

► SMP

- ENVIRONMENTAL IMPACT

Plastic sewer pipes in operational service have proved themselves time and again. But how do they compare with traditional pipe materials? What are the environmental impacts of sewer defects and leakage? In 2005, the Sustainable Municipal Pipes Project (SMP) compared thousands of CCTV footage of damaged sewer pipes. It was the first independent study of its kind and its conclusions were very interesting.

Leaking Sewers are a problem that effects the whole of Europe with consequences that can have a significant impact on the environment. The main risks are those associated with infiltration of ground water into the sewer and exfiltration of effluent from the sewer. In 1999, TEPPFA together with PlasticsEurope commissioned Professor Stein & Partners to look at what was going on here. To ensure absolute objectivity in all interpretations and conclusions drawn from the data, an

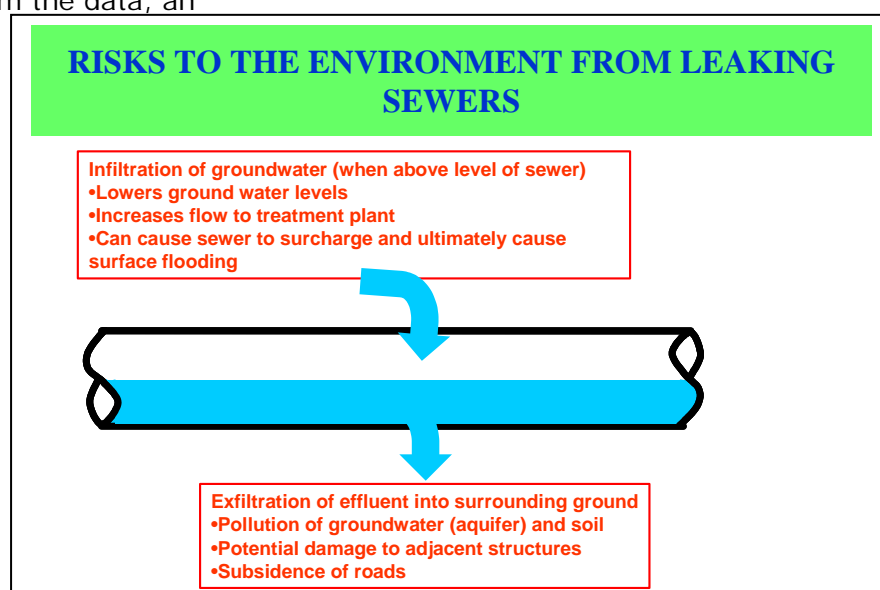
Independent Consulting Board was established, chaired by Professor Stein. This comprised an international panel of experts in the field of sewer and drainage systems from the **UK** (Water Research Centre), **Sweden** (Chalmers University) and **Netherlands** (KIWA)"

The eventual study involved the examination of 1,800 km of existing public sewers. Core samples were taken from routine surveys in Germany and comparative studies in the Netherlands and Sweden. The average age of the pipes inspected was 11.5 years for rigid and 6.8 years for flexible.

Defect analysis

All visual defects were recorded using the European Standard visual inspection coding system for drains and sewers (EN 13508-2). Furthermore, the data was combined into two grouped categories comprising:

- Rigid Pipes (clay and concrete)
- Flexible Pipes (PVC, PP, PE)



Statistical analysis techniques were then used to determine the likely environmental consequences of observed defects. The table below outlines the extent of the data examined.

General statements

From the analysis of CCTV video footage, and associated sewer pipeline condition reports, the following general statements could then be made:

- For both rigid and flexible pipes, many defects can be attributed to defective installation, due to poor techniques or workmanship, and/or lack of supervision
- Flexible pipes are significantly less likely to have defects than rigid pipes
- A high proportion of the defects observed in rigid pipes are those likely to cause infiltration and exfiltration



Primary results

These statements when published clearly favoured plastic pipes as opposed to traditional pipe materials. But there was more...

The authors of the report noted that the environmental impact of the average section caused by infiltration or exfiltration for flexible pipe systems is **15% (less than one-sixth)** of that for rigid pipe systems.

Project description

• Inspected Length

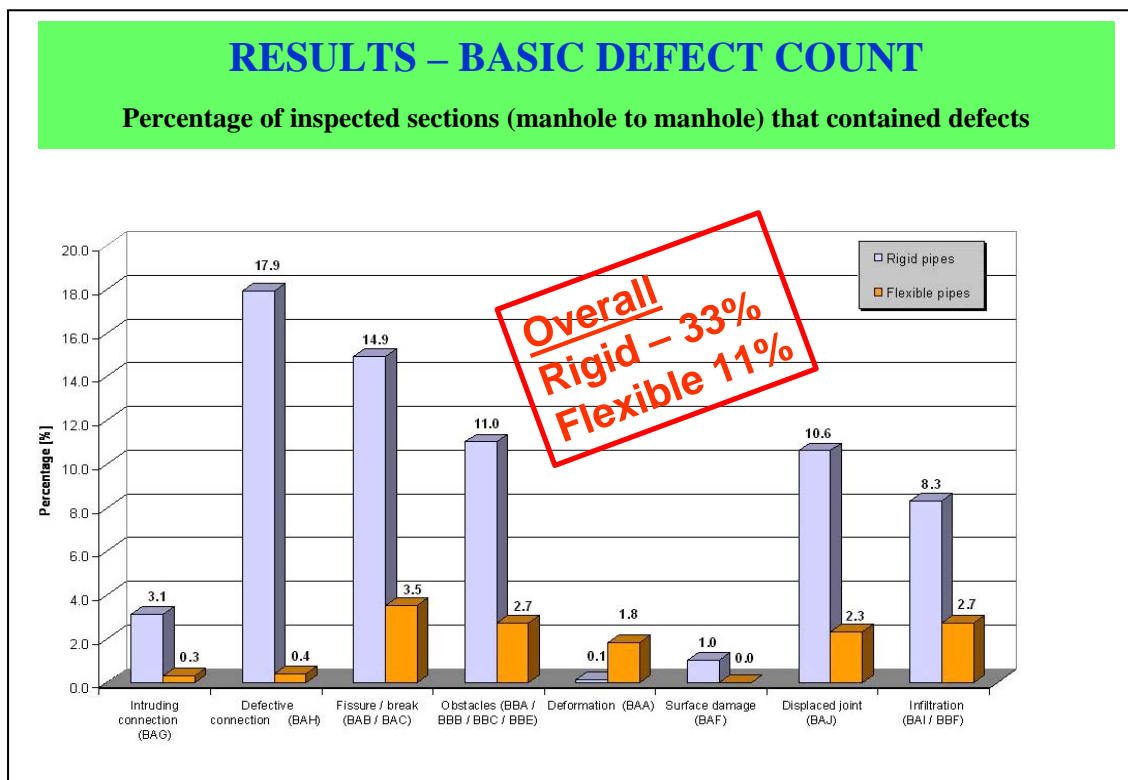
	Inspected length [km]	Sewer sections
Germany		
Rigid	1641	49250
Flexible	91	2750
Netherlands		
Rigid	30	600
Flexible	16	320
Sweden		
Rigid	3	90
Flexible	9	270

Furthermore, especially in scenarios with sensitive ancillary conditions, flexible pipes show a better environmental performance than rigid systems.

Considering the number of defects in reference to the installed length of all sewers of the particular material groups analysed in this study, flexible pipes have, on average, just **20% (one fifth)** of the defect rates of rigid pipe systems.

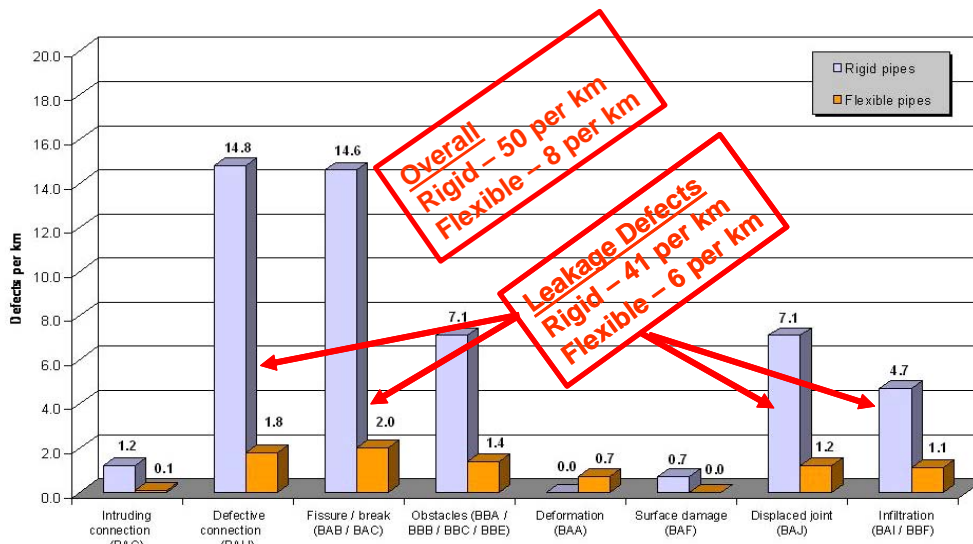
And even when considering defective sections with defect types that are the main causes of infiltration and exfiltration (*), defect rates of flexible pipe systems are, on average, 25% (one quarter) of the defect rates of rigid systems.

(*) such as fissures (BAB), break/collapse (BAC) or defective connection (BAH)



RESULTS – BASIC DEFECT COUNT

Frequency of defects within the total inspected length of pipelines (defects per kilometre)



The study highlighted the fact that environmental impact cannot be based on the defect count alone. Local conditions and other variables had to be taken into consideration.

The interacting variables identified by the technical consultants and the independent consulting body were:

- Defect type and position on the pipe circumference
- Leakage potential
- Soil permeability
- Ground water level
- Sewage level within the pipe

The variables could then be grouped to form a typical scenario for a particular combination of conditions

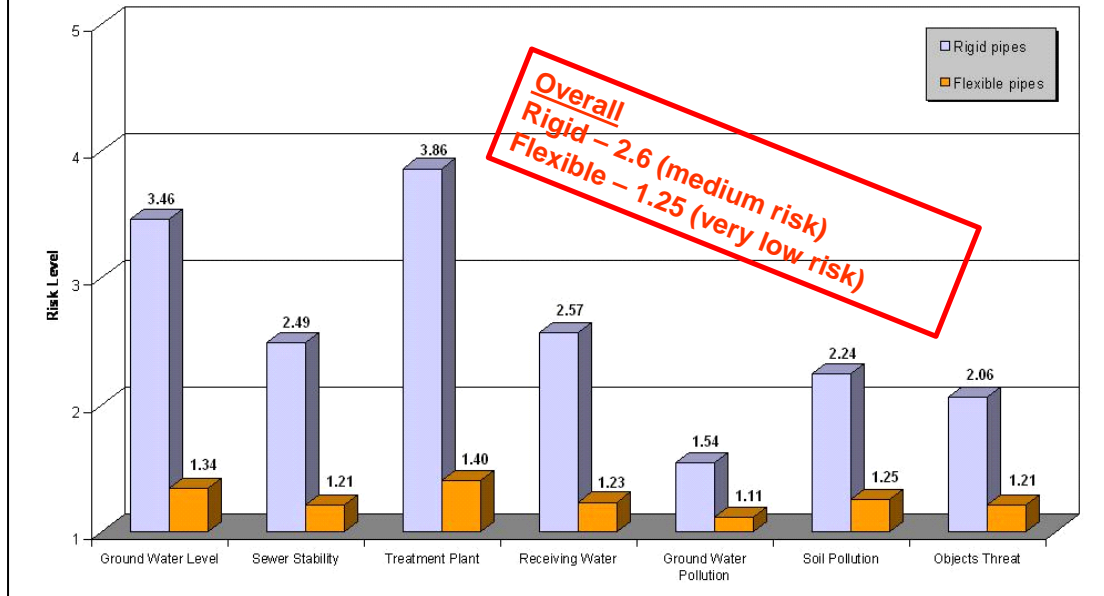
It was clear that local conditions surrounding the pipelines are a major influence on the level of environmental impact whatever the type of pipe material. Operators of sewer networks see infiltration as more critical due to the impact on the cost and quality of treatment.

A comparison on a scale of severity was therefore made between the environmental risks associated with different pipe materials:

- 1 = Very low risk
- 3 = Medium risk
- 5 = High risk

Figures could therefore be compiled from statistical modelling of defect frequencies and the expert's views on the likely impact to the environment. In terms of performance, flexible plastic pipes only represent a very low risk and are clearly the more sustainable option.

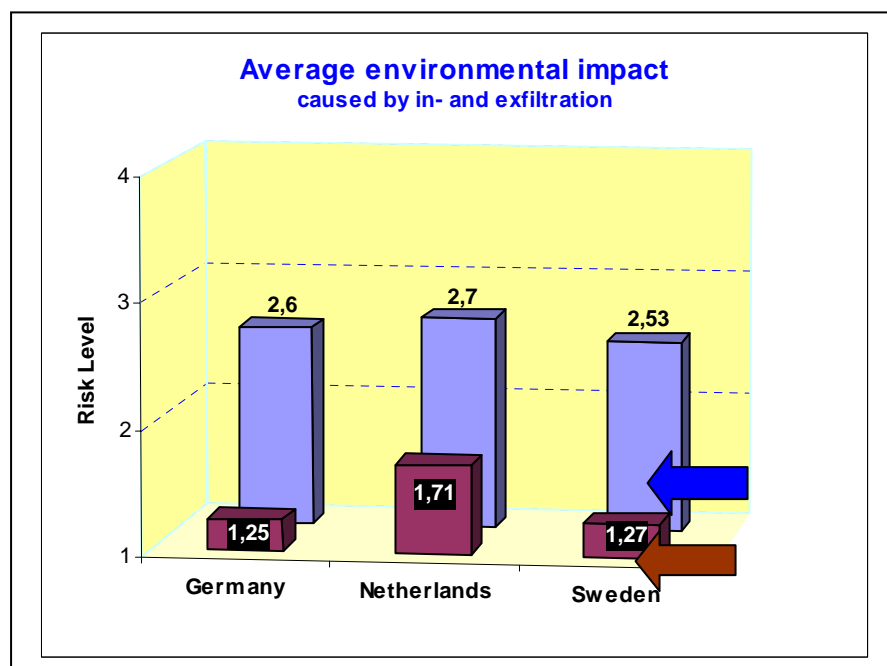
RESULTS – ENVIRONMENTAL IMPACT



From a country point of view, the situation is more or less similar.

Various key conclusions (see next page) were made in the final report from Stein & Partners. Tony Calton who is also involved with this project on behalf of TEPFPA explains:

“Whereas flexible pipes perform better than rigid pipes, good installation practises are a key factor for good performance of sewer pipelines. Installation of flexible pipeline systems significantly reduces risk to the environment so it offers better sustainability and good long-service.”



The detailed results of the study are of high interest for the local municipalities; they can now rank the sewer defects in their system with regard to environment. But will they?

Tony Calton is considerably upbeat: "In the UK, as in many other European countries, the reduction of diffuse pollution is now seen by government as being high on the environmental agenda. This is further endorsed by one of the prime objectives of the Water Framework Directive to improve water quality of river basins. The environmental impact of leaking sewers has been identified by government advisors as being one area requiring further investigation. The SMP project is now providing UK government departments with relevant data on this issue."

The full report and an executive summary have been published on the TEPPFA website and several other associated media. Various technical conferences have also examined and discussed its implications.

Future plans involve an interactive program for engineers that will be web-based and/or available as CDROM.

KEY CONCLUSIONS

- In service, flexible pipes perform better than rigid pipes
- Buried pipelines need flexibility
- Fittings for flexible pipeline systems have tighter dimensional tolerances and therefore ensure more reliable connections
- Installation of flexible pipeline systems significantly reduces risk to the environment
- When choosing which type – rigid or flexible – latter offers better sustainability, flexible sewer pipelines are the sound, long-service option