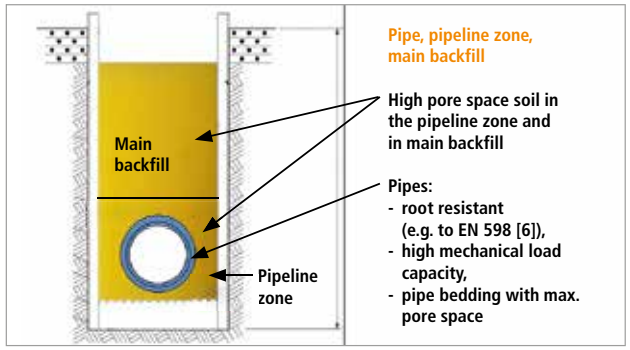
Robust and root-resistant ductile iron pipe system

Highly compacted soils with low pore space characterise the city subsoil at many places. Areas in the underground which are pore rich and better aerated are accessible to **tree roots**. As a consequence: There are unintentional interactions with sewers and pipelines and root **penetration with conflicts** between those involved locally.



The effects of climate change, however, make everyone aware of the increasing **importance of urban greenery**. The so-called roadside greenery has not just an optical function. Shading and evaporation improve the **inner city environmental conditions** through a reduction of the danger of heat islands. Solutions to improve growth conditions of city trees must be found in underground space. The **creation of root spaces** in pipe trenches can only be successful if root-resistant pipe systems are used that at the same time allow the use of pore space-rich backfill materials for rainwater storage in the pipe trench. **Ductile iron pipe systems with cement mortar coatings offer these degrees of freedom!**

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Stormwater management with ductile iron pipes

Drainage and climate concepts · Storage of stormwater
Sponge city principle for stormwater management
Soil-pipe system as a solution

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Stormwater management with ductile iron pipes

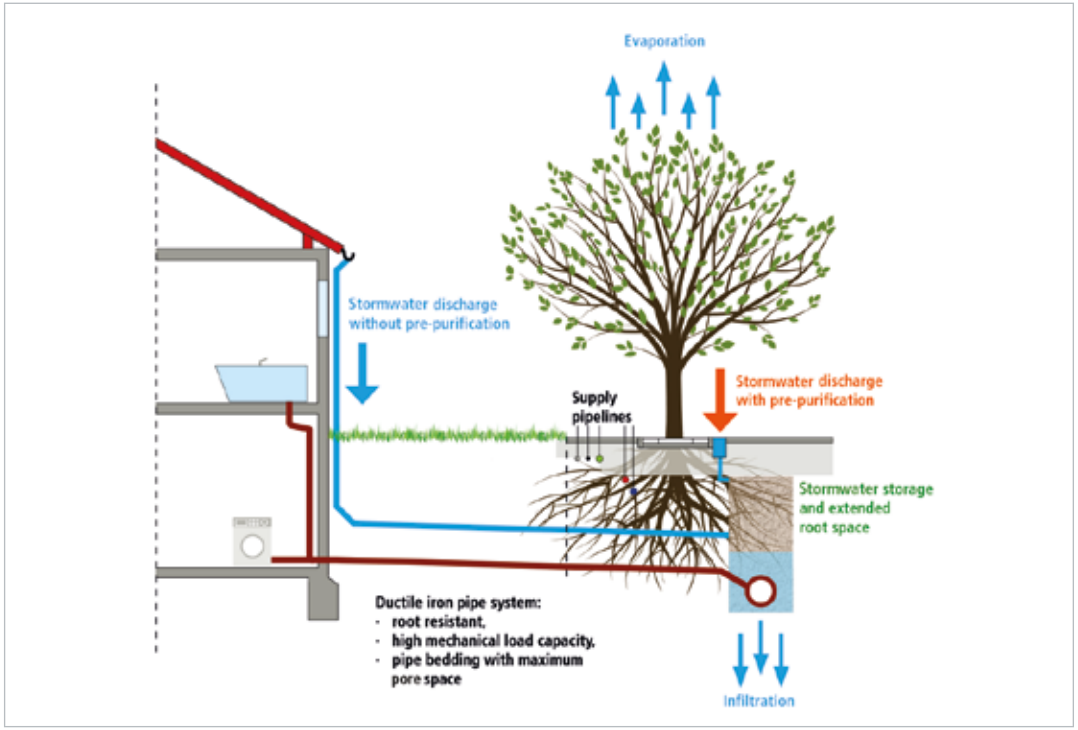
The consequences of **climate change** affect life in cities in different ways. Drainage systems cannot always cope with the **volumes of stormwater occurring during torrential storms**. Flooding and cellars awash with water are already a consequence. During the hot spells of summer, surfaces with a high density of buildings and no vegetation do not cool down. **Heat islands** are produced, resulting in health problems and increased mortality. This means that the city of the future will call for adjusted **drainage and climate control concepts**.

What is the sponge city principle?

An alternative use of the urban subsoil, described by the **term sponge city**, offers potential for **reducing** both of these **effects of climate change**. By adopting this sponge city principle, the subsoil of our cities becomes a space for storing stormwater and green spaces become the city's natural "refrigerators". The promotion of the sponge city principle and the development of sustainable storage and irrigation systems are central **tasks for the future for climate-adapted cities**.

What does the water industry say?

The water industry, too, has recognised the benefits of water evaporation for cooling cities as a new part of its remit. This means that conventional drainage systems which drain away the water completely no longer meet the objective of **modern stormwater management**. The "de-coupling" of surfaces conducive to run-off from the existing sewer system looks like an effective approach for decreasing hydraulic loads on the water management system and improving flood protection. The **de-coupling potential** of public roads ranges between 22 % on link roads and 53 % on residential streets.



Sponge city principle: storage volumes produced by coarse-grained material

However, the following questions are posed:

- Where can the stormwater be stored in case of heavy downfalls?
- How can the stormwater be used by the vegetation?

The use of robust ductile iron pipes increases the amount of freedom in backfill material

Answers to these questions provide a different way of looking at the properties of pipeline trenches. Until now, the term pipe-soil system has stood for an optimal bedding for the pipe system used and for the bearing capacity of the compacted soil incorporated. **Pore spaces** in the backfill materials used, **storage capacity for rainwater** or the possibility of spaces being used for **root growth** remain unconsidered for the most part. In addition, in order to protect the pipes, coarse-grained backfill materials are excluded as a rule.

However, in the light of implementing the sponge city principle, these soil properties have a major significance. If robust and root-resistant ductile iron pipes with cement mortar coatings are used as the transport pipes, there are **degrees of freedom in the choice of backfill materials** in the pipe trenches. In keeping with the idea of "from pipe-soil to soil-pipe system", by using coarse-grained, high pore-space but nevertheless highly compactable backfill materials the **sponge city principle** will be implemented in the street space.

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