Think global, act local

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Water is neither inexhaustible nor invulnerable. But the intensity with which it is used today tends to ignore these facts, as we increasingly exploit and pollute this gift of nature that is so essential for life. If we do not want to have to dig for our own water in future, we must think co-operatively, decentralize, and establish autonomous systems for water use at a local level.

There is no other natural resource on which mankind makes such heavy and complex demands as it does on water. Although it is not renewable in part, we neglect it far more than other resources – just remember how oil exploitation was co-ordinated internationally. In contrast with this, we treat water as though it were inexhaustible. Philosophy, science and technology have contributed to this mistaken assessment.

On the whole, people prefer and have always preferred to establish towns near water. It can then be exploited directly, it is a transport medium that promotes trade, and it contributes to the well-being of the inhabitants. Water in a town fulfils cultural, architectural and social functions. The urban hydrologist Murray McPherson was emphatically pushing for planning of the water economy to meet social and ecological requirements as early as 1970.

Water was comprehensively studied and managed even in ancient cites like Miletus. This requires creativity that can combine art and design, social perceptions, insights into handling water and technical innovation. It was probably this universal appeal that inspired so many scholars to occupy themselves with water. Thales of Miletus (624–545 BC) reflected on the water cycle, Plato (427–347 BC) later philosophized about it and Palissy (1510–1590) provided scientific justifications. Annually recurring precipitation or springs and rivers that never dry up give people the feeling that water is limit-lessly available – which is often reflected today in senseless use of water in precisely those cities where there is a drought. In recent times, despite all the insights and knowledge about it, water has become a utility whose origins we do not think about, that we simply use and throw away.

Towns have always been the heaviest water users. If local supplies were not sufficient, water was brought from near and far – according to the technology available. Thus the resource was exploited beyond the extent to which it could be renewed, and the natural water cycle was permanently damaged. The devastating effects of urban growth and user behaviour were simply not seen at first. Increasingly more efficient technologies opened up new supplies like deep groundwater, for example, that could not be regenerated. Large dams on rivers in arid areas, often the life-arteries for many different peoples, may show the life-giving attributes of water, but they can also be a threat to peace. Low water charges, well below its market value, have also led to errors of judgement about the availability of water. Thus users remain unaware of the price they are really paying for water, and this leads to careless handling of the resource. For example, in an Indian community in which there was a major drought, water was brought in at great expense and distributed free of charge. This meant that users were not able to recognize the true value of water and left the taps running night and day even when no water was being used. This was justified by pointing out that the water did not cost anything.

There has been a failure to take precautions when dealing with water in the past. Problems arising from excessive consumption were often not recognized in time. And then when the problems were recognized they did not all generate appropriate pressure leading to political action, not all the solutions that were determined politically led to decisions that could be implemented, and those decisions did not all lead to concrete measures. Such measures were frequently consequence-driven, local case-by-case decisions that were made in response to damage, but not to causes. Here the 'enemy approach' was generally taken: excess or dirty water had to be removed from towns as quickly as possible. Measures were designed to meet a purpose, and not integrated into comprehensive planning appropriate to the complexity of the water cycle. Thus the groundwater level was inevitably lowered in many urban areas, flooding increased, and natural plant and animal habitats were destroyed.

The larger cities become, the more they seem to use water regardless of the consequences. For example, Peking is a city with millions of inhabitants. The groundwater level is going down annually by over 2 metres, but water is used for air conditioning plants, cleaning cars and street cleaning, huge sprinkler systems are installed for green areas and rainwater is removed from the city in large channels. A Mediterranean tourist uses a thousand litres of water a day, even though it is a particular scarce commodity in the region in the summer months. Water is wasted all over the world, in countries with rapidly growing cities that are in the early stages of industrialization, in industrialized countries growing at a moderate rate, in regions that have little water and regions that have a lot of water. At the same time there are already a billion people who do not have adequate supplies of drinking water, two billion people have no sanitary facilities and four billion people produce contaminated water that is not subsequently purified to a sufficient extent. Additionally, thoughtless introduction of harmful chemicals and bacteriologically polluted sewage into the ground and water often makes the water

unusable unless it is expensively purified. Far too little attention is paid to the hidden chemical time bombs that are lying in wait in the ground and in sediments. These harmful materials could be reactivated by changed land use or climatic changes.

Thus present-day development of cities is often at the expense of future generations, and the gravest errors of urban history are repeated: the environment is massively damaged to achieve short-term economic advantage and growth, and the profit drawn from this helps to make good the grossest of the environmental damage. Many developing countries are starting to make the same ecological mistakes as the industrialized countries. Cities often grow in developing countries before a solid economic basis exists, and above all before the necessary infrastructure is in place. There are few cities with the resources and personnel to provide their rapidly growing population with clean water and sanitation. As the majority of people will be living in cities for the first time in a few years time (an estimated 60 % by 2025; the urban population will double between 2000 and 2025 in South America, Africa and South-East Asia), the water problem will become more acute.

Mega-cities like the one in the Pearl River Delta between Hong Kong and Guangzhou or Japan's Tokaido Corridor between Tokyo, Nagasaki and Asaka are considered to be a rela-tively new phenomenon: a number of individual cities have grown together to form regional urban landscapes. Traditional water supply and disposal techniques no longer work because of their sheer size.

All attempts to secure a social and ecological balance on the basis of traditional environment protection measures only increase the imbalance. This means that even greater problems will have to be faced in the future. Changing patterns of employment and social structure can rapidly lead to the decline of cities, to unemployment with all its social consequences and to an inability to cope with toxic industrial waste that has been improperly disposed of.

Even the responsible politicians are gradually realizing that economic development and the condition of the environment, including water availability, can no longer be treated separately. Irresponsible use of water as a resource limits growth and rapidly destroys what has been created. Thus poverty is at the same time both a principal cause and a principal effect of urban water problems.

As globalization proceeds, even today cities are caught up in world-wide economic competition. If sustainable economic development is to be secured, some rethinking is necessary: water requirements must be made dependent on the water that is available on the spot and in the immediate vicinity – water must not be brought in regardless of the environment and expense. A distinction has to be made between the elemental basic requirement, an additional social requirement and an economic requirement. We should remember the Roman system of water distribution, as it has survived in Nîmes. Here the supplies to public wells, commercial operations, baths and private houses were staggered so that water was obtainable in each case only when supplies were adequate. If water was short, only the basic public requirement was covered.

Water management can only be balanced if social and economic wishes are covered by the quantities of available and renewable water. We have to accept that urban water concepts cannot be based on prefabricated models, whether they are local or imported. Water problems must be solved specifically and within the immediate vicinity for every town, every district and even every neighbourhood. Something that works for a town can be inappropriate in a particular neighbourhood. Realizing this compels us to decentralize responsibility and action. There are many reasons for this. Large supply and disposal systems cost far more than small, autonomous systems. Small units are far less prone to faults. They bring small and middle-sized enterprises together to construct and maintain them, and thus reinforce socio-economic structures. Small, autonomous systems remain able to function because the people running and using them identify with their system and see it as their property. 'Water neighbourhoods' are also better able to take responsibility for preventive measures.

Decentralized water management fails only occasionally, but still does fail because of the structure of the water authorities. They are centrally organized and their responsibilities broken down independently: watering green areas, drinking water or sewage, for instance. As no distinction is made between different uses, this means high costs for water of uniform quality. As well as this, central systems are geared to peak requirements, because they have to cover end-user needs directly at every hour of the day and night. This too suggests a concept in which central water supplies meet a basic load and keep neighbourhood reservoirs full all the time, for example. This opens up new possibilities for reducing water losses, as narrower supply pipe widths can be used, meaning that cladding or smaller pipework can be introduced in existing supply systems.

So solving water problems in town requires a dual system. Technically speaking, local resources have to be used. Rainwater management is the key to the future. Water is part of a cycle in which it is used to water green areas and feed ponds that enhance the value of the immediate environment. Local people take the initiative in small-scale water-neighbourhoods. Public water supplies can then be reduced to covering

a basic load, dependent on local climatic conditions. Economic responsibility is taken for a small area: the water neighbourhoods have to buy water in from central suppliers. In terms of water prices, a clear distinction has to be made between value, costs and tariffs. Here the real cost of supply and disposal has to be met by the user.

This system has a chance of success in the mega-cities because of the living conditions there: people live in a confined local environment, and spend their evenings and weekends in the immediate vicinity. They rely on local shopping facilities and leisure activities. Thus as a rule town-dwellers lead a life that is restricted to the locality, regardless of the size of their town. So the city of the future will have to be a city of neighbourhoods in which life-style and development are determined on a small scale. The central water authorities then follow the wholesale principle and sell to the neighbourhood units, who then manage their water internally.

The question remains of how long it will take to rethink in this way. Hesiod established the basic link between water pollution and the health of townspeople as early as 800 BC. At that time it took about three centuries for the Greek cities to introduce sanitary installation of the kind that already existed in the early cultures of Mesopotamia and on the Indus. We are faced with a learning process that will start in school and continue throughout our lifetimes. Whatever happens, this new way of dealing with water can only come from the inside, from the user.

Solving local problems by taking local measures does not exclude global action, especially as local water problems often have a lot in common. Hydrological and technical principles, the build-up of small water units and strategies for solutions that save expense and resources are transferable. Water-saving technologies can be used everywhere. Constantly rising demand, senseless use and mismanagement can be countered world-wide, by control through price. It is possible to lay down global requirements that all users are considered, river catchment areas are treated as hydrographic and economic units and that integrated overall water planning is set up to do this. The economic value of water is reflected in the price everywhere, and water users are involved in solving their problems, they can help to determine the course of events.

As eco-systems do not respect national boundaries, internationally agreed water management is essential. But within this global network the regulation systems must leave sufficient scope for regional and local implementation. It would be wrong to see globalization as doing everything in the same way. The basic principles must be recognized globally and implemented by regulation – then the appropriate solutions have to be found locally.

Global action should lead to solidarity in dealing with water. Here responsibility still lies with the industrialized countries. They are in a good position economically, and must therefore begin to implement the new thinking, particularly as they have dumped the cost of their growth on to nature and the environment in the past. Here making pretty declarations of intent about water protection is just as inadequate as suggesting to developing countries that they should handle their resources carefully. The development and environmental crises that the industrialized countries went through in the eighties have still not been fully overcome.

Global economic competition between cities must be transformed into global competition for the best ecological conditions, which will make cities economically competitive in the long term again.

It would be good in the year 2030 to be able to look back and say: in the last quarter of the 20th century pilot projects were started that created locally independent water concepts that secured people's basic water needs and also used local water resources following nature's model. And they also helped to maintain valuable eco-systems, at the same time offering people an environment that was worth living in, thus becoming a model for all new building and redevelopment models for the first decade of the 21st century. In many places, renewal went hand in hand with a change of thinking that no longer saw water as an everyday item to be used and then thrown away. Everyone recognised the true value of water. Globalization of markets and the media meant that these ideas spread quickly. The water problems that the 20th century had left behind were visibly alleviated.

In the second decade of the 21st century water neighbourhoods emerged in all towns and cities, and they took joint responsibility for designing and maintaining their immediate surroundings. Every household was geared towards economical and careful use of water. Municipal and regional privately funded institutions, linked with river catchment areas, were responsible for supplying the local water neighbourhoods and dealt with surplus water, preparing it for repeated use. A trade network was established between neighbourhoods, towns and the surrounding agricultural areas. Responsibility for water administration was completely separated from the supply and disposal infrastructure, which was geared to economic viability.

In the third decade of the 21st century, which has just ended, trade with water came to be taken for granted, with the price related to the true value of the water. State authorities retained only regulatory and controlling functions, and agreed these internationally and globally. The global network of main suppliers and locally based water neighbourhoods

worked increasingly well. The neighbourhoods met emergencies within a restricted area to as large an extent as possible or increased the amount of water they drew from suppliers outside the region. Local people took full responsibility for their immediate area, and made this more worth-while to live in. New life was breathed into the water-related cultural heritage. Nature started to play a major part in the megacities again as a lung and open space, and as a shell for emotional and physical existence. The dual system had proved its worth and led to sustainable development appropriate to the needs of the present generation and not limiting the possibilities available to future generations.

This state of affairs was achieved as a result of perceptions and farsightedness at the turn of the 20th and 21st centuries. Thus today the whole world has become an urban network that is capable of acting rapidly on a local basis, and thus of surviving.

Rainwater retention on the Kronsberg in Hanover

Rainwater is stored temporarily in the sloping avenue open spaces and then runs down to the bottom of the slope in a little stream.

We heard a great deal about the Kronsberg – before and after Expo 2000. But when the bulldozers have finally moved away, perhaps it will only be the local residents who find their way up this 43 metre hill. Which would be a pity. Whatever else happened, the Kronsberg development was one of the exhibits off the main World Fair site that was marketed and realized under the motto 'Man – Nature – Technology' as a model ecological project. As is well known, this challenge was not met in all fields.

One field in which it was successful, however, was the rainwater management in this new urban district of 130 hectares. The head of Hanover's environment department applied the word 'revolutionary' to this approach, which promised that the hydrological conditions would not deteriorate despite the sealing which the development made inevitable. The idea was that not a drop of rainwater that fell on roofs, roads and squares would be taken into the sewerage system, but would be retained on the Kronsberg or at its foot, soak away in part and feed a valuable body of water underneath, even in dry periods. This was largely achieved by two green areas, 13 by 30 metres, running parallel with the slope and various bands of parkland arranged one behind the other along the bottom of the slope. These three strips received all the surface water from the districts that could not soak away, evaporate or be retained in the private and semi-private areas, and in the district parks.

The retention and soakaway areas on the slope and at its foot are rightly called open spaces. Compulsory ecological measures are not seen as technical facilities here, but as parks. Water, even when it is intended to flow away slowly, or disappear by infiltration, and thus not a permanent feature, is an exciting and enhancing sight for all age groups in the green areas. In the two 'slope avenues'

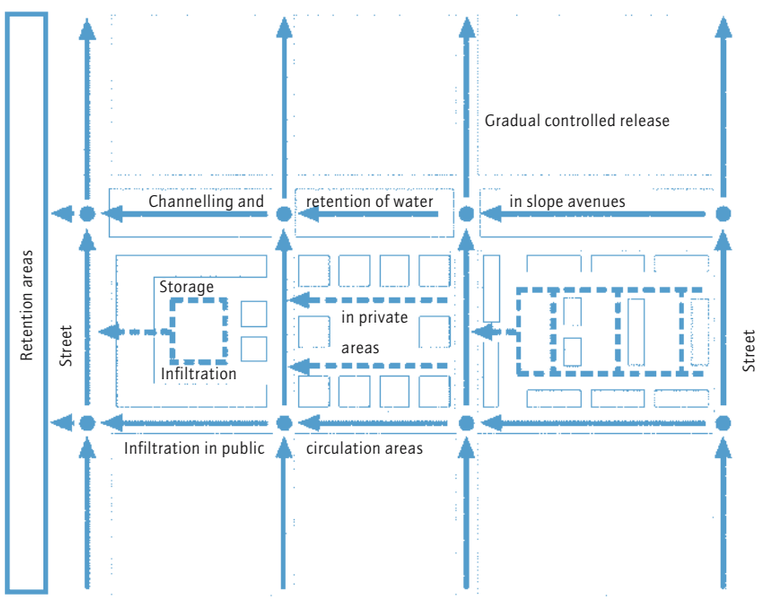
The 'slope avenues' under construction; the stream is fitted with sheet seal.

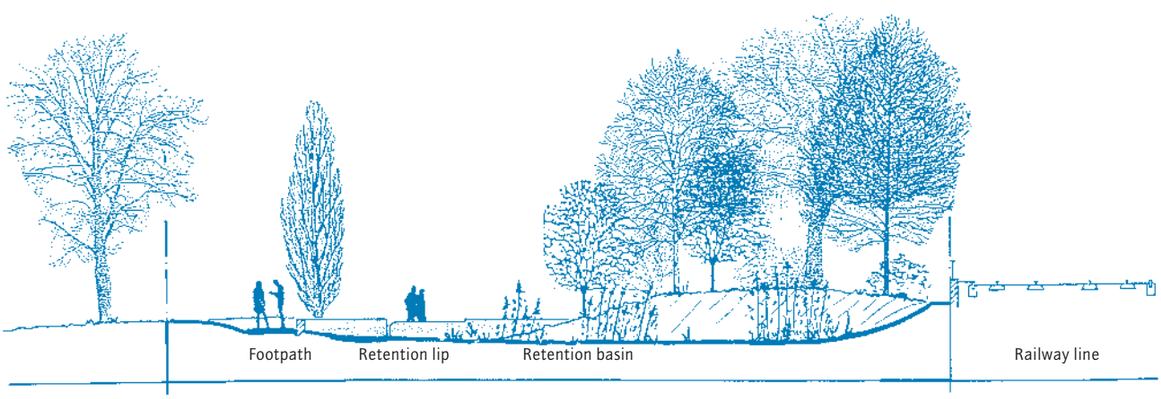
Regulating devices are built into the retention lips. This means that the outflow can be varied and the retention frequency controlled.

At the foot of the slope the retention basins hold back rainwater to slowly release it over time.

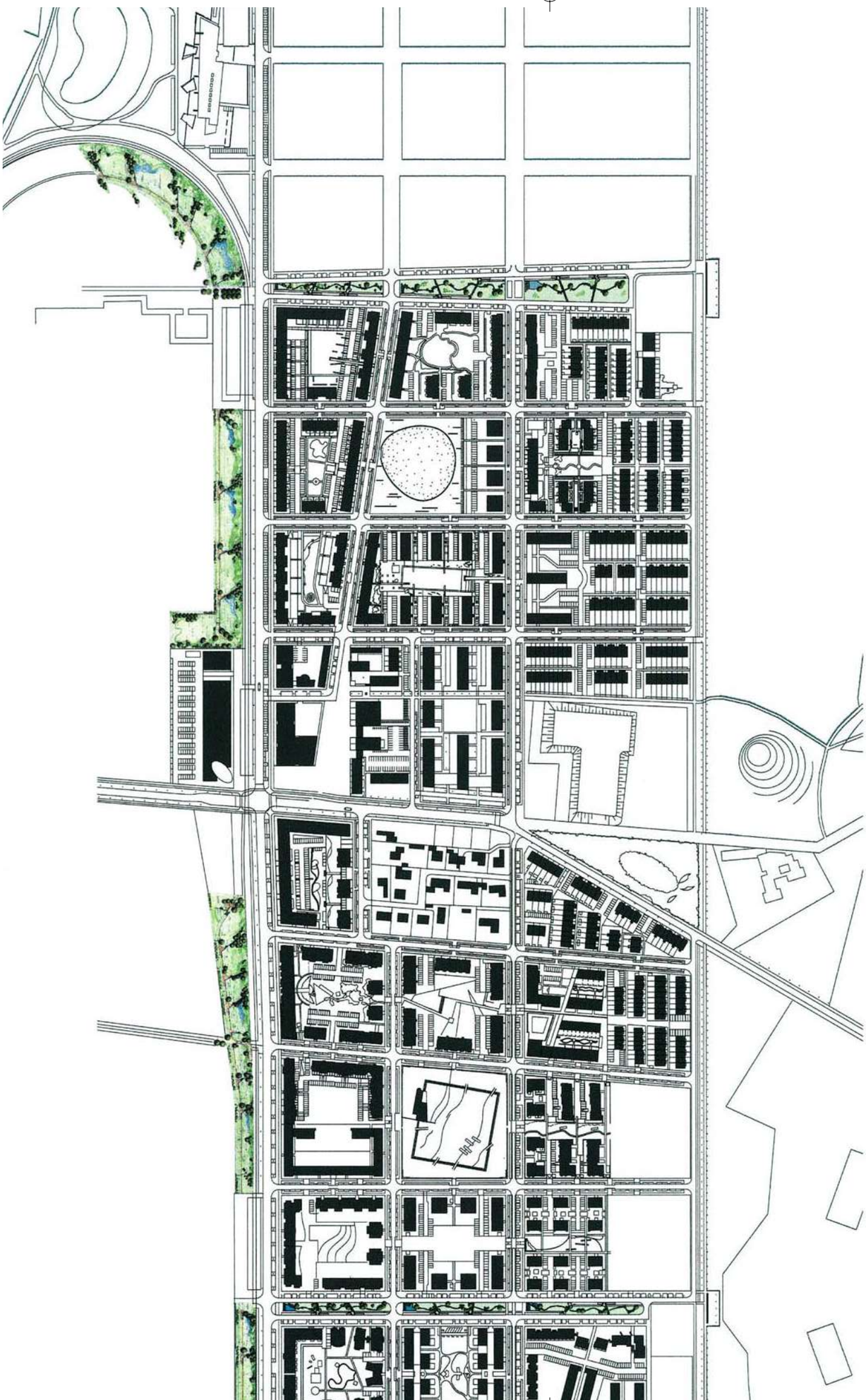
on the southern and northern peripheries of the development the planners made use of the slope of approximately 5 % with a cascade design. A naturally extended stream bed runs through the two green areas and takes the water to one of nine terraced basins, where it is retained until it soaks away. If there is very heavy rainfall the surplus water flows over the concrete retention lips, drawn on the site as civilization lines, and down into the next basin. The stream produced in this way is piped under intersecting roads, and footpaths run through the bed of the stream on reinforced fords. The water is intended to remain visible for longer in some basins which are an additional 30 centimetres lower and reinforced with a cohesive substrate. These are mainly in the areas along the foot of the slope and take up the water from the two sloping avenues and the surface water from the base road running parallel with the long side. A wooden regulating device set in the retention lip makes it possible to control the outflow quantity individually.

The Kronsberg definitely deserves a place as a show project in terms of rainwater management for a settlement of this size. It is worth a visit – perhaps especially after the World Fair.





Section through retention areas at the foot of the slope



Development plan showing areas built by the year 2000. The sloping avenues and retention areas show up as linear strips of urban parkland.

The Scharnhauser Park in Ostfildern

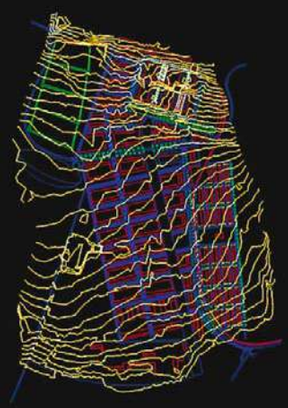
The original barracks and the topographical structure.

Topography and urban structure of the area as a whole

Barracks architecture traditionally has little in common with the quality of life. The buildings are arranged and developed from a purely functional point of view, and people are not intended to feel particularly at home. And at the time the people who commissioned them were scarcely concerned to address the ecological consequences of building. The Allied Forces have been leaving Germany and going home for years now. Quite frequently they leave run-down military accommodation behind, often extensive sites that had little money spent on them and that are usually more of an inherited problem than a welcome gift.

But these sites also have their own potential. They certainly take pressure off the town to provide new building land. But a new estate is only likely to succeed if the planners are creative and the barracks site meets modern requirements both inside and out. As in the case in the Scharnhauser Park near Ostfildern. This project involves 150 hectares, and is the largest urban development scheme in the Stuttgart area in the early 21st century. The 2002 regional horticultural show is at the heart of the site, and thus high on the list of regional priorities. Horticultural shows are increasingly inclined towards innovative approaches to town planning, and so it was clear from the beginning of the planning process that rainwater would have to be treated in a new way as well.

Two systems of streams flow below the site, which is on a south-facing slope, and the Scharnhauser Park surface water is useful to these. The Körsch, for example, often threatens to dry up in summer. Additional water would sustain the valuable biotope structure that is the only network worth speaking of in this region for sustaining flora and fauna. On the other hand, to avoid floods, the planners have settled for a different strategy of discharge reduc-



The landscape steps are the green backbone of the new housing development.

Even a one-in-100-year storm event was handled without problem.

Site plan showing
rain water management

A footpath crossing a drainage ditch, here still under construction

A housing lane with rainwater channels as a play street

The natural source area of the Krähenbach stream is feed with rainwater collected on site.

A shallow channel is a footpath and when it rains also a conveyor of rainwater.

Multifunctional grass-surfaced swale areas

The 'Baumhain' is a much used urban park with spacious swales which are also play areas.

tion, discharge delay and modest infiltration into the clayey subsoil.

The rainwater has now been fully withdrawn from the former mixed water sewer and now flows, when it has not been retained in private storage tanks or in roof gardens, or has soaked away through water-permeable surfaces, through a system of channels and ditches running alongside the streets. This network runs through the new estate as an unmistakable design feature. Here the cascade-like landscape steps, 1.5 kilometres long, are particularly striking. This design element is also part of the rainwater management programme: below the steps the living bottom zone purifies the water in additional retention hollows and pools. Discharged water that has been delayed and purified in this way is fed via natural gradients into the surrounding landscape, with its valuable wetlands, biotopes and spring areas.

Even if traces of the former military structure show in the urban development, the water has successfully linked up with the surrounding landscape and its features.

Toppilansaari Park in Oulu

Tangentially staggered paths accompany the rainwater in swales on its way out to sea.

Connection plazas have clear wall elements which give the 'flowing park' an anchor and space for relaxation and play.

The park 'flows' over the street crossing and thus has priority.

Few, apart from the Finnish, know where Oulu is. A town tucked away at the furthest reaches of the Baltic Sea, just 160 kilometres south of the polar circle, it is not the sleepy stop-over one might expect. World leaders in mobile telecommunications and advanced medical and electronic technology have chosen to base their businesses in Oulu. It is the city with the highest rate of economic growth in Finland and, consequently, there is high demand for attractive, affordable housing.

Toppilansaari, a half island between the canalised Oulu harbour entrance and the open sea, is the site of the Finnish Housing Expo 2005. The unique ecology and distinctive flora of the saline wetland on the sea side is made even more interesting through the proximity and contrast of the urban and industrial maritime canal.

The housing is laid out as a sustainable pilot project. A green park forms a central core for the relatively spread-out housing elements. The park provides convenient and informal recreation and activity areas which help reduce recreational impact on the sensitive wetland habitat. It is also a stormwater system, where rainwater and spring snowmelt are collected, cleaned and slowly released to the wetland via swales whose soft topography mirrors the flow of water. The proximity of the sea is further evoked by waved steel planting edges which are a repeated design element throughout the park.

'Toppilansaari' means 'Park of the Young Sailor' in Finnish. This name defined the programme of two land art installations which close the southern and northern ends of the park. In the southern garden, a conceptual, sunken boat is a memorial to all the young sailors who never returned to land. Masts are stringed like an instrument, low tones are heard from the benches integrated into the

Concrete stepping stones also function to hold back rain and melt water for detention.

Openings at street crossing convey the rain and melt water to the next park swale.

Run-off from adjacent roads and plazas is cleaned and brought to the 'flowing park'.

boat's 'hull'. A wooden ship deck frames a sand box and children's paddling pool.

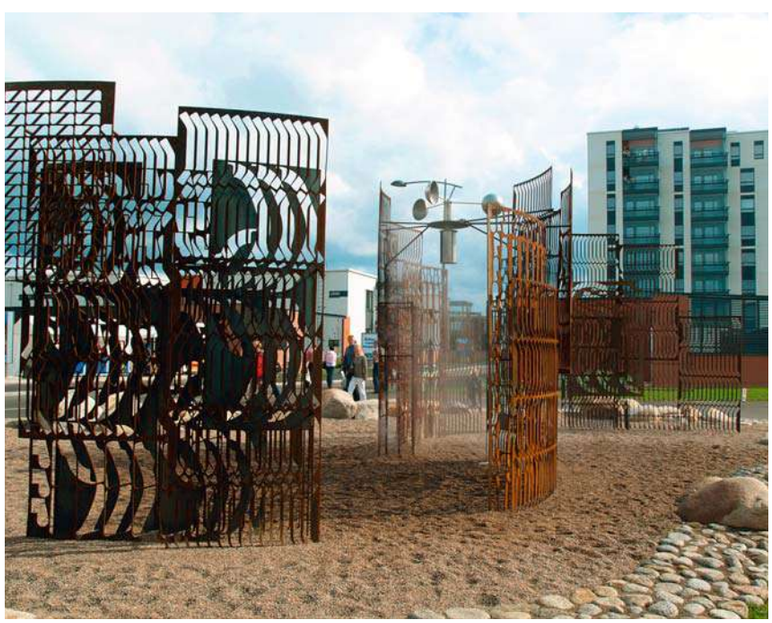
In the northern garden, a light 'vortex' is an orientation landmark, visible like a lighthouse from far and wide. The light vortex rotates in the wind, variably lighting up sculptural surfaces. In winter, these surfaces are ice sculptures, which depending on temperature, wind and air humidity are iced up in bizarre and fantastic patterns. Both sculptures were consciously designed by Herbert Dreiseitl using recycled materials and constructed on site by local contractors.

The park accommodates a whole range of local and city pedestrian and bicycle circulation routes. At crossings, the paving is laid in waves, emphasizing that the park flows with a natural spatial logic across these intersections. The sites own unique and delicate natural habitats have been preserved and coexist with areas which celebrate the past and present history of the people who live and visit there.

Steel bands, part of a sunken ship, hum in the wind and remind of the young mariners who never returned from the sea.

Recycled steel sheeting, a wind-powered rotating light and mist are the key elements of the 'light vortex'.

Abstract fragments of a sunken ship are a space sculpture in the park.



Sewage treatment plant at the Wörme Hofgemeinschaft in Handeloh

Decentralized purification plants are particularly suitable for remote farms and hamlets in country areas.

'O'er seven stones the water flows, 'tis pure again, the farmer knows.' This piece of agricultural wisdom may well no longer apply to the present day and the highly complex ways in which water is now polluted, but there is a grain of truth in it: water is able to purify itself. Nothing has changed here. But cities have long since had to say goodbye to giving sewage the time and space to purify itself. They have ultimately arrived at narrow-mesh sewerage networks and treatment plants, via the intermediate stage of evil-smelling sewage farms. This is a hygienic but very expensive method of getting rid of the daily quota of faeces.

Since the early 1990s, country people have increasingly started to remember decentralized sewage treatment. An increasing number of farmers, but also private householders who have enough land, are letting their sewage flow not over seven stones, but through settling tanks and purification beds, so that it can then pass into an effluent tank having been cleaned. This also applies to the Hofgemeinschaft in Wörme, an organic farm in Handeloh, south of Hamburg. The Dreiseitl studio planned a sewage treatment plant for about 30 people who live there plus holiday visitors and participants in educational projects.

The planners took advantage of the natural slope on the site, and were thus able to do without technical units to a large extent. Thus sewage from the farm first flows into a 250 metre long collector tank and then into three shafts. Here a filter sack separates solid and liquid components. Alternate use of the shafts means that the contents of the filled bags can be pre-composted and used in fields and gardens after nine to fifteen months.

The liquid part then flows into purification beds with an area of 7 square metres per resident equivalent. The botanical treatment plant is de-

Fitting the sheet seal in a purification bed. Here laymen can help as well – a school class at work.

Setting the manholes and introducing the filter substrate

The decentralized treatment plant with purification beds treats all the sewage from the hamlet of Unterbach, which has 80 inhabitants.

Installing the substrate for a purification bed layer by layer

Planting the beds with aquatic plants (phragmitis)

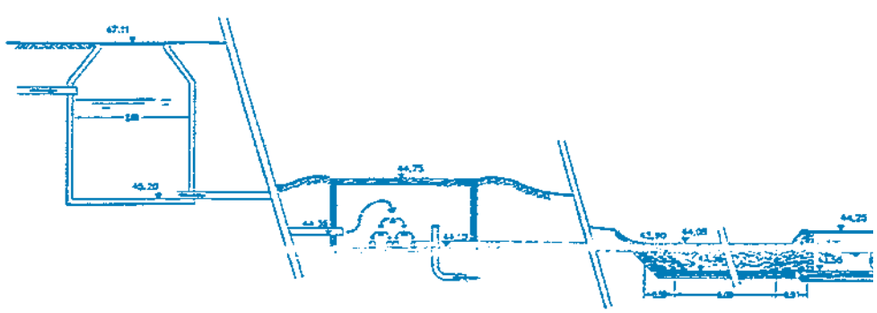
Residents can service the plant themselves, as it is easy to manage; this gives people long-term responsibility for their own sewage disposal.

signed for a maximum of 100 resident equivalents. The sewage runs through the beds in two stages: first of all through four 80 centimetre deep beds arranged in parallel, with a infiltration length of 5 metres. In the second stage the beds are 1 metre deep with a infiltration length of 7 metres. The plants that grow there introduce considerable quantities of oxygen into the earth- or water-bearing layer. Aerobic decomposition processes are then set in train. After passing the sampling shaft the purified sewage runs into the little river Seeve via a semi-natural channel with plants growing in it. Very little care and maintenance has proved to be necessary. The purification beds have simply to be kept free of undesirable vegetation and woody plants. The pipes and gutters have to be flushed out three to four times a year to test and maintain their ability to function.

The plant has been working without problems, economically and without complaint since 1994. The Wörme farm's treatment plant has thus contributed to regional water quality, but also considerably reinforced its image as an organic farm and seminar venue.

The sewage seeps through several planted tanks and harmful substances are removed by organic decomposition processes at the various purification stages.

Sewage treatment for an agricultural establishment with nursery

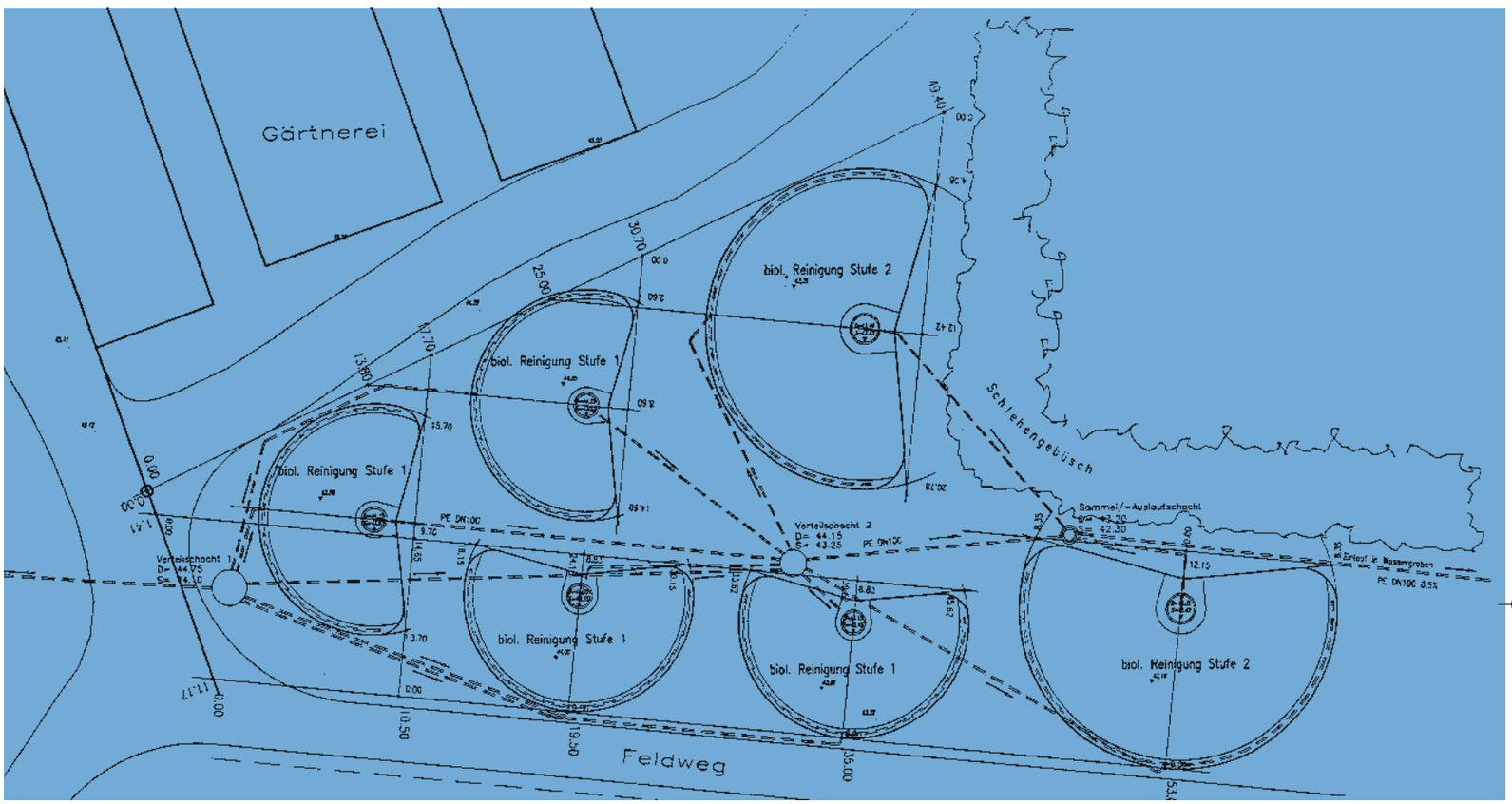


Section through the various purification stages: sewage flows horizontally through plant filters.

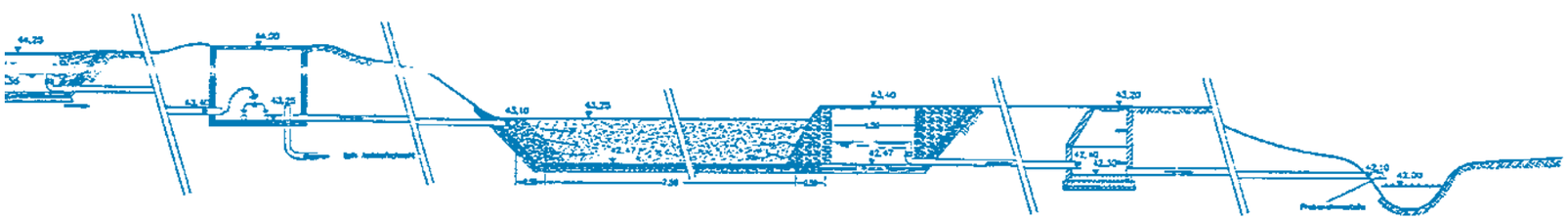
Mechanical purification stage

Distribution manhole 1

Biological purification, stage 1



Plan of treatment plant with various purification beds



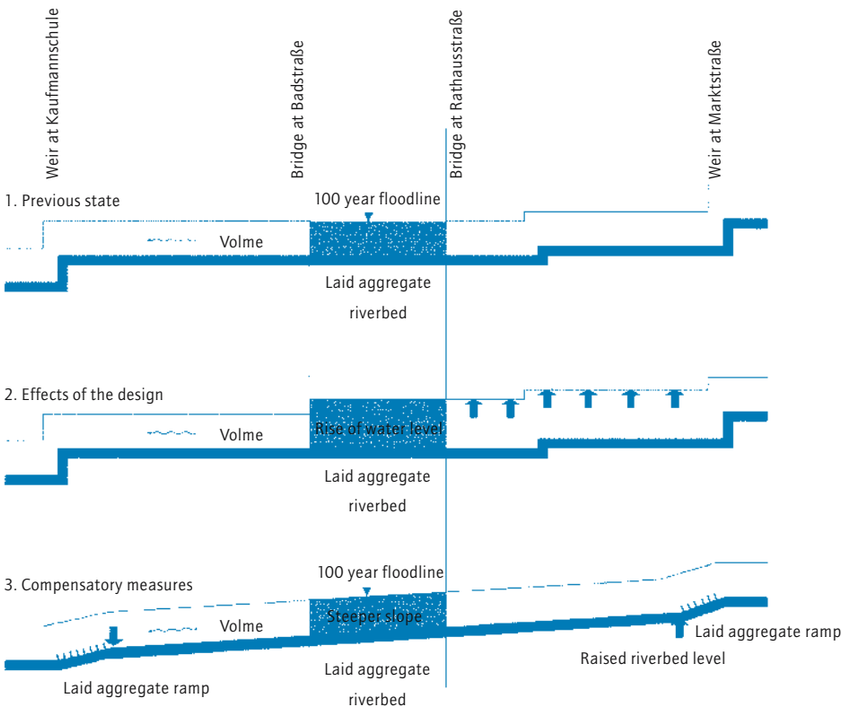
Distribution manhole 2 | Biological purification, stage 2 | Collection/outlet manhole | Drainage trench

Scheme for the banks of the Volme, Hagen

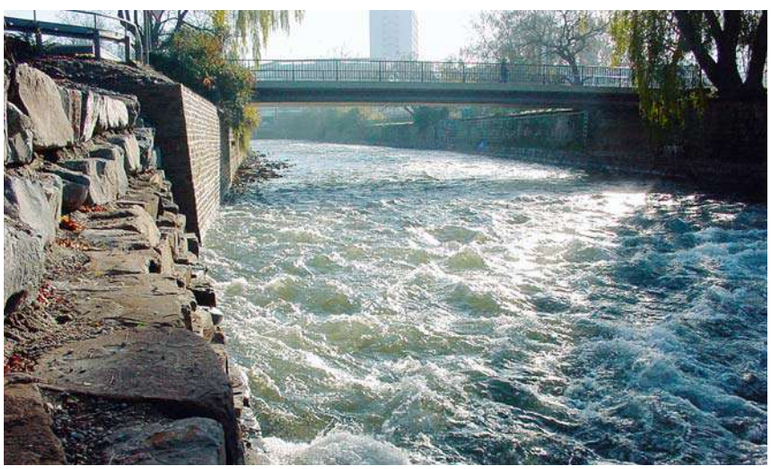
The Volme inside the town of Hagen was constrained within a box profile with embankment walls 3 metres high. As the concrete bed slowly crumbled away, a complete change of direction was envisioned.

There are some towns that have a considerable number of inhabitants and whose names are familiar, but do not trigger any associations. For example, you've heard of Hagen, but it's unlikely that you can describe more than the platform on the ICE train line. It's the same with rivers. The Ennepe is familiar enough, but how many people know that it flows into the Volme, which is a tributary of the Ruhr? Only people who live in Hagen, you might think. Anyway, the rivers come together just outside the town gates, and the Volme runs through the town centre.

But in the case of Hagen's inhabitants you can't even be certain about the Volme. As in many other places, this town with 200,000 inhabitants at the southern gateway of the Ruhr has treated its river somewhat shabbily. It was downgraded to a canal in the past 100 years, polluted with industrial waste and hidden away behind factory halls. The municipal backyards are all on the Volme. For this reason the town brought its angry citizens into the equation when it was choosing a site for its new town hall on the Volme. The people voted to dump these plans in a local referendum – until they heard in autumn 2000 about the idea of making the river and above all its banks attractive to the population at this point. At the same time the open-space planners wanted to lay the foundation stones for a waterway redevelopment that was to be continued in the long term. For example, the bottoms of the waterways were to be roughened, two weirs were to be removed or at least lowered, and banks arranged to impede the water or to allow it to flow.



Hydraulic assessment of the previous state of the Volme and projected effects of a new design



Since restoration, the river Volme has regained the diversity of its river structure. Natural shorelines alternate with urban ones. Stepped terraces in front of the Town Hall restore river access to the citizens.

Scheme for the banks of the Volme, Hagen

General plan for the town hall area with complete redesign of the river bed and the water features by the town hall. A crucial feature of the design is to restore accessibility for flora and fauna by rebuilding two weirs.

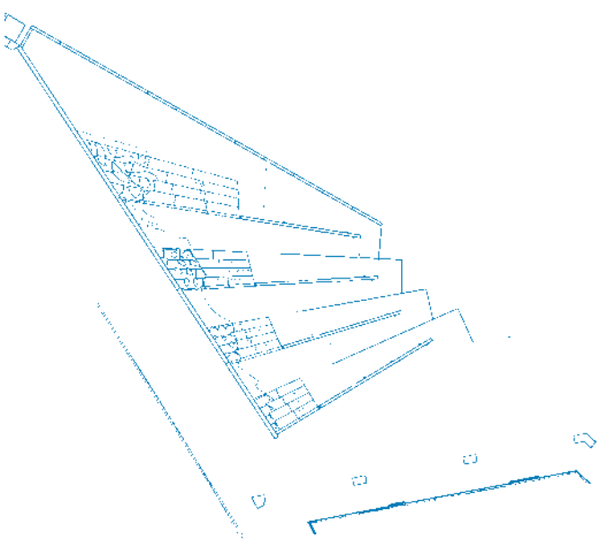
The Town Hall steps connect the city to the river. The river can be experienced directly thanks to a new path along the river shoreline.

But the people of Hagen seemed most impressed by suggestions for designing the area between the town hall and the Volme. A terrace was to curve along the bank of the river, with enough room for bistro chairs, jutting out over the water in places. From this terrace, a generously dimensioned flight of steps leads down to the gravel shore, and from there it is possible to walk to the next steps. Unless the path is flooded when the river is high. Then a narrow pedestrian bridge will lead from the terrace to the other side of the river. But in Hagen, Herbert Dreiseitl also met the challenge of creating a visible link between the town hall and the river. This was achieved with inlays set in the floor covering and leading to a water wall made of coloured glass, down which water glides. This is the starting-point for a watercourse that takes water from the roof and in a cascade down the steps into the Volme.

To make the terrace and steps part of the town, to remove its backyard image and to give people easier access to the Volme, the floor covering is taken

on into the adjacent street. Even if all this will not really make a great deal of difference to how well people know this industrial town – it has certainly enhanced the quality of life of the people who live there.

A cascade is integrated into the terraced steps. The cascade has an artistic water design which sets the tone for the transition between the urban realm and the natural habitat of the river Volme.



A water wall of glass, water and light within the foyer of the Town Hall extends over two storeys. Particularly at night, the water wall is a distinct symbol visible from the city through the glass façade of the building.

Green roof for Chicago City Hall

The flat roof of the historic city hall in downtown Chicago was transformed into a green roof garden.

Many people are familiar with the riveting view from the Empire State Building in Manhattan. Skyscrapers as far as the eye can see, the Hudson River blurs into the horizon, a freedom-loving, copper-clad lady 46 metres high becomes tiny. But at some point the far distance becomes boring and the eye finds its way back and looks down at apparently trivial details: yellow taxis, for example, the winding paths taken by individuals, clouds of pigeons suddenly flying up, the upward and downward staggered patchwork quilt of the flat roofs. Flat roofs are very popular in big American cities. Unlike Central Europe, the airy space in these little rectangles is used for air-conditioning units and fresh water tanks, sometimes for junk. You would look pretty much in vain for a roof garden here. The USA is still a developing country when it comes to roof planting.

Fewer people know the view from the Sears Tower in Chicago, one of the highest office buildings in the world, but if you look down from there it looks quite like the Manhattan roofscape. But this could change very soon, as this great city on Lake Michigan is one of the five major American cities taking part in the environment authority's 'Urban Heat Island Initiative' pilot project. This is the United States' attempt to reduce temperatures in the summer months, which are sometimes very high, and the smog levels in several cities. Roof planting is one of the key elements of this programme, which is also intended to relieve the overloaded sewers when the rainfall is heavy.

There are very few roof-planting experts in the USA because of lack of experience. For this reason the Dreiseitl studio was invited to join an American planning team in 1999, and commissioned to produce a design for a roof area of about 3,600 square metres. And so now people look down from the top of the nearby skyscrapers on to the roof of the 11 storey town hall. The walls below it are over 100 years old, and familiar to European film fans at least as the notorious Blues Brothers paid their debts there at the last minute.

What has emerged on top of the town hall is a lightly contoured landscape, planted on a shallow substrate with varieties of sedum and on a deeper one with trees and shrubs. It is possible to walk around the city hall roof on a curving path. Parts of the roof were removed for statical reasons before the planting, and provision of water for the roof plants was dealt with as part of this process. Rainwater from the penthouse (for technical units) which is built directly on to city hall, and higher, is stored in several small tanks and taken to the plants when needed. If water is short, the municipal supply can be used.

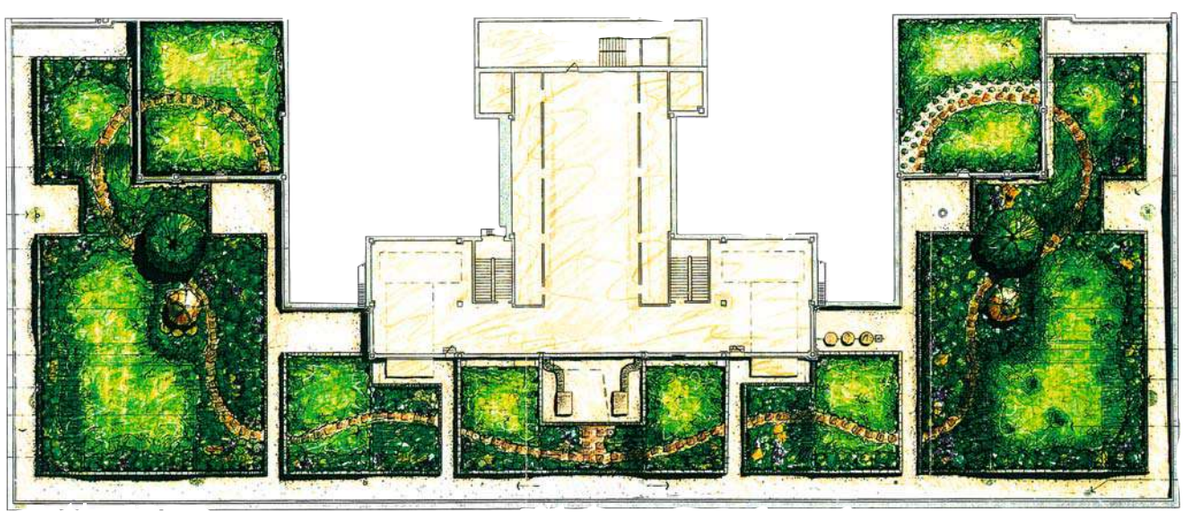
City hall's green roof has attracted a great deal of attention, and as part of the environment authority's pilot project it has interested specialists, even outside Chicago. In the city itself it is part of the extensive 'City Roof Garden Program', and the first example of the fact that planting on roofs is worthwhile, even from the point of view of economical and sustainable water management.

The garden is visible from the surrounding skyscrapers and has thus become a visual highlight.

Improving the city climate, greening of roof surfaces also significantly reduces rainwater run-off through detention, storage and evaporation of the rainwater.

A natural wildflower meadow right in the middle of Chicago has an aesthetic appeal which is rare in big cities.

The green roof can be enjoyed as a garden oasis from surrounding skyscrapers.

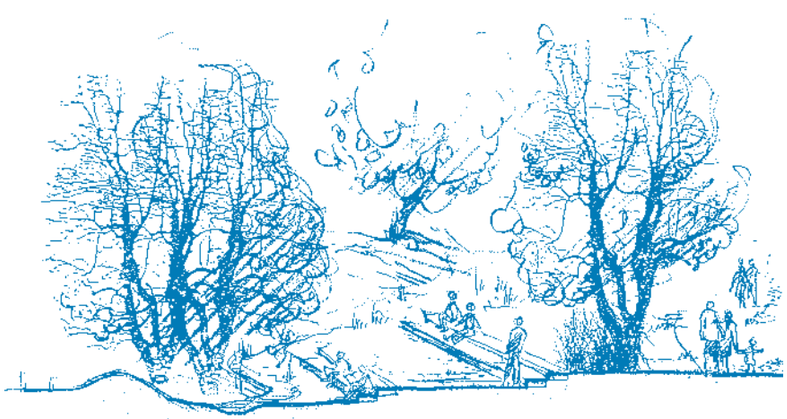


Design for the planted roof: the individual areas form a coherent roof garden.

The Lanferbach at Schüngelberg estate in Gelsenkirchen

Formerly a sewer with sheet-pile walls, the Lanferbach now runs by the Schüngelberg estate in a leisurely fashion.

Overflow of one of the overgrown infiltration swales



The steps by the bed of the stream invite people to stay for a while and play.
An old brick wall was used for their construction.

Most of the planners from elsewhere had to get used to two things over the ten years of the International Building Exhibition at Emscher Park: first to the stock of language that had emerged in Germany's melting pot, borrowing all kinds of vocabulary that would otherwise be unfamiliar from the various immigrant groups. And to a kind of person that does not take at lot of things particularly seriously. For example, all the tillefitt, or fuss, about the IBA. Many of these have still not realized that a building exhibition took place in the Ruhr at all, and that countless projects were completed or considered that had a great deal of influence on the local people's living conditions. It is only when your own front garden has been decontaminated or an almost completely natural stream appears instead of a concrete drainage gutter that even the people who didn't particularly care – it was all 'six of one' or 'jacket or trousers', as the German expression has it – that the landscape had taken a turn for the better. It is possible to walk around in it again, to experience it.

One project that became known well beyond the boundaries of the Ruhr is in Gelsenkirchen. A Jugendstil estate in front of the giant Rungenberg spoil heap, also known as Mount Slag, was redeveloped and tastefully complemented with slender terraced housing. The Schüngelberg housing estate for miners had previously been grey, surrounded by dismal green, and bordered by an open, evil-smelling sewer. After redevelopment the complex felt completely different – also helped by attractive open spaces. These appear in the form of nicely proportioned streets, attractive gardens and above all a park which came into being as part of a new rainwater concept. The Lanferbach had previously been a canalized stream in which contaminated water from the Rungenberg slag heap flowed towards the river Emscher. Today the liquid

Before it was redesigned the Lanferbach was forced into a concrete corset and ran through a fenced-off area – 'Danger – No Entry' was the order of the day.

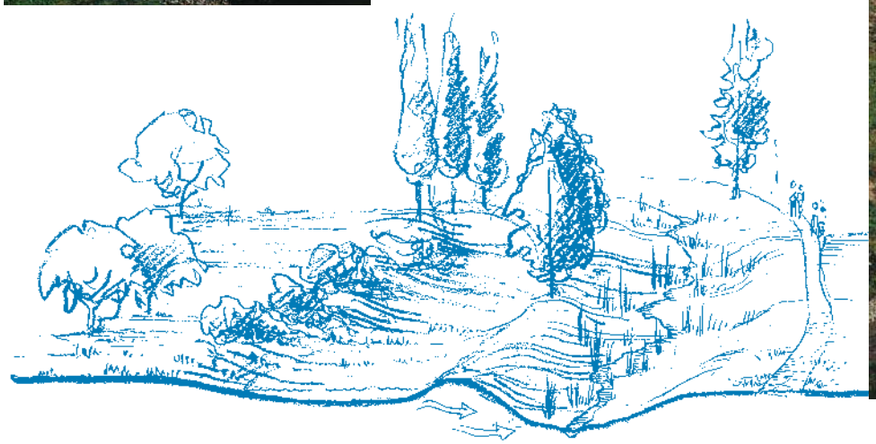
Site management in the mud of Monte Schlacko

Infiltration swale under construction. Water started to accumulate here even in the building phase.

poison flows out of a collective drain into a sewer. This opened up the way for water management in which rainwater from the Schüngelberg estate flows first through various purification stages and retention basins, and is then released in a controlled way into the restored and completely redesigned Lanferbach. Street water runs straight into the retention basins by the Lanferbach and seeps towards the stream through water-bearing strata.

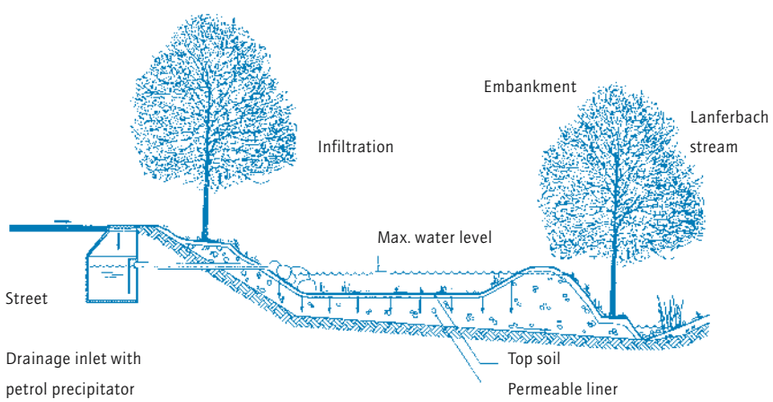
A valuable biotope will develop along a length of just under 800 metres, but this is not all. In fact the estate residents have acquired a new park, which is used a great deal, especially by the large proportion of Turkish inhabitants. Steps intended as seats, built of re-used bricks, draw austere lines in the otherwise gently contoured park landscape. These are the meeting places, which are reached via winding pathways that adapt to the natural design of the park. And the final benefit from the new design is that existing harmful waste was disposed of safely, which at least for the residents of the Schüngelberg estate is not schissko-jedno – which is derived from the Polish wszystko jedno, and means roughly the same as 'jacket or trousers'.

The bridge over the Lanferbach with its discreetly designed steps links the Schüngelberg, the Lanferbach and the Rungenberg slag heap.



Street water is filtered and purified in retention basins that are integrated into the design, then fed underground to the stream.

Along with the Rungenberg slag heap, which has now been planted, the Lanferbach now functions as a coherent public park area, and is used by the residents for all kinds of activities.



Housing estate in Echallens near Lausanne

The meandering channel is in the central square in the estate, and shows the history of the course of a river with changing loops. At the end a rhythmically pulsating movement is set up that is reminiscent of organic forms (John Wilkes' Flowforms).

Creative people do not always look back on their early work with particular pleasure. We sometimes hear that the artist is pleased to have developed further. This implies an admission that time passes by one's own work as well, that it is subject to fashion – even when designing open space. But ultimate artists are content to know that every work is a step along a path, without which it would not have been possible to reach one's current position – and this alone means that every work is valid in its own right. And as well as this it is enjoyable to see the effect of earlier projects on the thinking of a whole profession, and even on related ones.

This may well be the case for the Dreiseitl studio and the Hameau de la Fontaine estate project in Echallens. In the early 1980s, surface water drainage, swale infiltration, purification in reed beds, installing underground cisterns and re-using rainwater were all seen as newfangled ideas in urban development that people were a little suspicious of. And so it was all the more courageous of the people of Echallens near Lausanne to commit themselves to an experiment by using a modern rainwater management idea for an estate with ninety dwellings. Since 1986, all the surface water here has flowed along the streets in gutters to a sealed treatment bed. Here the roots of reeds and rushes, in symbiosis with the filter floor, remove the harmful substances from the water before some of it runs into storage tanks. From here water is pumped to the central village well, which is a meeting-place, but also a sculpture, whose impressive volume of flowing water sets currents in motion, whose veil of water reacts to wind, and that is perhaps reminiscent of the fact that the source of all life once sprang from the village fountain. As well as this, a play and adventure area draws its water supply from the tanks. The rest of the rainwater flows into a retention pond, where it evaporates, soaks away or is fed slowly into a stream. The presence of delicate amphibians in the form of alpine salamanders and palmated newts demonstrates the high quality of the water from the reed and rush basins, and also show the importance of artificial water features as second-hand survival biotopes.

It was clear from a very early stage in the Hameau de la Fontaine that how the disciplines of art, open-space architecture, leisure research and environmental technology fuse together to form a single theme.

The fountain with its watercourse is a special feature of this estate.

The centre of the village with a treatment biotope under a platform that is available for performances.

Paved basins show how the rainwater drains away.

Here a second-hand biotope becomes a habitat for creatures under threat, in this case an alpine salamander.

A naturally designed retention pond forms the edge of the estate.

Rainwater management in Krems Business Park, Austria

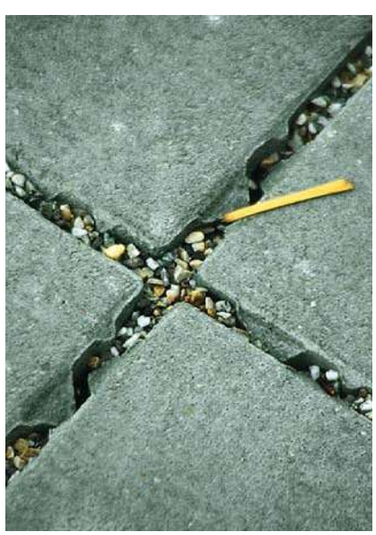
At times when flooding is on the increase, local authorities think about the omissions of recent years and decades. And they have to do this, as the damage caused by water in recent years have became a regular item in the accounts of local authorities, cantons and states. Unfortunately it is not until it gets difficult to balance the books that ready arguments are available for taking new directions in water management. And here it is important not to be too morose about having to do today what one could have wanted to do yesterday.

The Lower Austrian town of Krems an der Donau demonstrated this in terms of rainwater management. Here the municipal engineers drew up estimates for draining a proposed 33 hectare industrial estate with a conventional sewerage system. But before the community started to implement this, it was well advised to have an alternative concept devised, for open rainwater management. This produced pleasing results. It was possible to use infiltration techniques even for an industrial area in the Danube catchment area with relatively high groundwater levels. Of course the gravelly, sandy subsoil with a Kf value of 1×10^{-3} was of considerable assistance here. The director of building was particularly pleased when he was able to show a financial saving of over 50 % against the proposed costs for the sewerage solution.

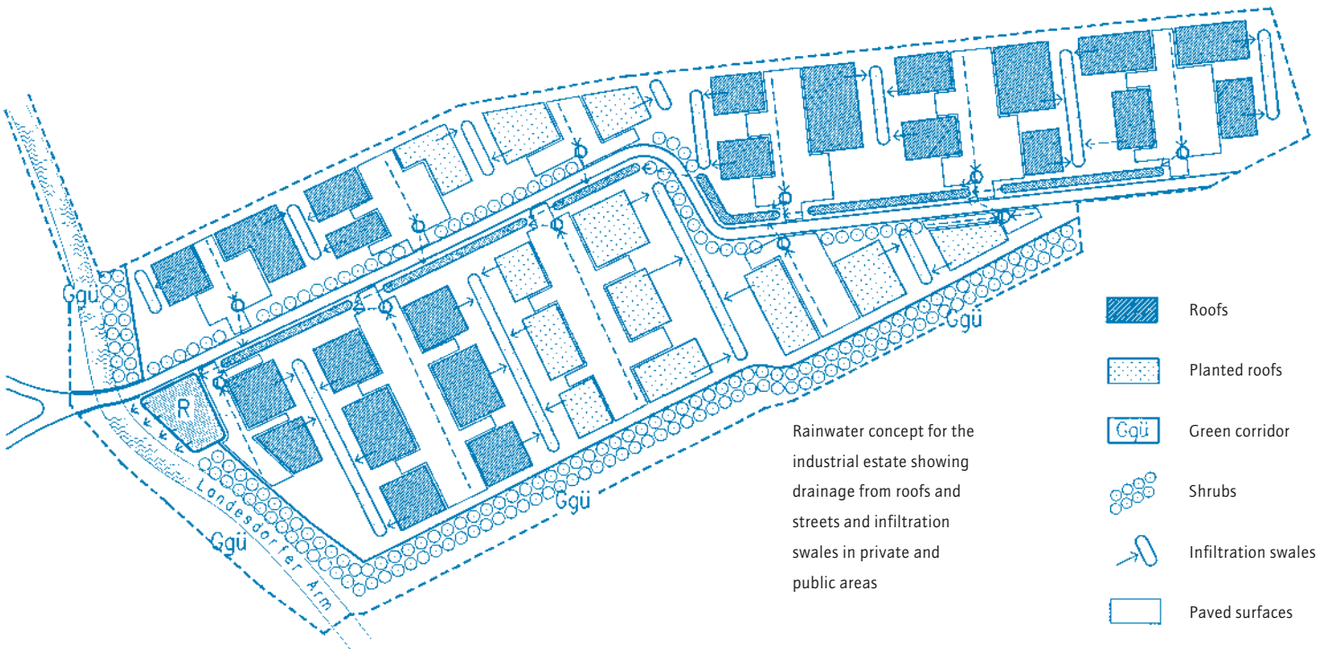
The technical framework for this success lies in a system of long swale strips along the main access road, and infiltration basins between the buildings. Alongside the main access road, the yard and parking areas drain into the decentralized gravel trenches, each complete in itself, after passing through light-density material separators. There are planted retention basins above the trenches. Once the water has arrived here it soaks through a treatment layer about 50 centimetres thick into the gravel trench, which is clad in shear wool, and runs from there into the ground. Roof water flows into planted soakaway basins, and from there into the groundwater. All the sewage is fed into a separate sewer and taken to the communal sewage treatment plant. A relatively large number of roof gardens definitely contribute to the overall efficiency of the concept. Rainwater is delayed in draining from about a third of the buildings. The effects of open infiltration are best studied when rainfall is heavy. The industrial estate has canals running through it from which water occasionally runs over the edges on to the lawns – but without getting as far as the buildings. But the Landesdorfer Arm, which is linked directly with the Danube, maintains a water level that is well under the top of the embankment. The Krems East industrial estate does not contribute a drop to possible flooding on the Danube and its tributaries.

Constructing a swale system between parking spaces

Gaps in the kerb allow rainwater to run off the streets into the grassed swale alongside and seep away there.



Infiltration via open joints in the pavement



Rainwater concept for the industrial estate showing drainage from roofs and streets and infiltration swales in private and public areas

- Roofs
- Planted roofs
- Ggü Green corridor
- Shrubs
- Infiltration swales
- Paved surfaces
- Drainage of courtyards with light density precipitators
- Retention areas for slow infiltration through planted soil layer for purification
- R Purification bed

A retention basin with infiltration after heavy rain

Grassed swales are placed next to the parking spaces, the trees planted there flourish even in the conditions prevailing in locations of this kind.

Planted swales with a high purification potential for rainwater management