# The Challenges of PR04 (for the Sewerage Undertaker)

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## *Introduction*

In 2004 the Office of Water Services (OFWAT) will set price limits for the period 2005-6 to 2009-10. Their aim will be to set these price limits at a level which will enable water companies to deliver the levels of service required of them in an efficient and sustainable way. The approach adopted is likely to be based on an evolution of the approach adopted for the 1994 and 1999 reviews, informed by recent industry work on serviceability indicators and the development of a common framework for capital maintenance planning.

The review will allow for capital maintenance; security of supply issues; Government requirements to improve environmental and drinking water quality and customer service issues, not least the need to reduce the numbers of customers at risk of sewer flooding.

This paper reviews some of the main issues of the PR04 process for sewerage assets and examines the challenges facing the key stakeholders over the next five and beyond.

### *The Challenges*

There are a number of important issues will test the abilities of water and sewerage providers (WSPs) to respond to pressures to improve quality whilst reducing costs and raising standards of service to customers:

- Complying with European Directives (e.g. the Bathing Waters, Shellfish, Habitats and Water Framework Directives);
- Delivering the UCSO programme;
- Reducing infiltration into sewers;
- Satisfying the Government's wish to introduce more competition into the industry;
- Accommodating changes in customer demand;
- Reducing the incidence of flooding from sewers;
- Exploiting the useful life of all the assets whilst, at the same time, upgrading them to meet higher quality standards and making full use of new technology;
- Optimising operational and capital maintenance expenditures to provide economically justifiable levels of Capital Maintenance;

This paper will focus on two of these issues which are currently seen as "hot topics" and which strongly relate to the others:

- Reducing the incidence of flooding from sewers;
- Justifying Capital Maintenance.

The discussion will focus on the challenges facing the key stakeholders and review some of the tools and techniques available for capital maintenance planning.

## Avoidance of Flooding

Recent high profile cases have highlighted to WSPs, customers and the regulators the fact that flooding from blocked or overloaded sewers is “one of the worst service failures that water and sewerage customers can face. Headlines in “The Times” tell the story of 3000 homes inundated with sewage last year with a “further 26,000 on the at risk registers of flooding from drains”.

Despite the severity of the impacts of such flooding and the publicity it draws, relatively few customers (2-3 out of every 10,000) will be affected each year. WSPs have a duty under Section 94 of the Water Industry Act 1991 to provide, extend and improve the public sewer system to ensure that their areas are, and continue to be effectually drained.

Only incidents of internal flooding are reported in detail to OFWAT and these are apportioned between;

- Properties flooded because of overloaded sewers.
- Properties flooding from other causes, typically blockages, collapses or equipment failures.

Properties which are at risk of internal flooding, either once or twice in ten years are reported annually. The addition to or removal of properties from these registers are reported to OFWAT and act as an indicator of the effectiveness of water companies. Data on the incidence of flooding external to buildings is not routinely collected.

The risk of flooding caused by overloaded sewers or due to transient problems such as blockages has decreased over the last 10 years although there is concern, not least from Watervoice, the OFWAT customer service watchdog, that improvements are not taking place quickly enough and some customers face repeat flooding. This downward trend is summarised in Figure 1 below.

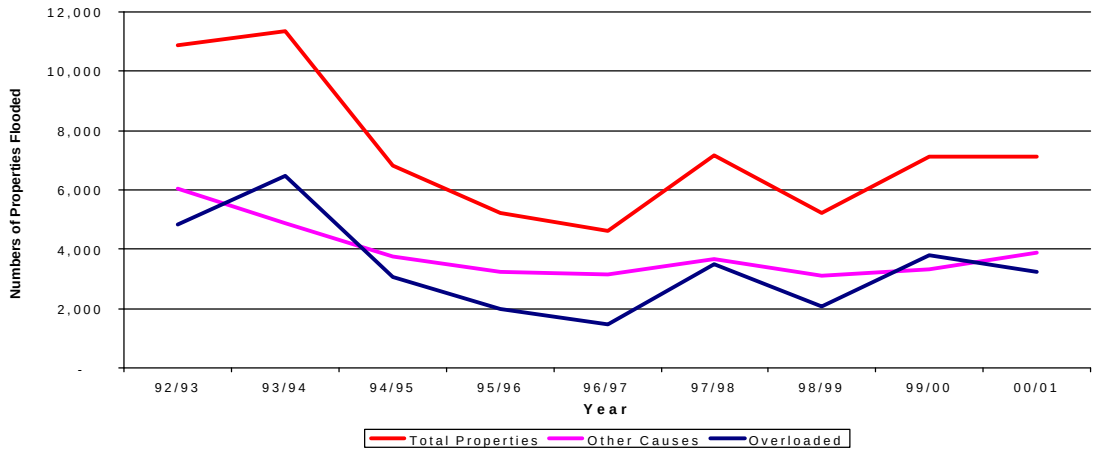



**Figure 1 Summary of UK Sewer Flooding**

Until recently companies legal responsibility to customers experiencing loss and damage due to sewer flooding was limited. OFWAT however introduced the amended Guarantee Standard Scheme in 1992 whereby internal flooding would trigger a compensation payment equivalent to one year’s sewerage changes, except where flooding was caused by exceptional weather. In 2000 this scheme was amended to deal with repeat flooding and the previous compensation limit of £1000 in any year was changed to apply to each incident.

The increase in the awareness of the severity of sewage flooding was highlighted by the recent Marcic case which saw the courts rule that a sewerage undertaker can be liable for nuisance (without being negligent) and for breach of human rights where it has failed to adequately rectify repeated external sewage flooding.

Undoubtedly some of the flooding faced by customers is due to overflowing watercourses rather than sewers but the problem the WSPs face is that the customer does not necessarily distinguish between the two. Consequently there is at least a perceived failure to provide adequate levels of service. This was especially true of the exceptionally wet winter of 2000-1.

It is difficult to make a robust estimate of the severity and scale of the problem, mainly due to the need to factor in the effects of climatic variability (or indeed longer term climate change) on flooding trends and the variation in the extent and quality of the data held by the WSPs. There are difficulties in assessing the levels of risk between the different companies due to variance in the companies reporting structure, the accuracy of their information and also improvements due to new data over time. However, if long term climate change is a factor and winters like that of 2000-2001 become more typical, then the implications of this on basic sewerage design assumptions and the economics of inflow and infiltration reduction need to be quantified.

OFWAT customer service committees have campaigned for the consideration of external flooding also. They recognise the priority of internal flooding but recognise that in some instances, extensive external flooding could have a higher priority. The challenge here is the selection and agreement of criteria which would classify external flooding as being of equal or higher priority.

According to OFWAT companies must prioritise projects to effectively manage their investment programmes to deal with flooding. The challenge here is to agree ways of prioritising which are acceptable to the customers and regulator. Due to the way OFWAT monitors performance, WSPs will have a higher incentive to maximise the numbers of houses removed from the register and therefore may focus on the projects with low unit costs rather than those which are most frequent or severe.

**The challenge is thus three-fold:**

To develop ways of prioritising which are acceptable both to customers and the regulator (maximising cost-benefits);

to identify the most cost-effective ways of resolving the problems (maximising cost-effectiveness) and

to find new operational regimes which will help to reduce flooding other causes

In addressing these issues, WSPs are working with Watervoice to agree prioritisation schemes which ensure customers' priorities are properly reflected in their sewer flooding prevention programmes. Some companies have already made progress in this direction and some have made significant changes in the way they communicate with their customers to ensure that, once flooded, customers are kept adequately informed of the situation.

According to a recent OFWAT study examining the causes of sewer flooding and the costs of possible solutions;

- Costs are higher when the solution involves increasing the size of the network rather than managing flows differently
- Cots tend to rise with increasing sewer size

- Economies of scale are seen for solutions which increase capacity but not for other solution types
- There are considerable variations in unit costs

The pilot study for this work enabled an example cost benefit matrix to be assembled for a range of solutions.

Though more work is needed in this area, the study provided information on the most common methods of resolving problems of sewer flooding and gave Ofwat 'first cut' estimates of the costs of such schemes. Further development would help WSPs to gain a better understanding of what influences the cost of sewer flooding schemes, enabling them to present more robust cost estimates to Ofwat.

## *Capital Maintenance Spend - Regulatory Drivers*

Capital maintenance spend is a provision for Utilities to invest in the infrastructure and non-infrastructure assets so as to preserve services that would otherwise decline because of ageing and deterioration of the asset base. Continuity of services, avoidance of flooding and pollution and treatment of wastewater are some of the specific service areas to be considered under the capital maintenance review process.

Capital maintenance needs for wastewater assets are reviewed every 5 years. This is part of the periodic review undertaken when Utilities submit their asset management plans (AMP) to OFWAT in order to identify strategic investment needs for the coming period.

To date, the future levels of capital maintenance spend have been informed by assessments of a combination of trends in serviceability indicators, asset condition, and the historic levels of both capital and operational maintenance. This approach was criticised by the Competition Commission in 2000 and Environmental Audit Committee in 2001 for not recognising the potential of a deteriorating asset base.

OFWAT's response was twofold, firstly, the development of new serviceability indicators for JR02 and secondly, co-sponsorship of the UKWIR common framework (CF) for Capital Maintenance Planning (CMP).

OFWAT are taking a long-term view to the development of a more robust basis for CMP. The review and development of new indicators was aimed at introducing parameters that could be monitored and which would show trends indicative of the suitability of associated capital investment.

The involvement in the CF was partly to show a willingness to participate in development of a generally accepted approach, but also demonstrated a desire to encourage Utilities to adopt a risk aware basis for investment planning, informed by knowledge of the true costs and benefits of risk mitigation (maintenance and management) options.

## *Capital Maintenance Spend - Asset Drivers*

### *Deterioration and the impact on investment*

Companies have complained that OFWAT have been unfair, not recognising that assets have been deteriorating over the last 5-10 year period and not providing sufficient investment. OFWAT retorted that headline serviceability indicators have, if anything, tended to improve and that the Utilities AMPs were weak, not linking asset

condition to serviceability and not identifying rehabilitation and maintenance options that will meet serviceability targets at least cost.

Undoubtedly, asset ageing will eventually impact adversely on serviceability, but equally true is the fact that many Utilities have not been able to put together convincing business plans, lacking crucial data and information on asset stock, performance and failure rates, cost impacts and the costs and benefits of rehabilitation and maintenance options.

The net result of the arguments and counter arguments has been firstly a new willingness by the Utilities to implement risk-based planning and secondly a clearer definition by OFWAT of what they expect.

Of course, to use a popular expression, ***the devil is in the detail!***

## Changing Profile of Asset Stock

As well as the natural impact of physical deterioration of assets, there have been changes in the profile of the more granulated and complex assets such as wastewater treatment works.

Ageing assets and building peaks, as well as a switch to higher maintenance, short-life assets means that more investment may be needed for the future period.

To explain this, and in simple terms, a Utilities' wastewater treatment works can be considered like a fleet of cars. Each works has different components with a different life e.g. wipers, tyres, engine, bodywork. These can be classed as very short, short, medium and long life components. Each can be broken into sub-components and each has an associated 'service and inspection' regime. In the case of cars, there is plenty of data on optimum service intervals, repair and replacement intervals and it is fairly easy to build a statistical model for assessing the lifetime and running costs of the fleet of cars. Furthermore, when a part is replaced, or upgraded, we know with reasonable certainty, what the cost and benefits will be. Using this building block approach, we can calculate average life and costs for each 'car' and model with reasonable precision the impact of increasing the fleet size, or extending the average age, or 'driving' the cars faster and longer.

In theory, this approach can be used for modelling maintenance needs for treatment works. In practice, it is found that no two works are the same; they are operated differently and the databases with appropriate operational maintenance data (repair rates and costs) are not available. Consequently, at the present time, it is extremely difficult to build a robust statistical model for assessing future operational and capital maintenance needs. The problem is compounded by the recent additions of new types of process, quite different to those used historically, which are likely to incur greater maintenance costs and for which there is no feeling for asset life.

## Private Sewers

The government is currently considering the position regarding private drains and sewers and is undertaking a study to investigate the problem. UKWIR also commissioned WRc to investigate the extent of the problems and the likely costs. A consultation document is expected next year which could signal a transfer of private sewers and possibly some drains to the water companies in England and Wales. A Water Bill, which could include necessary legislation, is expected to be in the Queen's Speech. At a meeting in the House of Commons on 4th November, the new Minister responsible for the Water Industry, Elliot Morley, was pressed strongly by MP's from all parties to include transfer private sewers in the Water Bill. However present anticipated timescale of the consultation document would make this difficult and OfWAT's view is that this is an issue for PR09. However the timescales would

not need to change greatly for this issue to be included as a late addition to the Bill during its course.

If private sewers/drains are to be transferred the big challenges will be:

- Location, survey and mapping of the new assets;
- Gearing up to the increased workload – roughly speaking the proposals represent a doubling of length of sewers that the undertaker will be responsible for;
- Working out a proper costing mechanism (for financial regulation purposes) for the additional workload;
- Dealing with a high public expectation – things will not get fixed overnight, it could take a number of years to correct the problems.

In Water Magazine Brian Duckworth (MD of Severn Trent Water) suggested that water companies should take the high ground and press for this issue, as well as flooding issues, to be included in AMP4. WSC could adopt most private sewers without new legislation.

Whatever the route Elliot Morley stated that if the costs are to be included in AMP4, then they will need to be included in the draft business plans which are due to be submitted in August 2003. A late change of policy would not leave much time for WSCs to do the necessary work. This could be the greatest challenge of all!

**Rising to the Challenge - Water Company Responses to the Problem of Asset Deterioration**

WSPs have committed significant resources to the development of bottom-up approaches which required extensive data collection and analysis, which they feel have been ignored by Ofwat. The problem is that the WSPs have failed to demonstrate the relevance of the many elements of their analyses to the objectives and information requirements of OFWAT's top-down approach i.e. forecasting trends in serviceability indicators and demonstrating the cost-benefits of capital maintenance where there is a quantifiable need to invest in the assets. The result was a lack of agreement between the parties and a significant impact on expected capital maintenance allowances.

In response, Water Utilities are now actively undertaking route cause analysis in order to link asset condition and performance to the recognised serviceability parameters. It has been found that some assets are not well served by existing indicators and a number of alternative measures of CM needs are being investigated.

The following table summarises the key serviceability indicators for wastewater assets and summarises the key issues:

## Table 1 – Assessments of serviceability indicators - Summary

| | Asset | Key influences | Typical failure frequency | Data availability | Forecast Potential (tools) | General issues |
|---|---|---|---|---|---|---|
| **Sewer collapses** | Gravity sewers and rising mains | Ground types, age, installation quality, structural and hydraulic overloading, design faults, chemical attack. | Trunk sewers – low<br>Drains and rising mains – medium/high<br>High in clusters | Substantial amounts of inspection data available. | Sewers - Difficult.<br>Rising mains – good. | Sewers and rising mains have totally different failure rates and considering them together renders the indicator meaningless. |
| **Pollution incidents at CSOs and sewers** | CSOs<br>Sewerage | CSO & sewer deterioration, structural and hydraulic overloading, weather. | High in clusters | Substantial amounts of inspection and performance data available. | - | Developing tools for prediction is unlikely to be worthwhile. |
| **Properties flooded by sewers (DG5)** | Sewerage | blockages, weather, asset deterioration | High in discrete clusters –<br>Generally low | Comprehensive set of data available. | Good forecasts possible. | Good forecasts possible. This indicator needs to be developed further |
| **% STWs failing numeric consents – number & %** | STWs | Operations, loads needing treatment, enhancement programmes, effluent monitoring regimes, poisoning biological processes | Low | Good | Poor | Low number of failures |
| **STWs performance trends** | STWs | As above. | NA | Good | 1 year ahead | Useful for showing where to investigate incipient problems |
| **Sewage pumping stations – mean time between failures** | Pumping station | New indicator – no data | New indicator – no data | New indicator – no data | New indicator – no data | Once data has been collected it will be possible to appraise its potential. |

A number of problems exist in trending and analysing these high level serviceability indicators:

- Over aggregation of data masks specific trends and 'hot spots'
- Many external influences (e.g. quality program, operational activity, climate) makes it extremely difficult to isolate CM specific trend, because robust data for all these contributory factors is often missing
- Statistical models rely on data and a failure history for the assets being modelled
- Many assets are 'managed' to avoid failure (failure data is needed for reliability analysis)
- The industry has limited cost-benefit data for assessing the impact of rehabilitation and maintenance strategy
- Most of the industries tools are designed for prioritising investment, not assessing budget limits

However, these issues have now been recognised, and step by step Utilities are moving to address these issues. Indeed, UKWIR research programmes are now focussed on identifying tools and methodologies that complement the CF and on development of failure databases for pipelines and wastewater treatment works, so that reliability models can be be developed.

Yet another key element of the WSPs task will be to develop a more robust economic approach to capital maintenance planning. The economic model must 'set out an economic analysis of the options available for maintaining serviceability to customers' and enable 'each company to demonstrate how the flow of services to customers can be maintained at least cost in terms of both capital maintenance and operating expenditure'.

Least cost planning methodologies are already in widespread use by the industry and will provide an important contribution to this element of the framework. However, the economic approach needs to acknowledge the boundaries of regulatory KPIs and those used specifically as part of the business planning process.

## *Approaches to Capital Maintenance Planning*

In developing approaches to capital maintenance planning, consideration must be given to the need to satisfy OFWAT's four areas of concern in assessing capital maintenance proposals:

- Serviceability to customers;
- Performance forecasting;
- Company efficiency and competition;
- Effect of the quality programme.

To satisfy these concerns the approach will need to address a number of key issues:

- Knowledge of the assets;
- Deterioration and performance at asset level;
- Criticality of individual assets and systems;
- Drivers of serviceability other than capital maintenance;
- Performance and serviceability at system level;
- Levels of Service requirements;
- Maintenance policies.

Asset level performance and deterioration is discussed in more detail below as it is arguably the issue of greatest concern at the present time.

### Deterioration and performance at asset level

The next issue in understanding the assets is to model the deterioration and performance of principal assets. Sewerage assets may deteriorate steadily or in a non-linear manner and, since most assets can perform perfectly well even when in poor condition, the relationship between condition and performance is not straightforward. Similarly, an asset may be in good condition but performing poorly due to changes in requirements.

The key is to understand the characteristics of the principal asset types and identify the modes of deterioration. Deterioration models can then be developed and thresholds established beyond which poor condition constitutes an increasing threat to performance. Some assets will be below the threshold even when in good condition. Performance

indicators at this level may be considered as “transition indicators”, since they reflect local performance rather than the downstream serviceability monitored by OFWAT’s DG measures.

Different approaches will be appropriate for infrastructure and non-infrastructure assets and for long, medium and short life assets, depending on the mode of deterioration and data availability, so each category must be considered separately.

For example, with sewerage infrastructure assets, knowledge of the current condition of assets and the rate of deterioration is key to the understanding of the capital maintenance requirements for sewers. CCTV surveys have mostly been targeted at critical sewers and yet failures in non-critical sewers often have a more direct impact on serviceability to customers. There are important differences between these two groups of sewers. It is necessary to establish the overall condition of non-critical sewers without incurring major expense in extensive CCTV inspections. Stratified sampling techniques making maximum use of use of existing CCTV information, based on an understanding of the factors affecting sewer condition can be used to understand the condition of these assets.

Deterioration is known to be slow similar techniques can be used to minimise the extent of resurveys to determine the rate of deterioration.

## *The PR04 Toolbox*

In the context of capital maintenance, WSPs require tools and approaches for undertaking a range of activities:

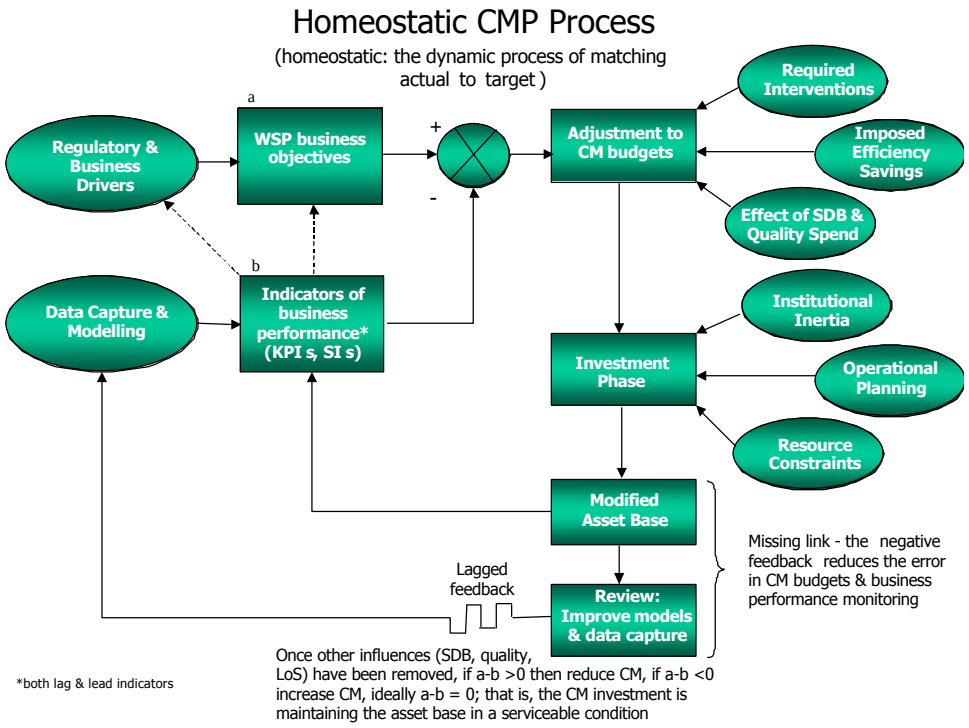
1. Help set strategic goals and priorities through a systematic evaluation of all relevant issues;
2. Mapping the relationship between asset performance and levels of service;
3. Set priorities for monitoring, operation and maintenance activities;
4. Identify budget requirements and evaluate potential changes in CAPEX requirements through assessment of likely asset performance and levels of service (assessing the impact of assets on future levels of service and the impact of various CM strategies on asset performance);
5. Target spend effectively;
6. Summarise assets for the purposes or reporting (that is, in terms of likelihood of failure and criticality, as well as condition and performance,).

Risk and serviceability approaches provide a comprehensive toolbox for supporting these activities. Serviceability scorecards (integrating appropriate lead indicators) provide an efficient means of data aggregation and inform both historical and forward-looking analysis. Risk assessment is used to provide a consistent framework for forward-looking analysis, and to feed consideration of rare but damaging events into decision-making.

Available tools include FMECA software for treatment works, reliability and statistical models, asset condition/life models, cost benefit analysis tools and performance indicator forecasting tools.

The most effective way to undertake these activities and to integrate the use of powerful analysis tools is to view the CMP process as an evolving procedure, as illustrated in Figure 2 below:




An essential, and often missing link is the feedback loop that lets the manager see the impact of changing levels of spend and the data capture system that lets him model the variety of influencing factors such as the environment, operation practice and other types of capital maintenance spend.

There are three key stages to determination of capital maintenance needs:

### Historical Analysis

Ideally it would be possible to determine if CM spend on assets was impacting headline measures of service. If headline SIs are improving or stable, there is no evidence of insufficient historical spend on all asset groups contributing to the headline SI across the WSP (although re-targeting of spend may be required to address local problems). If, however, there is a decline in the headline SIs, then there is evidence of insufficient CM. It will then be necessary to determine what asset groups are contributing significantly to this downward trend.

### Targeting the Forward Looking Analysis

The Common Framework notes that for many WSPs it will not be feasible in the short term to undertake a complete forward-looking analysis for all asset categories and/or service areas. A detailed forward-looking analysis need only be applied to those asset groups and service areas where there is likely to be a significant capital maintenance issue.

### Forward Looking Analysis

Once the WSP has identified service areas and asset categories where CM requirements could vary from previous submissions and where forward looking analysis is justified, the following steps must be followed:

- Identify the key failure modes of assets involved in the delivery of the service, using a systematic Hazard Identification procedure;
- Estimate the probability of failure (using appropriate deterioration profiles);

- Estimate the consequence of failure (in terms of asset function);
- Aggregate information for all assets that contribute to a given service area;
- Determine impact on service levels and compare to baseline levels of service with no additional investment;
- Compare to acceptability criteria;
- Identify CM and operational interventions;
- Evaluate interventions in terms of risk reduction and other benefits.

The challenge is to address these issues in an integrated, efficient way. This is discussed below within the context of a recently started European Union Fifth Framework project examining an integrated approach to sewerage investment planning.

## *European Perspective for Sewer Capital Investment - CARE-S*

*Whilst hydraulic models can be used to asses, quantify and forecast the impact of sewer deterioration on serviceability parameters such as flooding risk the challenge is to assess the rate of change of condition for the sewer system. This necessitates a knowledge of the deterioration processes, likely rates and impact of different environmental conditions.*

It may be difficult to separate poor performance of the sewer due to increased loads (population growth and storm events) from the more subtle effects that are likely to be caused by worsening physical condition of the sewer itself. Understanding these types of interactions will be a significant element of the EU funded, CARE-S project.

CARE-S is a new project, funded under the last call of the EU 5$^{th}$ Framework. This project deals with public sewer and storm water networks. It will address integrated problem solving for problems caused by ageing, structural failures, inflow/infiltration, exfiltration (leaking) and insufficient capacity which can cause floods, pollution of receiving waters, pollution of ground water and soil, treatment plant impacts and increasing maintenance costs.

The ultimate project goal is to develop a suite of tools, which provides the most cost-efficient system of maintenance, repair and rehabilitation of sewer networks, with the aim to guarantee security of sanitary sewage collection and storm water drainage in order to meet social, health, economic and environmental requirements. This will be done within the context of integrated catchment management and the strategic objective of ensuring security of water resources.

It includes the forecasting of both the deterioration processes and the effects of rehabilitation decisions for various time horizons.

The main elements of the project are:

**1.) Performance Indicators:** this will cover the selection and validation of appropriate parameters to define the state of the system and its future level of service e.g. flooding, collapse rate, repair costs, rehabilitation costs and social costs.

**2.) Description and validation of structural condition:** models for the classification and assessment of the sewer condition will be analysed and tested with data provided by end-users. These models will allow a forecast of the year in which a sewer will enter a critical class of condition, thus determining the next inspection date or rehabilitation measure.

**3.) Hydraulic performance:** this is the most important parameter for the analysis of the level service of the wastewater collection system**.** The main is to produce a model

for hydraulic performance with temporal decline including the effect of this on the network interaction with the environment.

**4) Rehabilitation technology information system:** this will present appropriate measures to tackle various wastewater network problems, including the technical selection and cost benefit analysis for rehabilitation and maintenance alternatives.

**5.) Socio-economic costs and impacts:** This activity will provide the rehabilitation manager with a battery of indicators directed to gauge the weight of wastewater system malfunction.

**6.) Multi-criterion decision support:** a decision support tool will be developed to support the right choice of rehabilitation technology at the scheme level as well as for input into annual and medium term rehabilitation planning.

**7.) Prototype of the wastewater network rehabilitation manager:** then the final product of the CARE-S project will be developed as a suite of tools that include conclusive software and methods from the identified elements of the study. This manager will include all constraints and conditions that are relevant for decision on sewer and storm water system rehabilitation.

The Sewer Network Rehab manager (simulator prototype) will be tested for 14 real cases. The pro-active approach, as suggested by the system, will be valued against re-active approaches. The test cases will reflect different European conditions, including geographical location, size and wastewater management organisation.

**The end-users of this product will be owners of wastewater systems, operating companies, financial institutions and national regulators**. Each has their individual information requirements. The owners or shareholders of the assets are interested in maintaining the value of infrastructure and set the standards in a contract with the operator. The operating company needs information on investment needs to maintain the assets with respect to the standard defined in the contract. The financial institutions and potential investors need information on the magnitude and economic viability of rehabilitation investments, and the regulator for decision-making and advising on water prices. Project partners in the UK include Severn Trent Water.

### Conclusions

- There are a number of challenges facing the key stakeholders regarding successful planning for the next periodic review (PR04).
- These range from legislative to asset specific but central to all of them is the need to deliver acceptable levels of service to customers
- Specifically for the provision of sewerage services there are a number of interrelated drivers which impact on levels of service.
- Sewer flooding is currently a high profile issue with severe impact on customers
- The key challenges for alleviating sewer flooding are to develop ways of prioritising problems which are acceptable to the customer, the water company and the regulator and to identify the most cost effective ways of flood alleviation.
- Setting appropriate levels of capital maintenance is crucial for ensuring continuity and sustainability of services.
- A key element of this is the approach outlined in the common framework, which makes the link between asset condition, performance and serviceability.
- The key challenge to WSPs is the identification and effective use of practical tools to ensure the effective implementation of the common framework approach.