.

8.3. Access points: experience, expectancies and trust

A way of introducing this section is to remember what do we mean by *access points*. Such term intends to name the time-space where representatives[54] of sewerage-expert system and lay individuals-customers meet, namely at the sequence of a *critical event*. Such meetings may be founded on the co-presence of both parts[55] or not[56]. The importance of these occasions elapses from the circumstance that they might be a means of lay trust reinforcement on sewerage-expert system or, on the contrary, a factor of trust erosion. Trust erosion on services is, this context, viewed as another potential impact of *critical events*, besides the ones affecting individuals' quality of life.

Besides the assessment of whether *critical events* induced or not on distrust on services expertise and performance, this chapter will include an analysis of *accessibility* parameter. The question here is to know the extent to which individuals know wastewater services and how did they manage to ask them for support. Finally, it is worth to mention that service expectancies, or what subjects value more in a customer service, was also founded as pertinent to approach.

8.3.1. Accessibility towards Wastewater services

For reasons of clearness and because failure events and rehab works are two *critical events* with their own specificities, we will opt by a separate analysis in what concerns to accessibility.

8.3.1.1 Accessing to wastewater services in case of failures

Failure events are privileged occasions for an understanding the type of relation the wastewater companies maintain with customers and vice-versa.

Concerning Lisbon sample, less than a half (33%) of interviewees stated to have contacted wastewater service at the sequence of the failure event. Those who did not ask for help or claimed to wastewater service are those who tried to solve the problem by themselves or who

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[54] Or experts.

[55] The following situations are examples of co-presence meetings: wastewater service picket team goes to customer' house in order to solve a failure problem; the costumer goes to wastewater service in order to make a claim or ask for help; the citizen goes to talk with sewerage works owner representative in order to try to solve something that is bordering him, etc.

[56] Giddens distinguishes co-presence meetings from non-presence meetings. These ones corresponds to situations whereas experts and lay individuals communicate, but not in a co-presence basis. The ask for support or the act of claiming by telephone, e:mail or mail letter are examples of such type of meetings.

asked support to other entities, such as other municipality departments, local district, firemen or private services/enterprises[57] (cf. Figure 6).

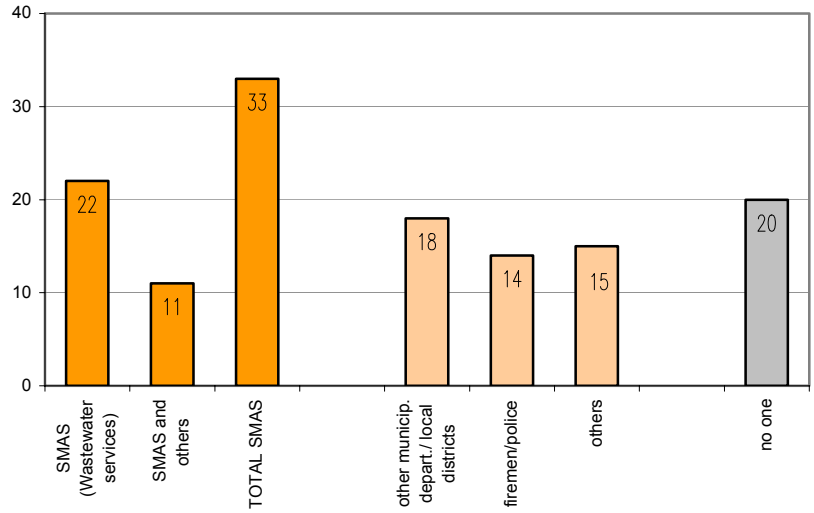

Figure 6 – Entities to whom subjects ask for support or claim, at the sequence of failure events

Reasons subjects evoke for not asking wastewater service for support or for not claiming are symptomatic of the nature of relationship between both parts. Indeed, approximately half (49%) of the interviewees declare “not knowing the service” or “not knowing to whom to contact”.

Besides, there is a small percentage of individuals (18%) who justifies the non-contact to wastewater services, by stating one of the following reasons: disbelief on wastewater service capacity to solve the problem, preference for a faster way of solving the problem or the sewer failure was a minor problem, being unjustified to ask for help.

Almost all of those who contacted wastewater service did it by phone. Only a residual number of subjects opted by other type of strategy, namely mail letter or fax. The majority of them found it easy to enter on contact with wastewater services.

[57] This last item was included in the category ‘others’ on Figure 7.

8.3.1.2 Accessing to wastewater services in case rehabilitation works

Almost every rehab subjects' state they did not claim to anybody responsible for works, during its occurrence (95%). According to most of them, there was no need to do so. Who felt some reason to claim, declares to have quit of doing it, arguing one of the following reasons: i) disturbances were normal events, under public works circumstance; ii) discredit on the possibility of individual' claim to be taken into account.

Concerning this trend, it is found as pertinent to recall the *time slowing down effect* already mentioned when discussing rehab works perceived impacts. It may have occurred that some subjects have forgotten either the works' impacts and their reactions at the time of the interview. In fact, information gathered during fieldwork[58] is consensual in the assertion that Alfornelos[59] sewer rehabilitation works was a complicated process, inducing on plenty of claims, especially from retailers.

Memory can also have some influence on individuals' response to questions related with the amount of information received before works start. In fact, more than a half of interviewees declare not having received information about works. Who states the opposite, affirms to have received information fundamentally through the neighbourhood "placard" (21%) and, in some cases, through other sources (such as mail letter, neighbours and local associations). When confronted with the degree of information received, some of these individuals considered satisfactory meanwhile others considered unsatisfactory.

Information about works is, in our view, the typical issue where pro-active attitudes and behaviours of both parts, public works owner and residents, are needed. On the one hand, detailed information about works' nature has to be delivered in a way that arrives to everybody; but, on the other hand, residents must be sufficiently interested on their own neighbourhood so as to pay attention to delivered information.

8.3.2 Public expectancies

Knowledge about users expectancies towards sewerage service is one aspect that, concomitantly with others, can give a contribute to the design of a politics of relationship with clients. A minimalist approach on this issue was attempted under the present study, by asking

[58] Namely the one obtained through interviews to privileged informers, such as experts from wastewater services and local district presidents.

[59] Alfornelos is one of the sites where most rehab interviews were done.

individuals to select from a list of 6 aspects of quality of service, the three they considered to be more important.

As can be seen through Figure 7, interviewees want sewerage services to be *efficient* on problem solving, *fast on responding* to customer problem and *easy to contact* in case of need. *Courtesy and politeness* along enquiry handling is secondary for almost all subjects. *Compensation* for damages and the deliver of a *satisfactory explanation for* what happened and how was[60] solved are two parameters not especially salient, except for some failure victims that emphasise compensation and a few rehab subjects that value information delivery.

An analysis of data according to the degree of importance individuals give to each parameter allows, as expected, similar conclusions. Nevertheless, failure victims seem to present a more marked pattern, by comparison with other target-groups. They clearly value *efficacy on problem-solving*. Indeed, this aspect of quality of service is referred by approximately 60% of individuals as the most important. Rehab subjects tend to split themselves on what they consider to be the most important parameter of quality of service and non-victims present a similar pattern to failure group (cf. Table 14).

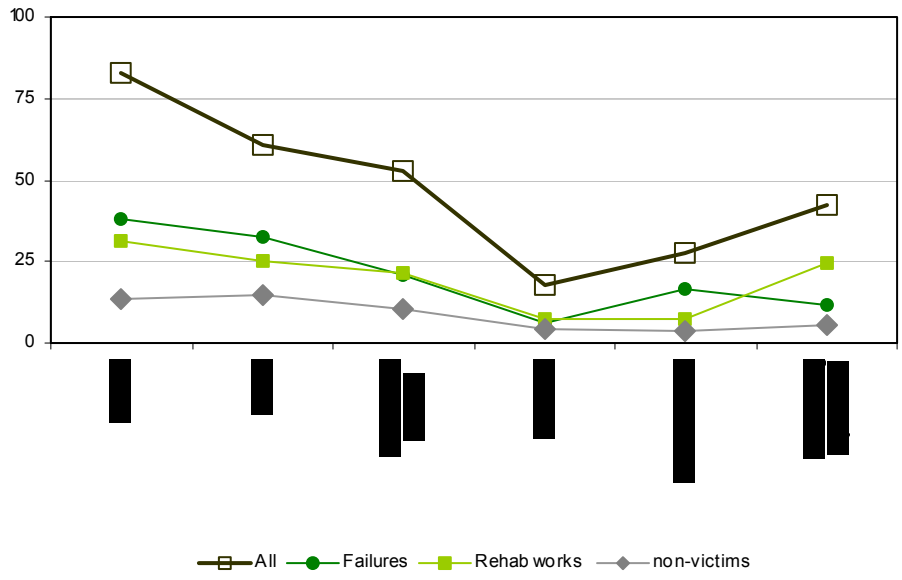

Figure 7 – Parameters of quality of service, according to the target-group (%)

[60] Or will or should be solved.

aspects	Target-groups: Failures 1º aspect	Failures 2º aspect	Failures 3º aspect	Failures total	Rehab 1º aspect	Rehab 2º aspect	Rehab 3º aspect	Rehab total	non-victims 1º aspect	non-victims 2º aspect	non-victims 3º aspect	non-victims total
	%				%				%			
easiness of contact with services	12,9	7,1	29,4	49,4	26,3	13,8	13,8	53,9	25,0	8,3	25,0	58,3
efficacy on problem solving	61,2	23,5	4,7	89,4	26,3	30,0	22,5	78,8	38,9	25,0	11,1	75,0
speed on problem solving	14,1	51,8	10,6	76,5	23,8	20,0	20,0	63,8	22,2	47,2	13,9	83,3
courtesy on public attendance	3,5	5,9	4,7	14,1	6,3	11,3	1,3	18,9	8,3	8,3	8,3	24,9
monetary compensation for failure events	4,7	3,5	30,6	38,8	3,8	2,5	12,5	18,8	0,0	0,0	19,4	19,4
satisfactory explanation to the client	2,4	7,1	18,8	28,3	12,5	21,3	28,7	62,5	2,8	8,3	19,4	30,5
no answer	1,2	1,2	1,2		1,3	1,3	1,3		2,8	2,8	2,8	
TOTAL	100	100	100		100	100	100		100	100	100	
	n=85				n=80				n=36			

Table 14 – Expectancies towards sewerage quality of service, according to the target group (%)

8.3.3 Experience of *critical events* and trust on sewerage services

Approach to lay trust issue stands on three interrelated indicators, as follows: i) *general trust* on water and wastewater service; ii) *perceived efficacy* of service performance when dealing with *critical situations* and iii) impact of experience of contact with wastewater service on subjects' opinion about it. Analysis will have to forego results underlying this last indicator, due to the low number of answers[61]. Anyway, it is found as pertinent to mention that such limitation didn't impede, as we shall see, the assertion of the impacts of experience at the *access points* on lay' trust on sewerage-expert system.

In general terms, positioning towards the two first above-mentioned parameters varies according to the target-group and *critical situation*.

[61] Only about 33% of failure victims responded to the questions reflecting the first-mentioned indicator, not being possible visualizing any trend. In what concerns to rehab subjects there are practically no answers to questions around this item.

Data analysis showed that manifestation of *trust* on wastewater service is not particularly marked. Nevertheless, the tendency is for rehab subjects and non-victims to manifest some level of trust and for failure victims to express distrust. In fact, as can be seen through Table 15, a half of failure victims state to have low or no trust on services responsible for sewerage.

	Target groups					
	Failures		Rehabilitation		Non-victims	
	%	N	%	N	%	N
no trust	**21,2**		3,8		11,1	
Low trust	**30,6**		10,0		22,2	
Trust	32,9		**38,8**		**41,7**	
High trust	3,5		**5,0**		**5,6**	
Don't know	11,8		**42,5**		19,4	
TOTAL	100%	85	100%	80	100%	36

Table 15 – General trust on wastewater services *per* target-group

Perceived efficiency general pattern has, as expected, some similarities with trust issue. The same negative trend manifests on failure victims. Indeed, more than a half of them (58,9) envision wastewater service as inefficient on the way it manages sewer failure events. Rehab subjects tend to assess more positively services' efficiency. Anyway, similarly to trust trend, there is a non-negligible amount rehab subjects who state not having opinion about this subject (Table 16).

It is found as worth to mention that, as demonstrates *Man-Whitney U* test in Table 17[62], such inter-group differences are statistically significative.

	Failures		Rehabilitation	
	%	n	%	n
Not efficient	**31,8**		8,8	
Little efficient	**27,1**		26,3	
Efficient	18,8		**27,3**	
Very efficient	4,7		1,3	
Don't know	17,6		**36,3**	
TOTAL	100%	85	100%	80

Table 16 – Mann Perceived efficiency on wastewater services per target-group

[62] For a comprehension of Man-Whitney U statistical procedure, see Methodological Note in Annex 5.

	Target-group	N	Mean rank
Perceived efficiency	Failure victims	85	69,86
	Rehab subjects	77	94,35
			Perceived efficiency
Mann-Whitney U			2283,000
Wilcoxon W			5938,000
Z			-3,420
Asymp. significance			,001

Table 17 – Mann-Whitney U, for inter-group comparison in what concerns to perceived efficiency of sewerage services

Once presented the main trend concerning *trust* and *perceived efficacy*, it urges as fundamental to understand what is at the basis of such trend and whether experience at the *access points* influences it or not.

It is quite insignificant the volume of rehab subjects who stated to have contacted or claimed to wastewater services[63], during works. Such fact may be seen as an impediment of assessment of above-mentioned parameter, but only if we have a restrict view about experience at the *access points*. A wider view of this parameter would be to conceive works (and all inconveniences it may induce to individuals) on itself as an experience at the *access points*. Even when not driving the individual to enter on contact with someone responsible, temporary daily contact with public works may influence individuals' attitude and representations about who manages works and how they are pursued.

In fact, although passive in terms of claiming, rehab subjects tend to evoke their own experience of works on their neighbourhood to justify their position about services' efficacy. Those who view sewerage services as efficient on the way they deal with rehab works, justify it by stating that public works, occurred on their own neighbourhood, were done without any type of problems or that sewer problems stopped occurring on that area, after works ending. In what concerns to those who evaluate negatively services performance, justifications elapse once again from subjects' own past experience of public works on the neighbourhood. The too long duration of works, accompanied by recurrent actions of trench re-opening[64], emerges as the most salient justification for *perceived inefficiency*. Besides this, some interviewees mentioned the scarceness of information during works and the re-appearance of sewer problems.

Given this, a broader view of experience at the *access points* leads, for the specific case of rehab works type of *critical event*, to the assertion that personal experience of sewer

[63] Or rehab works responsible.

[64] Such action is generally perceived as a symptom of lack of expertise on the part of public works' responsible. In other words, the recurrent re-open of trenches was, in the absence of any type of explanation of those responsible, perceived as a signal that "they did not know what there were doing and how to conduct works".

rehabilitation works *per si* influences, for better or for worth, customers' vision of sewerage services.

Data concerning failure victims goes into the same direction. There is a statistically significant correlation between the status of problem resolution and perception of services' efficiency. In other words, who has the sewer problem solved tends to evaluate sewerage services as efficient; who has not tends to evaluate negatively (ρ = .54; p <.0001)[65]. Besides, when incited to spontaneously justify their own perception of inefficiency, interviewees were consensual on the assertion that sewerage services were or are incapable of solving the sewer problem.

But, does such trend stands on concrete episodes of bad experience at the *access points* or on a kind of diffuse disbelief on public institutions and/or municipal services? As we shall see bellow, both situations seem to occur.

A combined analysis between contact with wastewater service[66] and *perceived efficiency* revealed that those who contacted services tend to evaluate negatively their performance in the sequence of critical events such as failures. Having this trend into account, jointly with the above presented, we can infer that experience at the *access points* tends, in the case of Lisbon failure victims, to perpetuate or provoke a situation of some distrust on sewerage service capability (cf. Figure 8).

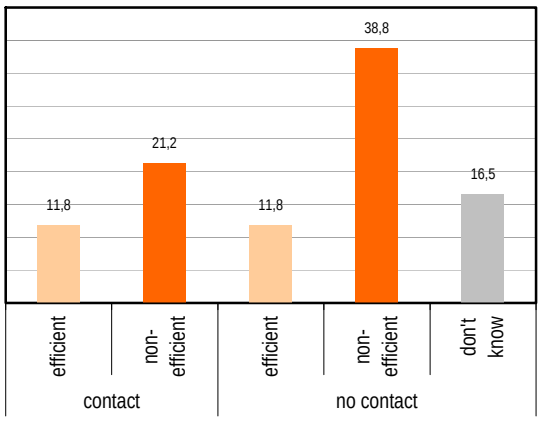

Figure 8 – Contact with wastewater services and perceived efficiency, in the case of failure victims (%)

But, as can be seen through Figure 6, there is also a non-negligible amount of individuals who state not having contacted wastewater services and found them inefficient. These are the individuals we call as disbelievers. Such disbelief may elapse from at least two types of

[65] Corresponding to statistical correlation test Spearman rho, for ordinal scale variables (cf. footnote 52).

[66] Either for just claiming or asking for support, following a failure event.

situations: a feeling of general disbelief on public institutions and, consequently, municipality and sewerage entities; or the result of what Hirschman calls as "*exit"* reaction. This last situation has on its basis an attitude of desistence, founded on failed attempts of complaint, ask for support or solve sewer problem through sewerage services.

8.4 Perceived importance of sewer rehabilitation

On theoretical framework, we discussed the hypothesis of failure experience to induce on more awareness towards the importance of sewerage rehabilitation. In fact, results indicate the existence of a higher awareness not only on the part of failure victims, but also on the part of rehabilitation group.

Looking specifically to failure target-group, when confronted with what should be done in order to avoid problems of sewer failure on their residence/work area, individuals are quite consensual on the statement that more investment should be done on sewerage maintenance & cleanness. Nevertheless, there is a relevant volume, approximately 60%, who emphasises sewer rehabilitation[67] as a mitigation measure to follow (cf. Figure 9).

Related to the subject under discussion, it was found as pertinent to assess whether *perceived importance of sewer rehab* varied or not according the *degree of acceptability of failures* or *perception of impacts* of such events *on quality of life*. Indeed, we found a timid correlation with the first mentioned variable and no correlation at all with the second one. Thus, we might say that the more unacceptable is experienced sewer problem, the more tends to the importance given to sewer rehabilitation ($\rho = .25$; $p < .02$)[68]. On the contrary, impacts on quality of life, either perceived as high or low, don't seem to have any influence on sewer rehabilitation perceived importance[69].

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[67] On the interviews, subjects were asked to point out what they considered to be the first and second most important action to be taken in order to mitigate sewer problems, in a group of three (maintenance & cleanness; sewer renewal; sewer fiscalization). About 32% of subjects put sewerage rehabilitation at first place, against 48% that emphasise sewer maintenance & cleanness. Figure 6 was constructed with data concerning the number of times each item was mentioned, independently of the symbolic place individuals' attribute to them.

[68] Corresponding to statistical correlation test Spearman rho, for ordinal scale variables (cf. footnote 52).

[69] Such timid statistical correlation as well as the inexistence of correlation between the above mentioned variables would need other empirical studies in order to be better assessed.

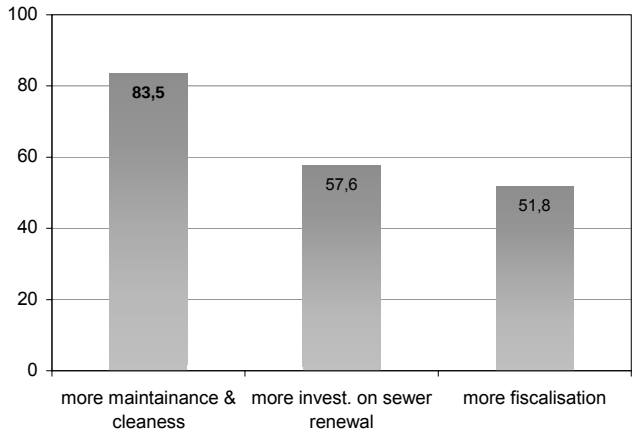

Figure 9 - Ways of mitigating risk of failure, according to failure victims (%)

	Target groups					
	Failures		Rehabilitation		Non-victims	
	%	N	%	N	%	N
not important	1,2				16,7	
little important	2,4		2,5		**33,3**	
important	18,8		27,5		11,1	
Very important	**77,6**		**70,0**		**38,9**	
TOTAL	100%	85	100%	80	100%	36

Table 18 – Perceived importance of sewer rehabilitation

But, where the above-mentioned hypothesis gains "strength" is when we proceed to comparative analysis between the three target groups. As Table 18 shows, not only failure victims perceive sewer rehabilitation as an important investment to follow, but also rehab subjects. Such high valuation contrasts with the one done by non-victims, which denotes more indifference towards rehab works investments. Inter-group differences are statistically significative (cf. Table 19), an aspect that increases the confidence of results trend.

	Target-group	N	Mean rank
Perceived importance of investment on sewer renewal	Rehab subjects	80	106,07
	Failure victims	85	112,45
	Non-victims	36	62,69
			Perceived importance of sewer renewal
Kruskal-Wallis			28,671
Df			2
Asymp. Significance			,000

Table 19 – *Kruskal-Wallis* test, for inter-group differences analysis

In parallel with awareness towards the importance of sewer rehabilitation, it was found as pertinent to explore individuals' views about aspects to be taken into account in case of works on their neighbourhood[70].

Results demonstrate, in short, that individuals want public works to last as little as possible, not to constrain pedestrian or car accessibilities and, for at least some of them, the assurance of good public information. Noise pollution due to machines and good-coordination between underground infrastructure' entities[71] is something that seems not to be valued by individuals, with exception of a few rehab interviewees. Similarly, easiness of contact with works owner in case of need and assurance of financial compensation in case damage appears as two parameters with low salience. The few individuals' that mention it are mainly victims of failure events (cf. Figure 10).

The above-mentioned trend is, at some extend, congruent with public' works consequences perceived as more disturbing by a great majority of interviewees[72]. Indeed, there is a relevant volume of individuals stating "difficulty of pedestrian & car mobility" as a troubling effect that should be mitigated. The other two consequences, also particularly salient on individuals views, concern house space, namely: "Dust & dirtiness in house/workplace", "temporary interruption of basic infra-structures (WC, kitchen, electricity)"[73].

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[70] On of the main aims of this dimension of analysis intends to provide Task 5.3 with an empirical basis.

[71] In order to avoid situations of successive public works interventions, each of one directed to one specific underground infrastructure.

[72] Public works effects perceived as more disturbing by individuals was assessed only through rehab works and non-victims questionnaires.

[73] It was asked for interviewees to nominate the three public works' consequences perceived as more disturbing, in a range of six: "noise pollution due to machinery", "dust & dirtiness in the street", "dust & dirtiness in the house/work place", "difficulty of pedestrian & car mobility"; "temporary interruption of house basic infrastructures".

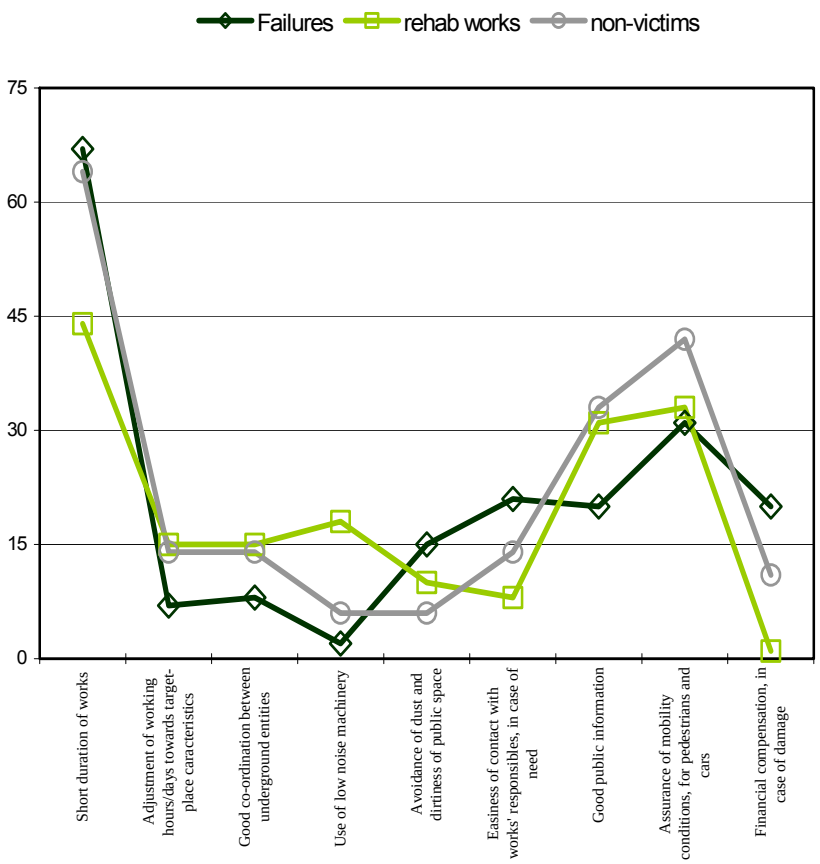

Figure 10 - Aspects to be taken into account in case of public sewer works

8.5 Synthesis of results

Critical events and quality of life

Failures and rehab works are two types of *critical events,* associated with sewerage-expert system, both inducing on impacts for individuals' quality of life. Nevertheless, those impacts are felt and perceived in a different way by individuals. Failures are fundamentally viewed as disturbing and unacceptable situations, affecting individuals' general well being. Sewer rehabilitation works are, in turn, perceived as producing modest impacts, if any, and as tolerable *critical events*.

Neighbourhood surroundings and house space appear as the areas of quality of life where impacts of failures were felt as more disturbing. Such type of events, mainly sewer flooding, was felt as detractors of public space use and usufruct. Most common impacts at house space were material damages to house, temporary usefulness of house divisions or infrastructure, associated with the feeling of general discomfort that such scenarios provoke.

Sewer rehab works main felt impacts where at the level of surroundings and public space use and usufruct. Individuals' complaints concern fundamentally the difficulties of car or pedestrian accessibilities inside the neighbourhood or to elsewhere outside. As mentioned before, modest degree of general disturbance may be, in the case of Amadora-Oeiras sample, influenced by the so-called *time slowing down* effect.

Nevertheless, there are certainly *critical events* specificities that turn sewer failures intolerable events and rehab works more tolerable situations. In an exercise of inference of the above-mentioned specificities, we would say that results indicate that failures induce on higher level of disturbance not only at surroundings and house space levels, but also, at some extent, at finances & work as well as health levels. Another aspect has to do with the specificity of each *critical event* and the expectancies it generate on individuals. If failure type of event induces on some kind of expectancy to individuals, such expectancy is certainly negative. When it comes to rehab works, in spite of the inconveniences they may provoke, it is easier to attach something positive to it. Although not always present on individuals' mind, there is often the presupposition that public works, such as sewerage rehabilitation, are done because it is needed or for community improvement. Such *critical event* trait turns it more tolerable.

Relation with sewerage services: experience and expectancies

Relation individuals maintain, as customers, with sewerage service is, in a certain way, fragile and distant. Only a few know the services and less than a half turned to them, when confronted with a sewer problem. Victims of failures advance two type reasons for non-contact: ignorance of service existence and disbelief on the capability or degree of fastness with which the service will solve the problem. In what concerns to rehab works subjects, they justify the non-contact fundamentally by stating the "normality" of experienced works inconveniences. Such aspect reinforces the above-mentioned individuals' tolerance trend, in case of rehab works. Still concerning rehab subjects, it is found as pertinent to emphasise their tendency to declare the non-reception of information about works, before its starting. Nevertheless, this is a typical issue where a two-way movement is needed. Residents must be pro-active on the interest for their neighbourhood, which not always happens. Sewerage services must, in turn, insure that information arrives to residents and customers, a parameter that sometimes fails.

Expectancies[74] are, at some extent, consonant with individuals' experience. In short, individuals value and want a service to be efficient on problem solving, fast on answering to the customer and easy to contact, in case of need. Although not so prevalent in quantitative terms, there are slight trends that analysis by target-group reveals that shouldn't be neglected. Thus, monetary compensation in something valued by a non-negligible volume of failure victims. There is, on

[74] Specially the ones stated by failure victims.

the other hand, a relevant number of rehab subjects that attribute importance to the "need for a satisfactory explanation (to the client) for what's happening, happened or will happen.

Trust and experience at the access points

Levels of general *trust* on organization representing sewerage-expert system are not particularly marked. Anyway, the trend is for Amadora-Oeiras rehab subjects and non-victims to manifest trust and for failure victims to express distrust. Individuals' evaluation about services' degree efficiency on dealing with *critical situations* such as failures or rehab works presents, as expected, similar a trend.

Amadora-Oeiras results indicate that experience of contact with services interferes, for better or for worth, on individuals' views about sewerage services and its performance. As seen above, it is residual the number of rehab interviewees who state to have contacted or complained to sewerage services, during works. Nevertheless, the tendency for individuals' to justify their own judgement about efficacy on something related with their own past experience of rehab works, allows us to infer such interference. Thus, perception of services as efficient appears attached to the judgement of works as having occurred without problems; perception of services as inefficient tends to be justified with the too long duration of works and systematic trench re-opening.

In what concerns to failure victims, the tendency is for experience at the *access points* to induce on *trust* erosion or distrust perpetuation. Besides, there is a non-negligible amount of individuals that make a negative judgement about sewerage services, although not having contacted sewerage services. These individuals are, in our view, disbelievers, either on public institutions at general or on sewerage services in particular, due to failed past experiences with them.

Awareness towards the importance of sewer rehabilitation works

As far as it was possible to gauge, experience of *critical events*, either failures or rehab works, has the effect of increasing awareness towards the importance of sewerage maintenance and rehabilitation investments. As seen, not only failure victims but also rehab works subjects classified sewer rehabilitation as important endeavours to be prioritized, contrasting with non-victims group which manifested more indifference towards such type of investment.

When confronted with aspects to be insured by public works owner on the course of public works, individuals revealed to want works to last as little as possible, not to constrain pedestrian and car accessibilities and, at some extent, to insure the maximum of public information as possible.

9 NANTES METROPOLIS CASE STUDY

9.1 Target population

Similarly to Amadora-Oeiras case study, Nantes sample is composed by three target-groups, as follows: victims of sewer failures, individuals with recent experience of rehab works and the so-called non-victims. As can be seen through Table 20, each group contains individuals who live in target-areas and individuals whose bound with them is of professional order[75]. In all, the sample comprehends 219 individuals.

	Failures	Rehab works	Non-victims	**TOTAL**
Residents	52	49	30	**131**
Professionals	39	30	19	**88**
TOTAL	**91**	**79**	**49**	**219**

Table 20 - Nantes sample

Rehab works have been identified in collaboration with the sanitation department; at the end, three different works have been selected, all located in the city of Nantes. As concerns victims of sewer failures, they have been identified through 2004 file of occurred failures; they are distributed on all the territory of Nantes Metropolis. Non-victims have also been identified thanks to the sanitation department; they are all from the city of Orvault, which belongs to Nantes Metropolis.

It was made an effort of conferring statistical minimums and representativiness in terms of target-group and sub-group and that was achieved, namely in what concerns to age and socio-professional variables. The questionnaire was conducted either in a face-to-face situation, in users' homes[76] or by telephone, especially for victims of failures geographically scattered throughout the entire region.

[75] It is found as pertinent to mention that professionals' sub-group correspond to individuals who own a business on the area, either commercial or not.

[76] After receiving prior notice from Nantes Métropole that a survey was being conducted.

9.1.1 General attitudes towards environment, water and sewerage

As far as it was possible to infer, Nantes subjects revealed some awareness towards environmental importance of sewerage[77].

Indeed, when confronted with potential consequences of sewerage malfunctioning almost all individuals made reference to aspects related with the domestic space and users well being. Nevertheless, it should be noted that environmental type of consequences is raised by almost a half of the population (see Table 21). Such timid manifestation of awareness towards environmental importance of sewerage is, in turn, reinforced by individuals' ecocentric position in relation to a set of issues.

Potential consequences	%
For users and their houses (i.e. odours, sewer flooding)	74
For public space use and usufruct for recreative ends	25
For the environment	44
Other	14
No opinion	4

Table 21 - Potential consequences of sewerage network malfunctioning

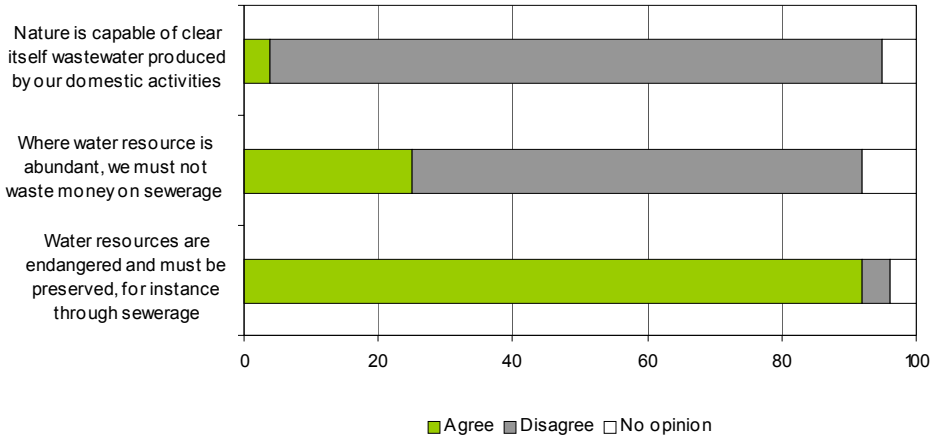

Figure 11 - Individuals' position towards environment' related statements

[77] As known, knowledge about this issue stands on an open question about potential consequences of sewerage malfunctioning as well as on a group of three sentences, inviting individuals to position themselves, in terms of agreement.

As can be seen through Figure 11, Nantes subjects reveal unanimity by agreeing with the assertion that *societies need to preserve water resources;* and that *societies need to continue to spend money on sewerage re-use, even in places where water resources are abundant.* On the other hand, almost all individuals disagree with the idea *Nature is capable of eliminate by herself domestic sewage*.

Notwithstanding the impossibility of taking definite conclusions[78], data analysis indicates that Nantes subjects reveal, at the level of the discourse, some awareness towards the environmental importance of sewerage.

Still at the level of general perceptions and attitudes, it was found as pertinent to know what type of potential *critical events'* effects would be viewed as more troubling for individuals. In what concerns to rehab works, noise and circulation problems are the effects most mentioned by individuals and considered as potentially most annoying[79]. When it comes to sewer failures, bad odours and housing sewer flooding are perceived as potentially more annoying, by comparison with other potential effects[80] (cf Annex 6).

9.2 *Critical events*: impacts on individuals' quality of life

As mentioned elsewhere in this Report, knowledge of failures and rehab works impacts stands on a set of four dimensions, each one composed by several items. Interviewees were asked to say if they have felt or not impacts at each item, jointly with their global appreciation of experienced consequences at the level of the four above-mentioned dimensions[81].

Before presenting main trends on this issue, it is found as worth to refer what type of effects victims of sewer failures stated to have experienced as well as those underlying rehab works experience. Concerning failures, felt effects were fundamentally difficulties with wastewater evacuation and bad odours. Most common rehab works effects were noise as well as traffic and car parking problems.

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[78] As mentioned on Part II Methodology, a more definite knowledge of subjects' attitudes towards environment and sewerage issues implies a deeper operationalisation of such dimension, than the one that was made under this study. Nevertheless, for this to happen the questionnaire would have to bigger, a fact that may be detrimental along fieldwork and in terms of general quality of information gathered. Given this, it was made the option of doing a limited exploitation of environmental issues dimension.

[79] This specific item of the inquiry, stands on a couple of questions where interviewees were invited to choose the three effects they considered as potentially more annoying for them, in an amount of five type of effects.

[80] Namely, temporary unfeasibility of WC/kitchen, due to sewer problems; wastewater open drainage in streets, public space flooding; and untreated wastewater drainage to rivers/lakes/streams/ocean.

[81] Cf. Part II, Method chapter: section 7.2.2.

9.2.1 Sewer failures

At Nantes sample, the area of quality of life where more individuals felt impacts concerns housing or workplace. Indeed, around 70% of failure victims made reference to this dimension. Although less preponderant, the amount of subjects referring to impacts at surroundings level should not be disregarded (54%). As can be seen in Table 22, it is minor the volume of individuals making reference to consequences felt at health and finances dimensions.

	Areas of quality of life							
	Housing | work place		Health & well-being		Surroundings		Finances & work	
	n	%	n	%	N	%	n	%
	57	**72**	27	34	43	**54**	20	25
Most referred items	Discomfort Temporary usefulness of WC, kitchen or other		Irritability		Impossibility of public space usufruct		Loss of clients	

Table 22 - Failures perceived impacts, by area of quality of life

Similarly to Lisbon case-study, housing related impacts concern fundamentally discomfort and temporary usefulness of kitchen/WC or other. Who mentions impacts at surroundings level, refers to have felt impediments of using public space.

But, as mentioned along Amadora-Oeiras data analysis, more or so important than *critical events* type of impacts is the knowledge of whether such situations had some significance to individuals' lives or not.

Globally, Nantes victims of failures tend to evaluate impacts as little or not significant at all. An exception may be found at housing area of quality of life, where we have around 40% of subjects stating experienced impacts were significant (Table 23).

		Degree of significance					
		No significant		Little significant		Significant	
		n	%	N	%	n	%
Quality of life	Housing | work place	21	23	34	37	36	39
	Health & well-being	43	47	39	43	9	10
	Surroundings	45	49	29	32	17	18
	Finances & work	41	45	36	40	14	16
	Residents	9	23	20	51	10	25
	Professionals	32	62	16	31	4	4

Table 23 - Perceived significance of failures impacts, by area of quality of life

Although globally assessed as of minor significance, impacts at finances & work level appear as slightly more disturbing for residents than professionals.

9.2.2 Rehabilitation works

Curiously, housing also appears as the area of quality of life where more rehab works subjects stated to have felt impacts. Surprisingly, only a few subjects (32%) made reference to impacts at surroundings level (cf. Table 24).

Similarly to failures type of *critical event*, there are more individuals assessing impacts of rehab works as not specially disturbing, than the opposite. Nevertheless, it should be noted that the percentage of victims stating that impacts were disturbing for them is higher for rehab works, than for failures.

Furthermore, a non-negligible volume of those who mention impacts at surroundings level classifies them as disturbing for them (37%).

Once again, finances & work area of quality of life appears as globally insignificant, but there is an amount of residents who found impacts at this level as having been significant (24%) (cf. Table 25).

	Areas of quality of life							
	Housing | work place		Health & well-being		Surroundings		Finances & work	
	N	%	n	%	n	%	n	%
	69	**76**	23	25	29	32	38	42
Most referred items	Discomfort Temporary usefulness of WC, kitchen or other		Irritability		Unwillingness to use public space		Extra-expenses	

Table 24 - Rehab works impacts, by area of quality of life

		Degree of significance					
		No significant		Little significant		Significant	
		n	%	N	%	n	%
Quality of life	Housing | work place	24	30	19	24	36	35
	Health & well-being	43	54	14	18	22	28
	Surroundings	28	35	22	28	29	37
	Finances & work	49	62	15	19	15	19
	Residents	9	30	8	27	13	34
	Professionals	40	82	7	14	2	4

Table 25 - Perceived significance of rehab works impacts, by area of quality of life

It is noticeable that eleven victims (6% of the panel) declare having suffered from loss of time but are unable to evaluate the induced cost. The evaluation of the financial cost proves also to be difficult for the induced repair: 27 % persons (16 % of victims – mainly failures victims) declare having to pay for the failures. The induced spending evaluated by people able to give

an amount (8 persons) are highly different: from 27 € for a resident (victim of sewer rehabilitation works) to 20 000 € for a professional (victim of failures).

9.2.3 What disturbs more?

In order to have global vision about the degree of disturbance of *critical events* on individuals' lives, an indice was constructed by attributing the value 1 for each item of quality of life stated by the interviewees, adding afterwards a weight to the correspondent interviewees evaluation of the degree of significance of impacts to their lives[82].

As can be envisaged through Figure 12, at Nantes neither rehab works impacts nor failure ones are perceived as specially disturbing, on the part of interviewees. Nevertheless, it should be noted that for one third of failure' victims impacts had significance to their lives and, as far as it concerns to rehab works, approximately 40% of subjects evaluated such type of events as having induced on some kind of disturbance. Actually, there are slightly more rehab victims stating experienced events as disturbing than failure victims.

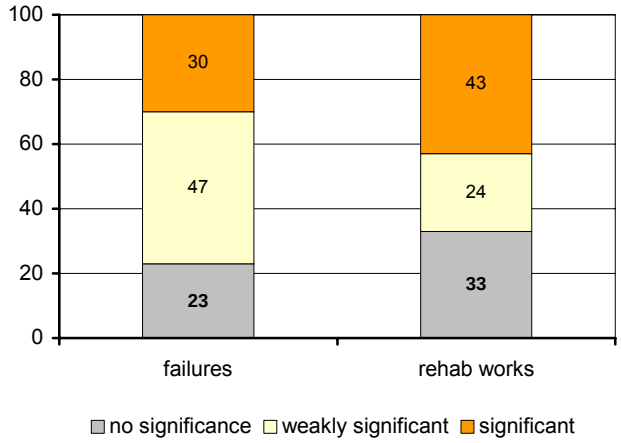

Figure 12 - General perceived disturbance, induced by *critical events*

Data analysis indicated that failures' degree of perceived disturbance seems to be related with the type of experienced problem. More precisely, impacts are perceived as high especially when sewer problem is inside subjects' home (i.e. wastewater in basement, problems with external private network malfunctioning, etc).

[82] In the cases where interviewees classified impacts as "not important" or "not disturbing" to them, no weight value was attributed. Whenever interviewees classified it as "little important" the weight value was of 1 and the value 3 for the highest attributed significance.

For rehab works, results indicated that works impacts seem to be less bordering for residents than for professionals. Once again, the type of problem may be at the basis of such tendency. Residents suffered mainly from bad smells problems.

Still concerning rehab works type of critical event, results showed that impacts seem to be felt as weaker for individuals living in the so-called border zone, than for those living at the epicentre. This is not by itself a surprise. Nevertheless, it is found, as worth to refer that, in case of rehab works, the degree of proximity of individuals in relation to "work area" seem to influence more the degree of impacts, than the nature of effects.

Confrontation of main trends regarding impacts' dimension with the ones concerning the degree of acceptability of experienced *critical events* reveal interesting conclusions, which should not be disregarded.

In spite of being mainly perceived as events of low significance, sewer failures are viewed as unacceptable or intolerable events by a non-negligible amount of Nantes interviewees. Indeed, a half of them classified experienced sewer failures as something "hardly tolerable" or as "unacceptable events, which cannot happen and should definitely be avoided". Such attitude of intolerability tends to be higher among the sub-group of professionals as well as victims os structural type of failures.

	Failures	Rehab works
Normal events [1]	23	29
Events not so normal [2]	28	52
Abnormal events [3]	25	14
Totally abnormal events [4]	24	4
No opinion		1
TOTAL	100	100

[1] Something that happens, whatever the sewerage network type or wastewater service.
[2] An unpleasant event that can always happen and with which we "have to cope with".
[3] An event hardly tolerable that should not happen.
[4] Unacceptable events that cannot happen and should be definitely avoided.

Table 26 - Degree of acceptability towards critical events, according to the target-group (%)

Concerning rehab works, we have seen above that there is an amount of individuals who perceived this event impacts as having been disturbing for their lives. Nevertheless, they seem to be envisaged as bearable situations. In fact, almost every interviewee classifies works' impacts as "something that happens", whatever the circumstances or as something "unpleasant", but with which individuals must cope with.

This trait of Nantes sample is, at some extent, convergent with Amadora-Oeiras case-study trend. Indeed, in this target-area sewer failures were also mainly classified as unacceptable events, by comparison with rehab works, whose impacts were found as tolerable.

Such trend indicates that, in both case studies, the type of *critical event* influences more acceptability, than level of impacts' intensity or degree of disturbance.

As far as it is possible to infer, it seems to exist more predisposition to bear negative consequences[83] if individuals anticipate some kind of benefit. Given this, sewer rehab works appear as more tolerable events because of its aims, which are, in short, to enable sewers to be kept in good working order. In what concerns to failures, they are nothing more than sewerage breakdowns, whose impacts to individuals' life are mainly negative and are not in conformity users expectations. Consequently, it is not surprising that they are perceived as intolerable events.

9.3 *Access point*s: experience, expectancies and trust

As known, experience at *access points* refers to presential and non-presential encounters between users[84] and delegates of sewerage-expert system, in the sequence of failure events or rehab works. Three aspects of this relationship were, under this study, explored, as follows: degree of accessibility towards sewerage services under those critical circumstances; influence of the so-called experience at *access points* on users' view and *trust* on sewerage services; and, finally, users expectations towards service performance.

This section intends to explore main Nantes case study' trends concerning the three above-mentioned aspects of relation with Sanitation Department.

9.3.1 Accessibility towards sewerage services

Both sewer failures and rehab works specificities oblige to some particularities in terms of relation with costumers. These particularities are mainly concerned with the importance of previously informing populations about rehabilitation works occurrence.

At Nantes case study, slightly more than a half of the interviewees (55%) stated to be clear for them that Nantes Métropole urban community was the responsible entity for sewerage.

As far as it concerns to rehab works, 56% of subjects declared to have been informed about rehab works, before its beginning. The main stated channel of information delivery was the mail. All of them felt satisfied with the type of information received.

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[83] Even if these ones concern with temporary interruption of basic housing infrastructures (i.e. WC/kitchen)

[84] In the condition of costumers.

	Failures	Rehab works	Non-victims	All sample
Yes	56	49	61	41
No	38	47	39	**55**
Non response	6	4	-	4
TOTAL	100%	100%	100%	100%

Table 27 - Knowledge of Nantes sewerage responsible entity (%)

Around 25% of the interviewees asked for support or claimed, during works. The remaining did not claim because they felt any disturbance. Main claims' underlying problems were difficulties of access to house or work place and noise. The great majority of claimers stated to have found easy to get in contact with services.

A large majority of failures' victims contacted sewerage services by phone. Nevertheless, some of them stated to have opted by writing a letter or subscribing a petition. More than a half (60%) found it easy to get on contact with the services and appropriate professionals, whereas 26% confessed to have had difficulties on reaching the "the right person".

9.3.2 Users' view and trust on sewerage services

As already referred on the above-chapter, *trust* issue stands on a set of interrelated indicators, namely *perceived degree of services efficiency* and *general trust on sewerage services*. As we shall see bellow, unlikely Amadora-Oeiras case study, perceived efficiency related questioning was, at Nantes sample, asked only to those who stated to have entered on contact with sewerage services, for some reason.

Given this, in the case of rehab-works sub-group, results on the efficiency issue concern 19 interviewees. A half of these judged services intervention as not efficient or little efficient. The remaining found it efficient or stated not having opinion about it.

Although insignificant in quantitative terms, it is found as worth to point out that a small group, composed by six interviewees, claimed to services due to an access problem[85]. They were all unanimous on the assertion of sewerage services as inefficient on problem solving, staying with a bad view of sewerage services.

Concerning sewer failures sub-group, around 85% of interviewees expressed their view about services efficiency.

As can be seen through Table 28, more than a half (60%) of the interviewees view sewerage services as efficient, on the way they dealt with their problem. In spite of this, there are approximately 40% of individuals who evaluate services as inefficient or little efficient.

[85] Difficulty of entering in the house or work place, difficulty of car parking.

	Failures	
Not efficient	19	
Little efficient	19	
Efficient	**28**	
Very efficient	**32**	
Don't know	2	
TOTAL	100%	n=77

Table 28 - Failure' victims perceived efficiency on sewerage services

Unlikely Amadora-Oeiras case study, at Nantes failures reoccurrence, namely after an initial repair, seems to influence perception of efficiency. In fact, many of those who evaluated negatively efficiency, suffered from sewer failures more than once (57%). On the other hand, those who have positive views of efficiency are mainly individuals who suffered from failures only once (93%).

As mentioned along this report, *trust* is a vital element on modern industrialised societies, extremely marked by the proliferation of expert systems. From this point of view, Nantes metropolis users do not appear to be out of the ordinary. Indeed, data analysis shows that *trust* in sewerage services seems to resist to experienced *critical events*. There were not found significative differences between failure victims, rehab works' subjects and non-victims. The majority of them stated to feel trust on Nantes sewerage services performance (cf.Table 29).

		No trust	Low trust	Trust	High trust	Non response	TOTAL
Failures	Residents	6	8	58	29	-	100%
	Professionals	3	10	67	15	5	100%
Total		**4%**	**9%**	**62%**	**23%**	**2%**	**100%**
Works	Residents	4	12	43	31	10	100%
	Professionals	-	7	60	33	-	100%
Total		**3%**	**10%**	**49%**	**32%**	**6%**	**100%**
Non-victims	Residents	3	3	60	33	-	100%
	Professionals	-	5	53	37	5	100%
Total		2%	4%	57%	35%	2%	**100%**
TOTAL		**3%**	**8%**	**56%**	**29%**	**4%**	**100%**

Table 29 - General trust on sewerage services, according to the target-group (%)

In spite of the above-presented global trends, as far as it concerns to failures victims data analysis unable us to identify two distinct groups, which are presented bellow:

- Victims of recurring or structural sewer failures

Impacts, mainly discomfort due to bad odours, are perceived as of low significance. Nevertheless, almost every victim felt that the way sewerage services dealt with the problem was inefficient. As far as it is possible to infer, this trend is at the basis of the revealed low levels of *trust* on capacity of sanitation department to manage efficiently sewage collection and treatment.

- Victims of once-off failures
  Main stated impacts are of financial or psychological order (nervousness, loss of time). Contact with sewerage services was found as easy and was done by telephone. The majority of these individuals have a high opinion of services. Such opinion was strengthened by the impression of efficiency along problem solving period. Indeed, in almost all cases problem was solved. The above-mentioned view was not influenced by the impacts they felt, which is classified as significant by more than a half of these interviewees.

9.4 The wishes of users

As mentioned in the former chapter, public inquiry included a section directed to the knowledge about users expectations or wishes towards sewer services. Such section stood on the questioning about the aspects of quality of service subjects considered as most important. The interviewees were confronted with a list of six aspects — efficacy, speed, and easiness of contact, courtesy, compensation, and satisfactory explanation — and asked to choose the three more important ones.

Results indicate that three main expectations for users are the same, although their order may vary from one population to another. On other words, the majority of Nantes interviewees (whatever the event in question) expect the service to be efficient, quick and easy to access. However, it is curious to note that non-victims have less definite expectations: only 27% place these three on the top of their list, placing greater importance than victims on pleasantness and a caring attitude.

Works	Non victims	Failures
Efficacy on solving the clients problems	Easiness on talking with sewer services	Efficacy on solving the clients problems
Cited in 1 by 35%	Cited in 1 by 37%	Cited in 1 by 41%
Fastness on problem solving	Fastness on problem solving	Fastness on problem solving
Cited in 1 or 2 by 65%	Cited in 1 or 2 by 61%	Cited in 1 or 2 by 59%
Easiness on talking with sewer services	Efficacy on solving the clients problems	Easiness on talking with sewer services
Cited in 1 or 2 by 33%	Cited in 1 or 2 by 59%	Cited in 1 or 2 by 37%

Table 30 - Preferred parameters of quality of service, according to the target-group (%)

9.5 Synthesis of results

Similarly to Amadora-Oeiras case-study, both sewer failures and rehab works induce on some kind of impact to individuals quality of life, at the level of *housing/work place*, *health & well being*, *nearby surroundings* and *finances & work*. Nevertheless, such impacts were not envisaged as especially disturbing the majority of individuals.

Another common aspect to Lisbon sample concerns public acceptability. Nantes interviewees view as failures fundamentally unacceptable events; meanwhile sewer rehab works are envisaged in a more tolerable way.

Given this, as far as it concerns to Nantes case study, unacceptability towards failures is not explained by perceived intensity of its impacts. What seems to count most is the sense of the event in relation to general users expectations. Users expect sewer network to perform the role to which it was designed and as always did, which is to allow the continuous “going out” of wastewater through an isolated technical system. Sewer failures menace such trivial, but vital role as well as contradict individuals’ rather unquestioned expectations.

As far as it concerns to *trust* issue, experience at *access points* following critical events did not induce on significative breaches on individuals’ *trust* or credibility on sewerage services. Nantes Sanitation Department user policy, based on quality and proximity parameters, had certainly a role on avoiding such type of impact.

Public wishes and expectations towards sewerage services give primacy to efficacy on problem solving, easiness of contact with sewerage utility in case of need and fastness of problem solving.

10 . FINAL REMARKS

Research underlying this report deals with social consequences of sewer rehabilitation scenarios as well as with non-rehabilitated vulnerable ones. More specifically, it was our aim to know to what extent rehab works and sewer failures provoked impacts to individuals' quality of life as well as on their view, as costumers, about sewerage utility. If occurring, such impacts should be taken into account along decision-making around sewerage management and rehabilitation.

As we have seen, in this study sewer systems are envisaged as one among a multiplicity of *expert systems* that colonise modern industrialised societies. Its vital role for social quality of life and environmental sustainability contrasts with its daily, unquestioned and non-reflexive use. In fact, common citizen is fundamentally a compulsory lay user of sewerage-*expert system*. As costumer, his relation with sewerage-*expert systems*, including who represents it, stands on a kind of *trust* or belief on those systems normal functioning and reliability.

Sewer failures and rehab works are envisaged as *critical events* in the sense they may collide with users' expectations of normal functioning and *trust*, jointly with eventual impacts on quality of life. As concerns to these ones, they may express themselves at least in the areas of *housing*, *health*, *physical environment* and *finances & work*.

As known, metropolis of Nantes and two municipalities of Lisbon metropolis (Amadora and Oeiras) were selected as target-areas for the pursuit of both exploratory study and survey.

Before synthesising main results of this study, it is found as pertinent to make two methodological remarks. First, unquestioned exercises of results' extrapolation contain risks. The study wasn't conceived with that ambition. Besides, the nature of research subject doesn't allow too many extrapolations. Impacts of both sewer failures and rehab works, jointly with the way they are lived by individuals, are extremely dependent of events' characteristics and context variables. We refer, on the one hand, to the type of failure or rehab works and, on the other, to the setting where they occur.

The second remark relates with the role of support to future research that this study can play. Indeed, as any other research, this one responds to some questions and raises other questionings. Apart from this, we intend this study gives clues which can, at some extent, support decision-making around sewerage management, namely in face of critical situations such as failures or rehab works.

Critical events*: impacts on social *quality of life

This research confirmed that failures and rehab works are two types of events that induce on some kind of impact on individuals' quality of life on the areas of *housing*, *health & well being*, *physical environment*[86] and *finances & work*. Nevertheless, such impacts were felt and perceived in different ways by individuals, target-groups and accordingly the type of *critical event*.

Housing or work place area of quality of life appears, both in Amadora-Oeiras and Nantes, as one of the areas where impacts of failures where felt as more disturbing by individuals. At the basis of this is fundamentally the feeling of discomfort associated with temporary usefulness of parts of the house and, in the case of Lisbon, material damages. In parallel, impacts at surroundings level were also frequently stated and, especially at Lisbon, where difficulties of public space use and usufruct were found as disturbing.

In what concerns to rehab works, at Nantes housing space continues to appear as the area where more disturbances where felt. Meanwhile, in Amadora-Oeiras sample nearby surroundings emerge as the area where impacts were felt as more significant. These ones were mainly concerned with difficulties of accessibility to house or workplace as well as car and pedestrian mobility.

But, where differences become more evident is when we turn to critical events' degree of acceptability. In fact, failures are mainly perceived as unacceptable or hardly bearable events meanwhile rehab works impacts are fundamentally viewed as more acceptable.

As far as it was possible to infer, impacts don't need to be felt as disturbing for failures to be found as unacceptable events. As we have seen at Nantes case study, most interviewees classify failures events as quite insignificant events, but view them "as something unacceptable that cannot happen and should be definitely avoided".

Failures are non-usual situations that collide with one of individuals' most trivial and unquestioned expectations, which concern with the belief of sewerage normal and good functioning, as usual[87]. Its occurrence opens a breach on such expectations. But, in parallel with this, unacceptability trend is also due to sewer failures' own specificities. As mentioned elsewhere in this Report, if this specific type of *critical event* induces on some kind of consequence to individuals, such consequence is certainly and solely negative. When it comes to rehab works, in spite of the inconveniences they may provoke, it is easier for individuals to attach something positive to it. Although not usually aware of its importance, individuals view public works, as for example the sewer rehabilitation, as something that will bring some kind of

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[86] Here, operationilised as individuals' housing or workplace surroundings.

[87] Such unquestioned expectations have, in our view, its origin sewer systems high technological standard of modern industrialised societies.

benefit to the community. This trait may be at the basis of this trend for a better ”intercourse” with rehab works inconveniences.

As known, one of this study hypothesis concerned with possibility of sewer failure experience to induce on more awareness towards the importance of rehabilitation investments. Amadora-Oeiras case study results indicate that not only failures may induce on more awareness, but also experience of sewer rehabilitation on individuals' neighbourhood.

Impacts of *critical events* experience on *trust*

This study reunites two distinct groups or situations. We refer, on the one hand, to the case of a non-negligible amount of Amadora-Oeiras interviewees, who manifested distrust on sewerage services performance. On the other hand, at Nantes sample the tendency is for global manifestation of *trust* on sewerage services technical capacity to manage sewerage.

As far as it was possible to infer, in Lisbon case study experience at the *access points*, following a *critical event*, had influence on *trust* erosion or distrust perpetuation. At Nantes, those events' experience didn't have particular effects at this level.

The nature of *critical events* may play a role at the level of *trust* impact. Nevertheless, this role seems to be certainly secondary, in face of the primary influence of sewerage utilities way of managing *critical events* and dealing with costumers at *access points*.

This is especially evident at Amadora-Oeiras case study. Here, perceived efficiency of sewerage services was justified with the judgement of works as having occurred without problems or with the fact that failures were solved. On the contrary, perceived inefficiency was justified with services incapability to solve the failure or, in case of rehab works, with the too long duration of them, re-appearance of sewer problems and, curiously, with the systematic trench re-opening.

In what concerns to Nantes, sewerage department user policy, stood on proximity and quality parameters, may have played an important role of absorbing impacts and avoiding *trust* erosion syndromes.

The above-mentioned trend has the merit of detaching the importance of a proper user policy, namely under situations of *critical events.* Sometimes, it seems that users are treated as if they were out of the system, when they are one of the most important components of it. Their claims can serve as an opportunity for service improvement. Their behaviour towards sewers can be (or not) preventive of failures. Finally, in face of the challenge of both old networks rehabilitation and wastewater re-use the role of citizens and costumers will be determinant. Given this, pro-active modality of sewerage management and failures should not exclude costumers, but include them as one among a set of “partners”.

Still concerning user policy in face of the so-called *critical events*, the study also revealed that some failures and related impacts might turn on a real challenge for sewerage utilities. This

became rather evident at Nantes case study, more specifically in face of situations of bad odours and noise. Sometimes, the cause of this type of "symptoms" isn't immediately evident for sewerage operational staff or implies a more structural lengthy type of solution. The potential effect of this on the user is his impatience in face of what he intends as a delay on problem-solving. In face of this, sewerage services must be able to activate attenuation measures, namely by negotiating a time scale with the costumer (within which the inconveniences to the user will end or structural work to solve the problem, will begin) and by taking the time to explain the cause of the problem to him. This implies a certain user policy, organisational capacity and the development of appropriate skills.

Public expectancies towards sewerage services performance

This is definitely an issue were Amadora-Oeiras and Nantes interviewees do meet. Most of them value and want a sewerage service to be efficient on problem solving, fast on ansewering to the costumer and easy to contact, in case of need. The remaining components appear as secondary. Nevertheless, at least in Amadora-Oeiras case study, we noted that some failure victims valued financial compensation and some rehab subjects stated the importance of assuring a satisfactory explanation to the client.

This last aspect is, at some extent, congruent with the position of Portuguese interviewees towards their "wishes" in case sewerage public works on their residential or work area. Apart from the importance they give to the short duration of works and car-pedestrian obstruction avoidance, a non-negligible amount of individuals emphasise the importance of good information to the public.

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ANNEXES

ANNEX 1

THEMES UNDERLYING INTERVIEWS TO PRIVILEGED INFORMERS

Privileged-informers	Main interviews themes
Wastewater management entity	Failure resolution routines; Pattern of relationship with costumers, namely in case of failure events and rehab works; Rehab works recently occurred on the area or under development; Failure vulnerable areas (hot spots).
City-municipality management entities	Evaluation of wastewater system of the area; Failure vulnerable areas (hot spots); Past and future sewer rehabilitation investment. Evaluation of its priority, by comparison with other city issues; Relation with wastewater entity and evaluation of its performance, namely in case of failure events and rehab works.

ANNEX 2

QUESTIONNAIRES

Questionnaire to sewer failures' victims

CARE	COMPUTER AIDED REHABILITATION NETWORKS

Good morning / good afternoon

We are presently doing a work about sanitation and quality of life. Through this work, we envisage to know what type of consequences sewer failures induce on individuals' daily life. On the other hand, we found it fundamental to know your opinion about the type of support sewerage services should provide individuals, under these circumstances.

So, do you mind taking a little bit of your time to answer to a set of questions? Your experience and opinion are, as you imagine, of great importance to us.

The interviewee is a:	
☐ resident	☐ professional
Street	
Date	

Enterviewer:	Enterview nº

0 Generic informations

0.1 Do you know who is responsible for sewerage on your area?

☐ no ☐ yes a) Which service or entity ?

0.2 In your opinion, what are the negative consequences of sewer networks malfunctioning ?

→ *[Open question]*

→ *[Pre-coding]*

☐ Consequences for the user and domestic daily life

☐ Consequences for recreative public space activities (ex. fishing, swimming, etc)

☐ Consequences for the environment (river and coastal areas pollution, etc)

☐ Don't know / no answer

0.3 What is your degree of trust on the ability of sewerage services to manage in an efficient way wastewater (drainage & water treatment)?

→ *[closed question]*

☐ None trust ☐ little trust ☐ trust ☐ total trust ☐ Don't know

0.4 Some people with which we talked along this work refered a few ideas about the issue of water & sewerage. I am going to read to you some of these ideas and ask you to say if you agree with them or not

→ *[closed question]*

a) Some people think that water is a resource presently at risk, being necessary to save it

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

b) Some people think that we should not spend many money on sewerage treatment, because nature is capable of eliminating everything by herself

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

c) Some people think that in places where water is abundant, it is not necessary to spend money on solutions to save as much water as possible

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

d) Some people think that we should invest on specific technologies for water re-use (ex. wastewater re-use for public space washing)

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

1 Sewer failure experience

1.1 Could you please tell me what type of problems, related with sewers, did you have or still have?

→ *[open question]*

→ *[Pre-coding]*

- ☐ Wastewater overtopping in basements / garage
- ☐ Wastewater overtopping inside house (i.e. through WC)
- ☐ Wastewater overtopping in your garden
- ☐ Wastewater overtopping in the street
- ☐ Housing/work place flooding
- ☐ Public space flooding
- ☐ Private sewer network malfunctions
- ☐ Rats and insects propagation
- ☐ Noise problems
- ☐ Nasty odors, due to sewer problem
- ☐ Other situation. Which one?

1.2 Along this work, we made a systematization of most common sewer problems. Now, we are interested on knowing which one are considered as the most serious by the population. I am going to refer the six more common problems and ask you to selected the three you consider as potentially more disturbing or annoying.

→ *[1=the most serious for the interviewee; 2=the second most serious; 3=the third more serious]*

- ☐ Bad odors in the streets, due to sewer problems
- ☐ Wastewater open drainage in streets, due to sewer problems
- ☐ Drainage of untreated wastewater in rivers / streams / ocean
- ☐ Wastewater overtopping inside your house, through WC or kitchen
- ☐ Rats and insects propagation, in public space
- ☐ Sewer network malfunctions, delaying wastewater drainage from your house

[Now, returning to the sewer problem you referred to have suffered]

1.3 Have you experienced this type of situation only once or more than once?

☐ Only once → *[go to P.1.5]* ☐ More than once

1.4 How many times have you lived such problems, in the last two years?

Around ☐ times

1.5 Do you know why this sewer problem occurred?

☐ No ☐ Yes. a) Why?

1.6 This sewer problem is presently solved?

☐ sim ☐ no. a) Why ? ☐ Don't know a) why ?

2 Perceived impacts of failures on quality of life

Now, we would like to know what type of consequences did the problem, you've just described, induced on your well-being as well as the one of those with whom you live.

2.1 As for example, as far as it concerns to your house [R] / work place [P], have you suffered from

Material damages to your house (R) / workplace (P) (i.e. damage to furniture, WC/kitchen or other)	☐ yes	☐ no	☐ Don't know
Temporary unfeasibility of kitchen / WC, due to sewer problem	☐ yes	☐ no	☐ Don't know
Discomfort feelings	☐ yes	☐ no	☐ Don't know
Temporary abandon of house (on the part of one or all members), because of unfeasibility of house for living	☐ yes	☐ no	☐ Don't know

2.1.1 **Globally, concerning your house (R) work place (P), you would say the consequences you felt were...**

☐ not serious ☐ Little serious ☐ serious ☐ very serious ☐ don't know

2.2 In what concerns to your health or psychological well-being, did you or other member of your family felt...

Irritability / stress / worry with the situation you experienced	☐ yes	☐ no	☐ Don't know
Appearance or worsening of a physical problem (disease or injury), due to the sewer problem	☐ yes	☐ no	☐ Don't know

2.2.1 **Globally, concerning your health would say the consequences you felt were**...

☐ not serious ☐ Little serious ☐ serious ☐ very serious ☐ don't know

2.3 Now thinking on your street or other streets/gardens/places near your house (R) or work place (P), did you or other members of your family felt...

Difficulty of using streets, gardens or other public spaces, due to the sewer problem you have experienced	☐ yes	☐ no	☐ Don't know
Loss of will on using your street, garden or other public spaces, due to sewer problems	☐ yes	☐ no	☐ Don't know

2.3.1 **Globally, you would say that consequences you've suffered in using public spaces near your housing were...**

☐ not serious ☐ Little serious ☐ serious ☐ very serious ☐ don't know

2 Perceived impacts of failures on quality of life (cont.)

2.4 Now, I would like you to think on your work and finances and tell me if, at this level, you…

residents

Had to miss/enter later in your work, due to the problem you experienced?

☐ No ☐ Don't know / don't remember

☐ yes. a) How many hours have you lost ?

Did you have extra-expenses?

(i.e. due to material damages)

☐ No ☐ Don't know

☐ yes. a) How much money have you spent?

professionals

Did you have to interrupt your activity four hours/days, due to sewer problems

☐ no ☐ Don't know

☐ yes. a) How much money have you lost?

Have you suffered from loss of clients?

☐ no ☐ Don't know

☐ yes. a) How much money have you spent?

Did you have extra-expenses?

(devido a danos materiais sofridos)

☐ no ☐ Don't know

☐ Sim. a) Aproximadamente, quanto dinheiro gastou ?

2.4.1 Concerning your finances and work area, do you think the consequences you've felt were...

☐ not serious ☐ Little serious ☐ serious ☐ very serious ☐ don't know

2.5. Did you suffered from other type of consequences? ☐ yes ☐ no ☐ Don't know

a) If yes, which ones?

3 Sewerage service experience and expectancies

3.1 To who did you asked for support or claimed, following your sewer problem?

→ *[go to Q.3.3]*

→ *[go to Q.3.2]*

- ☐ Sewerage services, to whom I pay the bill
- ☐ Other municipality services
- ☐ Local district
- ☐ Firemen/ police
- ☐ Private enterprise or entity
- ☐ No one, I tried to solve the problem by my self
- ☐ Other. Which one?

3.2 Why did you not claim or contact sewerage services, to whom you pay the bill?

→ *[go to Q.3.6]*

→ *[pre-coding]*

3.3 How did you ask for support or claimed?

→ *[open question]*

- ☐ Telephone
- ☐ Letter (by fax or mail)
- ☐ Personal visit to sewerage services
- ☐ Through a known fellow of the services
- ☐ Other. Which one?

3.4 Did you find easy to get on contact with sewerage services, make a claim and ask for their support ?

☐ Yes ☐ no ☐ Don't know / don't remember

3.5 Have you receive any type of financial compensation, due to the sewer problem you experienced?

☐ Yes ☐ no

a) Do you think it was fair ? why ?

b) Do you think you should have received? Why ?

3 Sewerage service experience and expectancies (cont.)

3.6 How do you assess the way sewerage services deal with this type of problems ? Do you think they are...

Inefficient	Almost inefficient	Efficient	Totally efficient	Don't know
1	2	3	4	8

a) Why ?

3.7 Imagine sewerage services of your area asked costumers to express their wills and expectations, in what concerns to support to clients, namely under sewer failures circumstances. I am going to refer six aspects of a clients' support service and ask you to choose the three you found more important.

→ *[1=the most serious for the interviewee; 2=the second most serious; 3=the third more serious]*

Easiness of contact with sewerage services, in case of need or for claiming	☐
Efficacy on solving the clients' problems	☐
Fastness on problem solving	☐
Sympathy and cordiality in the relation with the clients	☐
Explanation to the clients of what happened, why happened and how services will or solved the problem	☐
Monetary compensation to clients, due to public network related malfunctions	☐

→ *[The following question is only for the interviewees that asked for support or claimed to sewerage services]*
→ *[For the others interviewees please go to SECTION 4]*

3.8 Before this experience with sewerage services, did you have an opinion about the way they dealt with users with problems, such as yours?

☐ yes. a) in that case, your opinion about them...

- ☐ Changed for better
- ☐ Maintained positive as before
- ☐ Maintained negative as before
- ☐ Changed for worse
- ☐ Other situation. Which one ?

☐ No opinion

☐ no. b) in that case, your opinion about them...

- ☐ Became a positive one
- ☐ Became a negative one
- ☐ Let you indifferent, as before
- ☐ Other situation. Which one ?

4 Acceptability and awareness towards the importance of rehab works

4.1 Having into account the experience of sewer problem that you've just described to me, I would like you to assess the fact of these type of situations occurring in our days. Do you think that situations such as those you experienced are:

- ☐ Something that happens, whatever the type of sewer network and sewerage services *[normal type of events]*
- ☐ Unpleasant events, but that can happen and then "we must to try to cope with the effects " *[not so normal type events]*
- ☐ Events hardly tolerable that should not happen *[abnormal type of events]*
- ☐ Unacceptable events that cannot happen and should be definitely avoided *[totally abnormal type events]*

4.2 What investments should, in your opinion, be done in order to avoid sewer problems as the one you have suffered? Please, choose the two more important investments

[1= the most important; 2= the second most important]

More periodical surveillance of sewer network	☐
More periodical actions of cleanness and maintenance of sewers	☐
More investments on sewer networks renewal	☐
Don't know / don't have opinion	☐
Other investments. Which ones ?	☐

4.3 From time to time there is the need for the municipality to do sewer rehabilitation works, which imply dig or open holes in the street. Under these circumstances, what kind of care do you think sewerage utilities and enterprises should have with citizens, in order to prevent disturbances to their own life?

→ *[open question]*

→ *[pre-coding]*

- ☐ Short works' duration
- ☐ Adjustment of working hours/days to target-areas characteristics
- ☐ Good coordination between underground entities
- ☐ Use of low noise machinery
- ☐ Avoidance of pollutant machinery
- ☐ Avoidance of dust and dirtiness of public space
- ☐ Easiness of contact with works' responsible, in case of need
- ☐ Good information to the public
- ☐ Assurance of mobility conditions, for pedestrians and cars
- ☐ Financial compensation, in case of damages
- ☐ Don't know / don't have opinion

4.4 These type of works usually induce on some kind of disturbance for the population. On the other hand, they require big investments on the part of government. Having this into acount, how do you assess the importance of sewer renewal public works? Do you think they are...

- ☐ Not important, *("they should no be done / I don't see any need of that type of investments")*
- ☐ Little important, ("*they are investments that can be delayed in favor of others/ I don't envisage particular benefits with it*)
- ☐ Important *("They should be done in spite of the costs and disturbances for population/ I envisage benefits with it")*
- ☐ Very important *("they must be done, in spite of any type of costs / I see a lot of benefits with it")*

5 **Demographic information**

5.1 Gender ☐ male ☐ female

→ *[not a question]*

5.2 Age

☐ < 20 years ☐ 21-39 years ☐ 40-59 years ☐ 60-74 years ☐ more than 75 years

5.3 What is your school level

☐ Don't know to read or write
☐ Primary level (4 years of school)
☐ Secondary (12 years of school)
☐ Politecnic
☐ Gradutation (University level)

5.4 Presently, you are...

☐ Employed
☐ Unemployed
☐ Retired
☐ studant
☐ House keeper
☐ Other situation. Which one?

5.5 What is your proffession / main activity ?…

→ *[the last profession for retired / unemployed]* →*[companion profession for house keepers]*

5.6 Presently, at your work you are…

☐ Boss (=employer)
☐ Worker / employee
☐ Independent worker
☐ Other situation. Which one ?

→ *residents*

5.7 Type of dwelling ☐ Cottage ☐ Apartment: floor nº ☐ Other situation. Which?

5.8 You are... ☐ Owner of your house ☐ renter

→ shopkeepers

5.9 How many people work with you ?

☐ Workers

5.10 What is the area of activity of your business?

Thank you

Questionnaire to rehabilitation works' target-group

COMPUTER AIDED REHABILITATION NETWORKS

Good morning / good afternoon

We are presently doing a work around the theme of sanitation and social quality of life. Through this work we envisage to know the consequences to people of sewer public works, namely those which imply digging streets / open holes in the street. On the other hand, it is of particular interest for us to know what type of support or information citizens expect to have under these circumstances.

So, do you mind taking a little bit of your time to answer to a set of questions? Your experience and opinion are, as you imagine, of great importance to us.

The interviewee is:	
☐ resident	☐ professional
Street	
Date	
Interviewer	Interview nº

0 Generic informations

0.1 Do you know who is responsible for sewerage on your area?

☐ no ☐ yes a) Which service or entity ?

0.2 In your opinion, what are the negative consequences of sewer networks malfunctioning?

→ *[Open question]*

→ *[Pre-coding]*

☐ Consequences for the user and domestic daily life

☐ Consequences for recreative public space activities (ex. fishing, swimming, etc)

☐ Consequences for the environment (river and coastal areas pollution, etc)

☐ Don't know / no answer

0.3 What is your degree of trust on the ability of sewerage services to manage in an efficient way wastewater (drainage & water treatment)?

→ *[closed question]*

☐ No trust ☐ little trust ☐ trust ☐ total trust ☐ Don't know

0.4 Some people with which we talked along this work refered a few ideas about the issue of water & sewerage. I am going to read to you some of these ideas and ask you to say if you agree with them or not

→ *[closed question]*

a) Some people think that water is a resource presently at risk, being necessary to save it

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

b) Some people think that we should not spend many money on sewerage treatment, because nature is capable of eliminating everything by herself

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

c) Some people think that in places where water is abundant, it is not necessary to spend money on solutions to save as much water as possible

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

d) Some people think that we should invest on specific technologies for water re-use (ex. wastewater re-use for public space washing)

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

1 Sewer rehab experience

1.1 Did the rehab works, which occurred near your house [R] / work place [P], induce on some kind of disturbance to you or those with whom you live ? Could you please tell me what type of disturbances?

→ *[open question]*

→ *[Pre-coding]*

- ☐ No problem or disturbance
- ☐ Noise
- ☐ Dust in your house or work place
- ☐ Dust and dirtiness on the street
- ☐ Car circulation and parking problem
- ☐ Pedestrian mobility difficulties
- ☐ Odor problems
- ☐ Material damages
- ☐ Temporary unfeasibility of sewer network
- ☐ Don't know / don't remember
- ☐ Other. Which one ?

1.2 Along this work, we made a systematization of most common problems that disturb people living near public works, such as sewer renewal. Now, we are interested on knowing which the population considers as the most serious. I am going to refer the six more common problems and ask you to selected the three you consider as potentially more disturbing or annoying.

→ *[1=the most serious for the interviewee; 2=the second most serious; 3=the third more serious]*

- ☐ Noise due to machinery or other
- ☐ Dust and dirtiness on the street or garden, near your house (R) or work place (P)
- ☐ Dust or dirtiness on your house (R) or work place (P), due to public works
- ☐ Difficulties of pedestrian or car circulation
- ☐ Temporary unfeasibility of basic infra-structures, such as sewer or water networks
- ☐ Problems of car parking, near your house (R) / work place (P)

2 Perceived impacts of rehab works on quality of life

Now, we would like to know in more detail the type of consequences you have temporary felt, on your life, due to works.

2.1 As for example, as far as it concerns to your house [R] / work place [P], have you suffered from

Loss of comfort, due to for example noise, dust or bad odors problem	☐ yes	☐ no	☐ Don't know
Temporary difficulties of accessing to your house [R] / work place [P] or of circulating on your neighborhood	☐ yes	☐ no	☐ Don't know
Temporary unfeasibility of some of your house [R] / work place [P] infra-structures, such as WC/kitchen	☐ yes	☐ no	☐ Don't know

2.1.1 **Globally, concerning your house (R) work place (P), you would say the consequences you felt were...**

☐ not serious ☐ Little serious ☐ serious ☐ very serious ☐ don't know

2 Perceived impacts of failures on quality of life

2.2 In what concerns to your health or psychological well-being, did you or other member of your family felt...

Irritability/stress, due to problems such us noise, accessibility or other	☐ yes	☐ no	☐ Don't know
Problems of health, such as headaches or other similar symptom	☐ yes	☐ no	☐ Don't know

2.2.1 **Globally, concerning your health would say the consequences you felt were**...

☐ not serious ☐ Little serious ☐ serious ☐ very serious ☐ don't know

2.3 Now thinking on your street or other streets/gardens/places near your house (R) or work place (P), did you or other members of your family felt...

Difficulties of accessing to stores, services or other infra-structures near your house [R] work place [P]	☐ yes	☐ no	☐ Don't know
Temporary unfeasibility of proximity services or public spaces near your house [R] work place [P]	☐ yes	☐ no	☐ Don't know

2.3.1 **Globally, you would say that consequences you've suffered in using public spaces near your housing**

☐ not serious ☐ Little serious ☐ serious ☐ very serious ☐ don't know

2.4 Now, I would like you to think on your work and finances and tell me if, at this level, you…
residents

Had to miss/enter later in your work, due to the problem you experienced?

☐ No ☐ Don't know / don't remember
☐ yes. a) How many hours have you lost?

Did you have extra-expenses?

(i.e. due to some problem related with public works)

☐ No ☐ Don't know
☐ yes. a) How much money have you spent?

2 Perceived impacts of failures on quality of life (cont.)

professionals

Did you have to interrupt your activity four hours/days, due to sewer problems

☐ no ☐ Don't know

☐ yes. a) How much money have you lost?

Have you suffered from loss of clients?

☐ no ☐ Don't know

☐ yes. a) How much money have you spent?

Did you have extra-expenses?

(due to some problem related with public works)

☐ no ☐ Don't know

☐ Yes. a) How much money have you spent?

2.4.1 Concerning your finances and work area, do you think the consequences you've felt were...

☐ not serious ☐ Little serious ☐ Serious ☐ very serious ☐ don't know

2.5. Did you suffered from other type of consequences? ☐ yes ☐ no ☐ Don't know

a) If yes, which ones?

3 Sewerage service experience and expectancies

3.1 Have you received any type of information about works, before their beginning?

→ *[Pre-coding]*

☐ no ☐ yes a) how were you informed?

→ *open question*

- ☐ Public meeting
- ☐ Mail
- ☐ Municipal expositor
- ☐ Local journal
- ☐ Visit of a delegate
- ☐ Neighbors / friends / fellows
- ☐ Don't know / don't remember
- ☐ Other. Which one?

b) Did you feel information was enough?

- ☐ yes
- ☐ no
- ☐ no opinion

3.2 During works, have you claimed to works' responsible entity, due to any inconvenience caused by works?

→ *[Pre-coding]*

☐ no a) Why ?

→ *open question*

- ☐ Didn't have problems or reason to claim
- ☐ Did have problems, but they were a "necessary evil" to which we have to cope with
- ☐ Did have problems, but didn't claim because it was little probable to be taken into account
- ☐ Did have problems, but didn't know to whom to claim
- ☐ Did have problems, but didn't claim because other had already done
- ☐ Don't know / don't remember
- ☐ Other reason. Which one?

→ *If answer is «no », go to question 3.8 and then to section 4*

☐ yes a) why?

- ☐ Too long duration of works
- ☐ Duration of works longer than it was initially announced
- ☐ Disrespect by hours/days, during which works should occur
- ☐ Occurrence of other underground works, immediately before these ones occur
- ☐ Non-continuous occurrence of public works
- ☐ Noise
- ☐ Problems of accessibility (pedestrian and by car)
- ☐ Ask for an information
- ☐ Other reason. Which one?

3 Sewerage service experience and expectancies

3.3 To who did you asked for support or claimed, following your sewer problem?

→ *[go to Q.3.3]*

→ *[go to Q.3.2]*

- ☐ Sewerage services, to whom I pay the bill
- ☐ Other municipality services
- ☐ Local district
- ☐ Firemen/ police
- ☐ Private enterprise or entity
- ☐ No one, I tried to solve the problem by my self
- ☐ Other. Which one?

3.4 Why did you not claim or contact sewerage services, to whom you pay the bill?

→ *[go to Q.3.8]*

→ *[pre-coding]*

3.5 How did you ask for support or claimed?

→ *[open question]*

- ☐ Telephone
- ☐ Letter (by fax or mail)
- ☐ Personal visit to sewerage services
- ☐ Through a known fellow of the services
- ☐ Other. Which one?

3.6 Did you find easy to get on contact with sewerage services, make a claim and ask for their support ?

☐ Yes ☐ no ☐ Don't know / don't remember

3.7 Have you receive any type of financial compensation, due to works' inconveniences you've suffered?

☐ Yes ☐ no

a) Do you think it was fair? why ?

b) Do you think you should have received? Why ?

3 Sewerage service experience and expectancies (cont.)

3.8 How do you assess the way sewerage services manage this type of situations? Do you think they are...	Inefficient	Almost inefficient	Efficient	Totally efficient	Don't know
	1	2	3	4	8

a) Why ?

3.9 Imagine sewerage services of your area asked costumers to express their wills and expectations, in what concerns to support to clients, namely under sewer failures circumstances. I am going to refer six aspects of a clients' support service and ask you to choose the three you found more important.

→ *[1=the most serious for the interviewee; 2=the second most serious; 3=the third more serious]*

Easiness of contact with sewerage services, in case of need or for claiming	☐
Efficacy on solving the clients' problems	☐
Fastness on problem solving	☐
Sympathy and cordiality in the relation with the clients	☐
Explanation to the clients of what happened, why happened and how services will or solved the problem	☐
Monetary compensation to clients, due to public network related malfunctions	☐

→ *[The following question is only for the interviewees that asked for support or claimed to sewerage services]*
→ *[For the others interviewees please go to SECTION 4]*

3.10 Before works occurrence and this particular experience with sewerage services, did you have an opinion about the way they dealt with users with problems, such as yours?

☐ yes. a) in that case, your opinion about them...

- ☐ Changed for better
- ☐ Maintained positive as before
- ☐ Maintained negative as before
- ☐ Changed for worse
- ☐ Other situation. Which one ?

☐ No opinion

☐ no. b) in that case, your opinion about them...

- ☐ Became a positive one
- ☐ Became a negative one
- ☐ Let you indifferent, as before
- ☐ Other situation. Which one ?

☐ No opinion

4 Acceptability and awareness towards the importance of rehab works

4.1 These type of works usually induce on some kind of disturbance for the population. On the other hand, they require big investments on the part of government. Having this into account, how do you assess the importance of sewer renewal public works? Do you think they are...

- ☐ Not important, *("they should no be done / I don't see any need of that type of investments")*
- ☐ Little important, ("*they are investments that can be delayed in favor of others/ I don't envisage particular benefits with it*)
- ☐ Important *("They should be done in spite of the costs and disturbances for population/ I envisage benefits with it")*
- ☐ Very important *("they must be done, in spite of any type of costs / I see a lot of benefits with it")*

4.2 Having into account your experience of works, I would like you to assess the inconveniences they usually provoke, to whom lives or works nearby. Do you think that inconveniences such as those you have experienced are:

- ☐ Something that happens, whatever the type of sewer network and sewerage services *[normal type of events]*
- ☐ Unpleasant events, but that can happen and then "we must to try to cope with the effects " *[not so normal type events]*
- ☐ Events hardly tolerable that should not happen *[abnormal type of events]*
- ☐ Unacceptable events that cannot happen and should be definitely avoided *[totally abnormal type events]*

4.3 From time to time there is the need for the municipality to do sewer rehabilitation works, which imply dig or open holes in the street. Under these circumstances, what kind of care do you think sewerage utilities and enterprises should have with citizens, in order to prevent disturbances to their own life?

→ *[open question]*

→ *[pre-coding]*

- ☐ Short works' duration
- ☐ Adjustment of working hours/days to target-areas characteristics
- ☐ Good coordination between underground entities
- ☐ Use of low noise machinery
- ☐ Avoidance of pollutant machinery
- ☐ Avoidance of dust and dirtiness of public space
- ☐ Easiness of contact with works' responsible, in case of need
- ☐ Good information to the public
- ☐ Assurance of mobility conditions, for pedestrians and cars
- ☐ Financial compensation, in case of damages
- ☐ Don't know / don't have opinion

5 Past experience of sewer failures

5.1 Have you ever had a sewer problem, such as a failure, due to public network malfunctioning?

→ *[open question]*

→ *[Pre-coding]*

- ☐ Wastewater overtopping in basements / garage
- ☐ Wastewater overtopping inside house (i.e. through WC)
- ☐ Wastewater overtopping in your garden
- ☐ Wastewater overtopping in the street
- ☐ Housing/work place flooding
- ☐ Public space flooding
- ☐ Private sewer network malfunctions
- ☐ Rats and insects propagation
- ☐ Noise problems
- ☐ Nasty odors, due to sewer problem
- ☐ Other situation. Which one?

[Now, returning to the sewer problem you referred to have suffered]

5.2 Have you experienced this type of situation only once or more than once?

☐ Only once → *[go to P.5.4]* ☐ More than once

5.3 How many times have you lived such problems, in the last two years?

Around ☐ times

5.4 This sewer problem is presently solved?

☐ yes ☐ no. a) Why? ☐ Don't know a) why?

5.5 Where you satisfied with the way the sewer problem was solved or dealt with?

☐ yes ☐ no ☐ Don't know / don't remember

6 Demographic information

6.1 Gender ☐ male ☐ female

→ *[not a question]*

6.2 Age

☐ < 20 years ☐ 21-39 years ☐ 40-59 years ☐ 60-74 years ☐ more than 75 years

6.3 What is your school level

- ☐ Don't know to read or write
- ☐ Primary level (4 years of school)
- ☐ Secondary (12 years of school)
- ☐ Polytechnic
- ☐ Graduation (University level)

6 Demographic information

6.6 Presently, at your work you are…

☐ Boss (=employer)
☐ Worker / employee
☐ Independent worker
☐ Other situation. Which one ?

→ *residents*

6.7 Type of dwelling ☐ Cottage ☐ Apartment: floor nº ☐ Other situation. Which?

6.8 You are... ☐ Owner of your house ☐ renter

→ shopkeepers

6.9 How many people work with you ?

☐ Workers

6.10 What is the area of activity of your business?

Non-victims questionnaire

 COMPUTER AIDED REHABILITATION NETWORKS

Good morning / good afternoon

We are presently doing a work around the theme of sanitation and social quality of life. In this work, it is of particular interest to know the extent to which people is aware of the consequences for them of sewer malfunctions. On the other hand, we also want to know people' views about the importance of investing on sewer network renewal.

So, do you mind taking a little bit of your time to answer to a set of questions? Your experience and opinion are, as you imagine, of great importance to us.

The interviewee is: ☐ resident ☐ professional	
Street	
Date	
Interviewer:	Interview nº

0 Generic informations

0.1 Do you know who is responsible for sewerage on your area?

☐ no ☐ yes a) Which service or entity ?

0.2 In your opinion, what are the negative consequences of sewer networks malfunctioning ?

→ *[Open question]*

→ *[Pre-coding]*

☐ Consequences for the user and domestic daily life

☐ Consequences for recreative public space activities (ex. fishing, swimming, etc)

☐ Consequences for the environment (river and coastal areas pollution, etc)

☐ Don't know / no answer

0.3 What is your degree of trust on the ability of sewerage services to manage in an efficient way wastewater (drainage & water treatment)?

→ *[closed question]*

☐ No trust ☐ little trust ☐ trust ☐ total trust ☐ Don't know

0.4 Some people with which we talked along this work refered a few ideas about the issue of water & sewerage. I am going to read to you some of these ideas and ask you to say if you agree with them or not

→ *[closed question]*

a) Some people think that water is a resource presently at risk, being necessary to save it

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

b) Some people think that we should not spend many money on sewerage treatment, because nature is capable of eliminating everything by herself

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

c) Some people think that in places where water is abundant, it is not necessary to spend money on solutions to save as much water as possible

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

d) Some people think that we should invest on specific technologies for water re-use (ex. wastewater re-use for public space washing)

☐ totally disagree ☐ disagree ☐ agree ☐ Totally agree ☐ Don't know

1 Experiência com os Serviços e Expectativas

1.1 Did you ever had a problem related with sewerage, since you live here?

☐ no → ***[go to Q. 1.7 and then section 2]*** ☐ yes → ***[go to Q. 1.2]***

1.2 Could you please tell the type of problem you had ?

→ *[open question]*

☐ Problem related with a failure in public sewer network
☐ Problem related with sewerage works

} STOP: go to respective questionnaires

☐ Ask for connexion of private sewer network to public sewer network
☐ Problem with private sewer network
☐ Bill problem
☐ Problem related with tap water quality (taste, colour, etc.)
☐ Temporary interruption of water service
☐ Ask for information. Which?
☐ Other situation. Which?

1.3 To whom did you ask for support or claimed, in face of the problem you had?

→ *[open question]*

☐ nobody . **a**) Why ?

☐ Low possibility of being understood / of being attended by the services…
☐ Did not know how / to whom ask for support
☐ Don't remember
☐ Other reason. Which?

☐ Wastewater Company, to which I pay the bill
☐ Other Services of the municipality, that not Wastewater Company

} → ***[go to Q. 1.4]***

☐ Local district
☐ Police/firemen
☐ Private enterprise/entity
☐ Other situation. Which one?

} → ***[Go to Q. 1.3b]***

1.3 b) Why did you not contact/claim to Wastewater services, to whom you pay the bill?

→ ***[go to Q. 1.6]***

1 Experiência com os Serviços e Expectativas

→ *[pre-coding]*

1.4 How did you ask for support or claimed?

→ *[open question]*

- ☐ Telephone
- ☐ Letter (by fax or mail)
- ☐ Personal visit to sewerage services
- ☐ Through a known fellow of the services
- ☐ Other. Which one?

1.5 Did you find easy to get on contact with sewerage services, make a claim and ask for their support?

☐ Yes ☐ no ☐ Don't know / don't remember

1.6 How do you assess the way sewerage services manage this type of situations? Do you think they are...

Inefficient	Almost inefficient	Efficient	Totally efficient	Don't know
1	2	3	4	8

a) Why ?

1.7 Imagine sewerage services of your area asked costumers to express their wills and expectations, in what concerns to support to clients, namely under sewer failures circumstances. I am going to refer six aspects of a clients' support service and ask you to choose the three you found more important.

→ *[1=the most serious for the interviewee; 2=the second most serious; 3=the third more serious]*

Easiness of contact with sewerage services, in case of need or for claiming	☐
Efficacy on solving the clients' problems	☐
Fastness on problem solving	☐
Sympathy and cordiality in the relation with the clients	☐
Explanation to the clients of what happened, why happened and how services will or solved the problem	☐
Monetary compensation to clients, due to public network related malfunctions	☐

1 Experiência com os Serviços e Expectativas

→ [The following question is only for the interviewees that asked for support or claimed to sewerage services]
→ [For the others interviewees please go to SECTION 4]

1.8 Before works occurrence and this particular experience with sewerage services, did you have an opinion about the way they dealt with users with problems, such as yours?

☐ yes. a) in that case, your opinion about them...

- ☐ Changed for better
- ☐ Maintained positive as before
- ☐ Maintained negative as before
- ☐ Changed for worse
- ☐ Other situation. Which one ?

☐ No opinion

☐ no. b) in that case, your opinion about them...

- ☐ Became a positive one
- ☐ Became a negative one
- ☐ Let you indifferent, as before
- ☐ Other situation. Which one?

2 Perceived effects of sewer failures

2.1 Sometimes, public sewer network does not work as we desire or expect it. Sewer obstructions may occur or sewer collapses, especially in Winter when it rains a lot. Do you know which type of effects events like these ones do?

→ [open question]

☐ no ☐ yes. Which ?

- ☐ Housing flooding / inundations
- ☐ Wastewater open drainage in streets
- ☐ Non-treated wastewater open drainage in rivers/streams / ocean
- ☐ Bad odours on streets/houses
- ☐ Dirtiness and propagation of rats and insects in streets / rivers / streams
- ☐ Other effects. Which?

2.2 During this work, we did a survey concerning the most common sewer problems. Now, we want to know which of them are considered as most annoying / serious to the population. I am going to refer the six more common problems and ask you to choose the three that you feel as being more disturbing.

→ [1= the more disturbing for the interviewee; 2= the second more disturbing; 3= the third more disturbing]

- ☐ Bad smells in the street, due to sewer problems
- ☐ Wastewater open drainage in streets, due to sewer problems
- ☐ Drainage of untreated wastewater, in river/streams/ ocean
- ☐ Wastewater overtopping though kitchen or WC
- ☐ Propagation of rats and insects in the streets

2 Perceived effects of sewer failures (cont.)

2.3 Now, having in consideration the three problems that you have chosen, you would say that they are...

- ☐ Something that happens, independently from the type of sewer network and Service competence *[normal events]*
- ☐ Unpleasant events, but with which "we have to cope with..." *[events not so normal]*
- ☐ Something hardly supportable that should not happen *[abnormal events]*
- ☐ Something unacceptable that responsible Services should avoid at any cost *[totally abnormal events]*

3 Perceived effects of rehab works

3.1 Sometimes, solution for the problems I have just referred to you imply sewer renewal. This type of public works usually requires digging near houses / stores/ people workplaces. Do you see any negative consequence of such type of works for residents / workers, while they occur?

→ *[Open question]*

→ *[pre-coding]*

- ☐ no
- ☐ yes. Which?
  - ☐ Noise
  - ☐ Bad smells
  - ☐ Dust and dirtiness in the house / professional space
  - ☐ Dust and dirtiness in the street
  - ☐ Problem of car circulation / traffic jambs
  - ☐ Problem of circulation by foot
  - ☐ Sewer network or other infra-structures temporarily unfeasible
  - ☐ Other effects. Which one?
- ☐ Don't know

3.2 I am going to refer the six types of the most common consequences for inhabitants of works, asking you to choose the three consequences that you found it would be more disturbing for you.

→ *[1= the more disturbing for the interviewee; 2= the second more disturbing; 3= the third more disturbing]*

Noise due machinery, in day-periods when you are at home / when you are working	☐
Dust a dirtiness problems in the street/ garden near your house	☐
Dust in your house (R), / work place (P)	☐
Difficulty of car or pedestrian circulation	☐
Temporary interruption of basic infra-structures of your house / work place	☐
Difficulty of parking near your house/work place	☐

3 Efeitos percebidos de trabalhos de reabilitação

3.3 Now, having in consideration the three problems that you have chosen, you would say that they are...

- ☐ Something that happens, independently from the type of sewer network and Service competence *[normal events]*
- ☐ Unpleasant events, but with which "we have to cope with..." *[events not so normal]*
- ☐ Something hardly supportable that should not happen *[abnormal events]*
- ☐ Something unacceptable that responsible services should avoid at any cost *[totally abnormal events]*

3.4 Besides the disturbances that we just have talked about it, public sewer networks imply a great amount of investment, on the part of the Government. Taking this into account, how do evaluate the importance of investing on public sewer networks renewal. Do you think that...

- ☐ not important *("they should not be done / I don't see any need of that type of investments")*
- ☐ little important ("*they are investments that can be delayed in favor of others / I don't envisage particular benefits")*
- ☐ important *("They should be done in spite of the costs and disturbances for the population / I envisage benefits with it")*
- ☐ very important *("They must be done in spite of any type of costs / I see a lot of benefits with it")*

4.3 From time to time there is the need for the municipality to do sewer rehabilitation works, which imply dig or open holes in the street. Under these circumstances, what kind of care do you think sewerage utilities and enterprises should have with citizens, in order to prevent disturbances to their own life?

→ *[open question]*

→ *[pre-coding]*

- ☐ Short works' duration
- ☐ Adjustment of working hours/days to target-areas characteristics
- ☐ Good coordination between underground entities
- ☐ Use of low noise machinery
- ☐ Avoidance of pollutant machinery
- ☐ Avoidance of dust and dirtiness of public space
- ☐ Easiness of contact with works' responsible, in case of need
- ☐ Good information to the public
- ☐ Assurance of mobility conditions, for pedestrians and cars
- ☐ Financial compensation, in case of damages
- ☐ Don't know / don't have opinion

5 **Demographic information**

5.1 Gender ☐ male ☐ female

→ *[not a question]*

5.2 Age

☐ < 20 years ☐ 21-39 years ☐ 40-59 years ☐ 60-74 years ☐ more than 75 years

5.3 What is your school level

☐ Don't know to read or write
☐ Primary level (4 years of school)
☐ Secondary (12 years of school)
☐ Politecnic
☐ Gradutation (University level)

5.4 Presently, you are...

☐ Employed
☐ Unemployed
☐ Retired
☐ studant
☐ House keeper
☐ Other situation. Which one?

5.5 What is your proffession / main activity ?…

→ *[the last profession for retired / unemployed]* →*[companion profession for house keepers]*

5.6 Presently, at your work you are…

☐ Boss (=employer)
☐ Worker / employee
☐ Independent worker
☐ Other situation. Which one ?

→ *residents*

5.7 Type of dwelling ☐ Cottage ☐ Apartment: floor nº ☐ Other situation. Which?

5.8 You are... ☐ Owner of your house ☐ renter

→ shopkeepers

5.9 How many people work with you ?

☐ Workers

5.10 What is the area of activity of your business?

ANNEX 3

AMADORA-OEIRAS PROFILE SAMPLE

	TARGET GROUPS							
	failures		rehab works		non-victims		TOTAL	
MUNICIPALITIES	n	%	n	%	n	%	n	%
Oeiras	41	48,2	8	10	36	100	85	42,3
Amadora	44	51,8	72	90			116	57,7
TOTAL	85	100	80	100	36		201	
INDIVIDUALS								
residents	52	61,2	50	62,5	22	61,1	124	61,7
retailers	33	38,8	30	37,5	14	38,9	77	38,3
HOUSE TYPE								
flat	38	73,1	50	100	22	100	110	
house/bungalow	14	26,9					14	
RELATION WITH THE SPACE								
owner	22	25,9	41	51,3	14	38,9	77	
renter	28	32,9	8	10	6	16,7	42	
unknown	35	41,2	31	38,8	16	44,4	82	
GENDER								
female	46	54,1	40	50	18	50	104	51,7
male	39	45,9	40	50	18	50	97	48,3
AGE								
< 20 years	1	1,2	1	1,3			2	1,0
21-39 years	14	16,5	28	35	5	13,9	47	23,4
40-59 years	37	43,5	40	50	17	47,2	94	46,8
60-74 years	26	30,6	10	12,5	14	38,9	50	24,9
> 75 years	6	7,1	1	1,3			7	3,5
SCHOOL ATTENDANCE								
no read or write	12	14,1	2	2,6	2	5,6	16	8,0
1st-3rd grade	49	57,6	37	46,3	24	66,7	110	54,7
Secondary	12	14,1	24	30	7	19,4	43	21,4
Politecnic	6	7,1	2	2,5	1	2,8	9	4,5
Graduation	5	5,9	15	18,8	2	5,6	22	10,9
SOCIAL CLASS								
high	3	3,5					3	1,5
medium-high	6	7,1	19	23,8	3	8,3	28	13,9
medium-low	38	44,7	44	55	19	52,8	101	50,2
low	31	36,5	14	17,5	9	25	54	26,9
unknown	7	8,1	3	3,8	5	13,9	15	7,5

NANTES PROFILE SAMPLE

	TARGET GROUPS							
	Failures		Rehab works		Non-victims		total	
	n	%	n	%	n	%	n	%
TOTAL	**91**	100%	**79**	100%	**49**	100%	**219**	100%
INDIVIDUALS								
residents	52	57%	49	62%	30	61%	131	60%
retailers	39	43%	30	38%	19	39%	88	40%
HOUSE TYPE								
flat	15	29%	47	96%	9	30%	71	54%
house/bungalow	37	71%	2	4%	21	70%	60	46%
RELATION WITH								
THE SPACE owner	36	69%	20	41%	18	60%	74	56%
renter	14	27%	29	59%	12	40%	55	42%
unknown	2	4%	0	0%	0	0%	2	2%
GENDER								
female	46	51%	46	58%	36	73%	128	58%
male	45	49%	33	42%	13	27%	91	42%
AGE								
< 20 years	0	0%	2	3%	0	0%	2	1%
21-39 years	20	22%	36	46%	14	29%	70	32%
40-59 years	51	56%	29	37%	25	51%	105	48%
60-74 years	14	15%	11	14%	7	14%	32	15%
> 75 years	6	7%	1	1%	3	6%	10	5%
SCHOOL ATTENDANCE								
no read or write	0	0%	0	0%	1	2%	1	0%
secondary	37	41%	23	29%	18	37%	78	36%
bachelor	15	16%	16	20%	15	31%	46	21%
graduation (low)	25	27%	20	25%	8	16%	53	24%
graduation (high)	10	11%	20	25%	7	14%	37	17%
unknown	4	4%	0	0%	0	0%	4	2%

ANNEX 4

IMPACTS OF SEWER FAILURES AND REHAB WORKS

	FAILURES VICTIMS			
	Amadora-Oeiras		Nantes	
HOUSE	n	%	n	%
material damages into the house and/or its contents	40	47,1%	13	14,3%
temporary usefullness of house divisions or infra-structures	23	27,1%	28	30,8%
discomfort	76	89,4%	58	63,7%
temporary re-housing of part or all those living in	6	7,1%	13	14,3%
HEALTH & WELL-BEING				
irritability, stress and worry	78	91,8%	20	22,0%
appearance or worsening of physical problem (i.e. disease or fall)	10	11,8%	4	4,4%
NEIGHBOURHOOD SURROUNDINGS OR PUBLIC SPACE				
impossibility of public space infrastructures	56	65,9%	19	20,9%
unwillingness of public space use	55	64,7%	27	29,7%
FINANCES & WORK				
RESIDENTS				
loss of working hours or days	11	12,9%	7	7,7%
extra-expenses	28	32,9%	18	19,8%
RETAILERS				
activity temporary interruption	11	12,9%	4	4,4%
loss of clients	13	15,3%	12	13,2%
extra-expenses	12	14,1%	6	6,6%
	N = 85		N = 91	

	REHAB VICTIMS			
	Amadora-Oeiras		Nantes	
HOUSE	n	%	n	%
temporary usefullness of house divisions or infra-structures	8	10,0%	22	27,8%
discomfort	52	65,0%	48	60,8%
difficulties of accessibility to house or workplace	20	25,0%	35	44,3%
HEALTH & WELL-BEING				
irritability or stress	32	40,0%	27	34,2%
health problems (ie. Headache due to noise problems)	8	10,0%	13	16,5%
NEIGHBOURHOOD SURROUNDINGS OR PUBLIC SPACE				
difficulty of accessibility to commerce/services or other	40	50,0%	29	36,7%
temporary usefullness of public space (ie public garden, parking)	37	46,3%	26	32,9%
unwillingness of public space use			35	44,3%
FINANCES & WORK				
RESIDENTS				
loss of working hours or days	5	6,3%	4	5,1%
extra-expenses	3	3,8%	1	1,3%
RETAILERS				
activity temporary interruption	1	1,3%	4	5,1%
loss of clients	14	17,5%	13	16,5%
extra-expenses	1	1,3%	2	2,5%
	N = 79		N = 79	

ANNEX 5

MAN-WHITNEY *U* TEST FOR STATISTICAL EXPLORATION OF DIFFERENCES BETWEEN TWO TARGET-POPULATIONS

Methodological note

Man-Whitney *U* test is a non-parametric test designed to analyse the differences between two samples or populations. Similarly to other non-parametric tests, Man-Whitney is used when the researcher is dealing with qualitative variables, namely the ordinal type ones.

This procedure is founded on the comparison of number of times a score from one of the samples is ranked higher than a score from the other sample. If the two populations are similar, then the number of times this happens should also be similar for the two populations.

The output proposed by this procedure is shown on the tables bellow. More or so important as Man-Whitney U statistic, is the mean rank of the ratings for each group, which indicates the extent to which they are different or not. Another value also particularly important is the significance level *p*. Similarly to other statistical procedures, when *p* is greater than 0.05 null hypotheses is accepted, meaning that the two populations are equal (Bryman and Cramer, 1997; Pestana and Gageiro, 2000).

As can be seen through the tables bellow, impacts are differently felt and perceived by victims of failures and rehab works interviewees. With exception of neighbourhood surroundings area of quality of life, impacts on house space, health status and finances & work were felt as more disturbing (or significant) by victims of failures than rehab subjects.

TABLE 1. *Man-Whitney U* for inter-group differences analysis between target-group and perceived disturbance towards house/workplace area of quality of life

	Target-group	**N**	Mean rank
House/workplace perceived disturbance	Rehab subjects	80	66,09
	Failure victims	85	98,91
			House/workplace perceived disturbance
Mann-Whitney U			2047,500
Wilcoxon W			5287,500
Z			-4,729
Asymp. significance			,000

TABLE 2. *Man-Whitney U* for inter-group differences analysis between target-group and perceived disturbance towards health & personal well-being

	Target-group	**N**	Mean rank
Health & well-being perceived disturbance	Rehab subjects	80	61,59
	Failure victims	85	103,15
			Health & well-being perceived disturbance
Mann-Whitney U			1687,000
Wilcoxon W			4927,000
Z			-6,498
Asymp. significance			,000

TABLE 3. *Man-Whitney U* for inter-group differences analysis between target-group and perceived disturbance towards surroundings area of quality of life

	Target-group	**N**	Mean rank
Surroundings perceived disturbance	Rehab subjects	80	78,90
	Failure victims	85	86,86
			Surroundings perceived disturbance
Mann-Whitney U			3072,000
Wilcoxon W			6321,000
Z			-1,112
Asymp. significance			,266

TABLE 4. *Man-Whitney U* for inter-group differences analysis between target-group and perceived disturbance towards house/workplace area of quality of life

	Target-group	**N**	Mean rank
Finances & work perceived disturbance	Rehab subjects	80	66,59
	Failure victims	85	98,45
			Finances & work perceived disturbance
Mann-Whitney U			2087,000
Wilcoxon W			5327,000
Z			-4,672
Asymp. significance			,000

ANNEX 6

POTENTIAL IMPACTS OF FAILURES AND REHAB WORKS, PERCEIVED AS MOST DISTURBING BY NANTES INTERVIEWEES

WORKS		Failures	
Victims	Non victims	Victims	Non victims
Noise	Temporary interruption of basic infra-structures	Bad odours	Bad odours
Cited in 1 by 44%	Cited in 1 by 37%	Cited in 1 by 50%	Cited in 1 by 41%
Circulation by car or by foot	Circulation by car or by foot	Wastewater in house/ professional space	Wastewater in house/ or professional space
Cited in 1 or 2 by 53%	*Cited in 1 or 2 by 49%*	*Cited in 1 or 2 by 36%*	*Cited in 1 or 2 by 51%*
Interruption of basic infra-structures/ Street dust / Parking	Noise	Wastewater open drainage	Rats
Cited in 1 or 2 by 23%	*Cited in 1 or 2 by 44%*	*Cited in 1 or 2 by 35%*	*Cited in 1 or 2 by 33%*

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