

# Tiel East Drier and nicer

PREFERRED SCENARIO FOR THE  
FIGHTING OF WATER NUISANCE

gemeente **Tiel**



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FIGHTING OF WATER NUISANCE

Municipality of Tiel



**Future Cities**  
urban networks to face climate change

## **Colophon**

This booklet is a publication of the municipality of Tiel and realized with the cooperation of the Rivierenland District Water Board. For more information please contact the project leader of "Wateropgave Tiel East", Mrs Ine van den Hurk

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# Preface

Tiel East is a special district in all respects. People love living there. Water nuisance is also special here, although a less attractive aspect. The district lies between the dikes of the Waal and the Amsterdam-Rijn Canal. Problems with seepage water occur everywhere along the Waal, especially at high water levels. A special feature is that the problems occur here in a residential district.

As a result of climate change and higher water levels more seepage water will be created in the future. It is quite a task to find a solution for this, while we want to build new houses in this district as well. The Netherlands chooses to build in the existing towns as much as possible and to keep the surrounding landscape open.

There are no ready-made solutions available for the situation in Tiel East. That is why the municipality has asked a large group of

experts to help us think: Department for Public Works and Water Management, the province, the district water board, housing corporations, project developers, consultancy firms and district residents. Each party sees the district in its own manner. This has resulted in animated discussions and new views. Because no one knows everything. The great involvement and active participation have come as a pleasant surprise to me.

In a few months' time we have put dozens of ideas for Tiel East on the map. The municipality of Tiel will translate the best ideas into a preferred scenario, in the long term and in the short term. Also in this respect the combined approach will be of decisive importance. If everybody contributes a little it will certainly become a success.

mr. drs. W. Gradisen  
*Alderman for the municipality of Tiel*





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# The task for Tiel East

**Tiel East is boggy by nature. Not surprising that cellars are sometimes damp and streets are flooded. But to keep the district livable the water nuisance must really decrease. In addition there are wishes to utilize the district more intensively, for instance for additional houses, a community school, parks and squares. The water issue and these other wishes cannot be viewed separately. Drier, better and nicer are interrelated.**

There is a high dike between Tiel East and the Waal. Nevertheless the district and the river are continuously in contact with one another, by means of the water! The water in the river makes the groundwater below Tiel East heave. If the water in the river rises, so does the groundwater. If the river water drops, so does the groundwater. The Amsterdam-Rijn Canal also pulls and pushes the groundwater in that manner. Especially in spring and autumn the groundwater is high, almost up to street level.

The wetness in Tiel East has worsened in the course of the years. That is because more houses and paved roads have been realized. As a result rainwater can hardly sink into the ground anymore.

Another thing is that Tiel East has few ditches, ponds or canals that can collect rainwater, much less than elsewhere in the Netherlands. Almost all the rainwater flows directly into the sewer. But in the event of a heavy shower it cannot cope with the water mass and the water treatment system also becomes overloaded. Subsequently the water from the drain holes will flow into the street.

The high groundwater level and the overloaded sewer create all kinds of problems. In some houses crawl spaces and walls become damp. The floor may start to rot or the wallpaper falls down. After a heavy shower the streets are flooded and are then impassable for a couple of hours.





## **Water**

The problems with water nuisance are not just going to disappear. On the contrary, without action the nuisance will actually become bigger. Climate change will cause the river to rise more often and drag up the groundwater as well. Heavy rains will also occur more often. So the sewer will have a harder time.

Tiel East is faced by three tasks:

1. The nuisance of the groundwater must decrease. The target is that the groundwater must be at a depth of at least seventy centimetres.
2. More water storage must be created to 'park' the superfluous rainwater temporarily. For the whole district thousands of cubic metres of storage are necessary.
3. The overloading of the sewer must be halved. That means that less rainwater is to flow to the sewer.

In Tiel East six hectares of hardened surface, mainly roofs, must be disconnected from the sewer.

Other districts of Tiel will also have to face climate change. The risk of water nuisance is also increasing there. Solutions for the water problems in Tiel East must consequently be found as much as possible in the district itself. Shifting it to other districts is not an option.



### **Houses, roads and public green spaces**

More people are coming to live in the surroundings of Tiel and new houses are needed for this. The houses are preferably built within the present boundaries of the town, so that the landscape in the surrounding area will not become clogged. The Tiel East district must offer space for an *additional thousand houses*. Some of them may be located at the Vijverberg and the Vijverterrein. But more houses must be built in the existing residential areas as well. This often requires a thorough renovation. In addition to low-rise building, multi-storey flats will be needed as well.

More houses attract more *traffic*. The residents must be able to travel easily from their homes to other destinations. That is why the municipality will build a new traffic route from the motorway to the Tiel East district. Along the south side of the railway a new road will also be built to make the station area more easily accessible.

The schools in Tiel East need more space and better accommodation. There is also a need for more facilities for parents and children in

the district, such as childcare, healthcare and social work facilities. Both wishes may be combined in a so-called community school. Clustering may be used to limit the traffic flows in the area.

In comparison to other residential districts Tiel East does not have a generous share of *parks, squares* and *ponds*. If more people come to live in the district, the need for this will only increase.

### **Space, space, space**

The wishes for water, living, traffic and green spaces require extra space for each feature. But the district remains the same size. That is why the space must be used efficiently, if possible for different wishes at the same time. That may be realized by building parking space under the houses, for example, or by using parks and ponds for water storage as well. To be able to find those kinds of combined solutions, the municipality wants to tackle the various issues jointly as much as possible.





## *Theo Peters ~ member of the Provincial Executive of Gelderland*

“Tiel is the centre of this region. The surrounding area also uses the facilities such as the theatre and the business parks. For the residents of Tiel and the surrounding places it is important that those facilities will remain. That is why most new houses are built in Tiel: Tiel must remain the biggest.

In the near future we will take decisions about houses in Tiel East. That cannot be done behind your desk, you must have been there. For that reason I have walked around and talked to residents. Some of the houses are no longer up to date. By refurbishing, occasional demolishing and new building the district may become nicer and more varied. I like it when the residents also join in the conversation, because they know best what harmonizes with their district. And the residents of Tiel East do have a special feeling for their district, they are enthusiastic.

The water nuisance in Tiel East is substantial. It is no picnic if you have water in your crawl space. Elsewhere, on the other hand, we are bringing water to the area, to create lovely living environments. In Tiel East we must ensure that people can also enjoy the water and are not troubled by it. And that is also possible, as long as we tackle water nuisance and house building at the same time. We have regarded water and living as separate issues for too long.”





T i e l

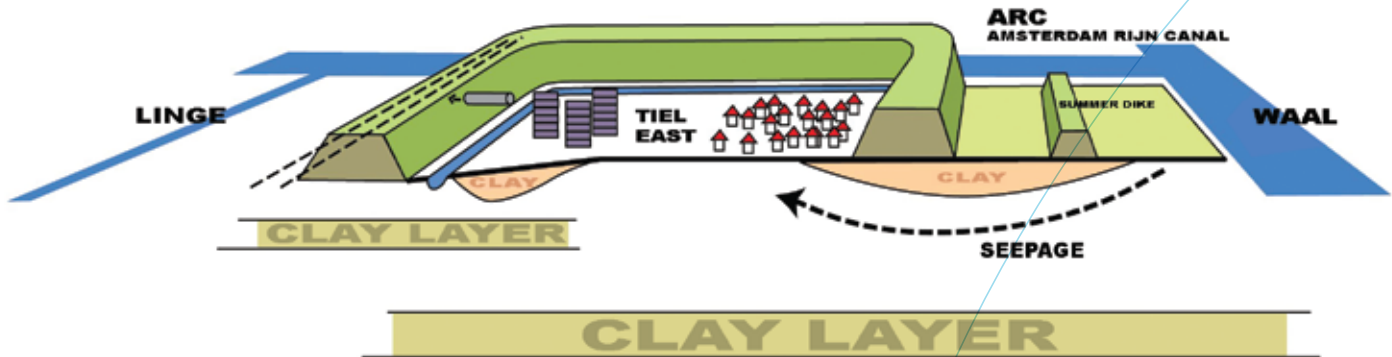


# Water flows from high to low

**The Netherlands is rich in water. This has attractive aspects, but also gives nuisance from time to time. The nuisance may differ greatly from place to place. In this way it will sometimes get quite wet in Tiel East, while within a stone's throw the centre of the town remains as dry as a bone. Also within Tiel East there are drier and wetter places. How does the water find its way?**

The first residents of Tiel built their houses on a natural height along the Linge. At the beginning of the nineteenth century the small town started to grow substantially. The natural height was soon full. For the new development districts the town had to move to lower-lying areas around the centre. Originally they were bank areas of the Linge and the Waal.

## Schematic cross-section of Tiel East



Grontmij Houten, june 2008

The Tiel East district is also built in a former bank area of the Waal. The river itself no longer reaches that point. A heavy dike prevents this. But a trickle of river water seeps under the dike continuously, which is also called seepage. The higher the river, the stronger the seepage flow. Water will flow from high to low. Under the dike along the Amsterdam Rijn Canal seepage water also flows to Tiel East.

In this manner the groundwater in Tiel East rises and falls with the water level in the river and the canal. The subsoil of Tiel East consists of clay and sand. In the past the river left those materials in a jagged pattern: in one spot somewhat more clay, in another somewhat more sand. Groundwater flows easier through a parcel of sand than through a layer of clay. That is the reason why the nuisance differs from place to place.

Especially in spring and autumn the water in the river and the canal is high. In low sandy parts of Tiel East the groundwater is then almost at street level. If a heavy shower falls in such a period, there is a considerable risk of water nuisance.



# The search for solutions

**The more the merrier. This was how the search for solutions was started. From resident to water expert, from historian to urban developer, from dike warden to project developer. A motley group of people started to look for ideas to make Tiel East drier and nicer. By combining the knowledge of many different people the best results are created.**

The task in Tiel East is not easy to solve. If that were true, water nuisance would have been a thing of the past long ago. That is why the municipality called in the assistance of a large group of experts. The district water board, the province and ministries have joined in. Engineering firms, urban developers, housing

corporations and building companies have studied the issues. Residents contributed their knowledge about the district.

The participants started working in four groups. They were inspired in various manners, for instance by a walk through Tiel East, a visit to water measures in Dordrecht or a digital discussion. The groups presented their findings three times in a large meeting, so that they could point out improvements and shortcomings to each other. Nothing was too outlandish at this stage.

Each group has made a new map of Tiel East. They include operations that can make the district drier and nicer. Jointly the groups have collected dozens of ideas. All kinds of things are included: permeable streets, a super-wide dike, new canals and ditches, overgrown roofs and water squares.

Some ideas could already be started tomorrow, in a manner of speaking, while other measures require more time.

In the end only one map of Tiel East can become reality. To realize that map the municipality had all the ideas thoroughly examined. Does the idea actually solve the problems with water nuisance? Is it feasible? How much does it cost? And which ideas may be properly combined with one another? The best ideas of each group have subsequently been combined into the preferred scenario.







## Scenario At Present: Short-term solutions

# Scenario R0 -H20: Linking urban development and water







Complete scenario:

Durable scenario for the future

1 Storing, draining and delaying the drainage



3 Community school, transformation and infra - Variant A



3 Community school, transformation and infra - Variant B



2 Draining



4 The "Kleine Willemspolder"





“When the water in the Waal is high, I have forty centimetres of water in the crawl space at my home. Almost all the residents of Tiel have to deal with water nuisance, not only in Tiel East. So far we have had to learn to live with this.

Damp crawl spaces are unhealthy, but that is no reason to demolish our homes. The residents are fiercely opposed to this. To enforce our arguments we have formed Bewonersbelangen Vogelbuurt Tiel (Residents Interest Group). We have participated in the meetings of the municipality regarding the seepage problems and helped to think about solutions. The residents believe that the seepage water must be drained faster and wonderful ideas for this have been developed in the last few months. Now we are anxiously awaiting the municipality’s plan.”

***Ab de Graaf ~  
Chairman “Vogelbuurt Tiel”  
Residents Interest Group***

## *Mirjam Cox ~ Resident of Tiel East*

“Recently the water in the Waal was high and when this happens there is always a pool of water in our cellar two days later. We have impregnated the floor, but that does not help. We have even installed drainage in our back garden; otherwise nothing would grow there. We must even count ourselves lucky because the beams in our house do not get wet. That is because our house is built on a somewhat elevated sand ridge.

Some time ago I read a notice of the municipality in the paper to participate in a discussion about water nuisance in Tiel East. I went there together with my father, because I would dislike it very much if nobody from our street would be there. It is important to tell the experts what life is like in this district. Otherwise we will get plans that have been devised behind the desk and that perhaps do not harmonize with the culture of Tiel East.

With a small group of residents we have thought of solutions for the district. It is sometimes a matter of small things. By removing street litter regularly, for example, you prevent the drain holes from becoming blocked. I would love it if they started operating the water tower again. It can take away a lot of groundwater and the water will be put to good use. But most of all I hope that no houses will be built in the Willemspolder. I would really hate that. As soon as you have passed the dike, you are in another world, pure nature. That is really my niche!”







# Preferred scenario

**The best ideas for Tiel East are in the preferred scenario. The water nuisance will decrease in these circumstances and the agreeable features of the water will actually be emphasized. Space for more houses and public green will be created as well. If all the parties decide to carry out the preferred scenario Tiel East will become drier and nicer.**

The preferred scenario has been composed of ideas that the experts and residents have thought up in the past period. If the municipality and other parties approve of it (the preparation of) the execution may be started. There is no universal remedy against water nuisance. That is why the preferred scenario consists of various operations.

Broadly four types may be distinguished:

- retain the water longer
- 'park' the water temporarily in storage areas
- drain the water to areas that are less vulnerable
- climate dike

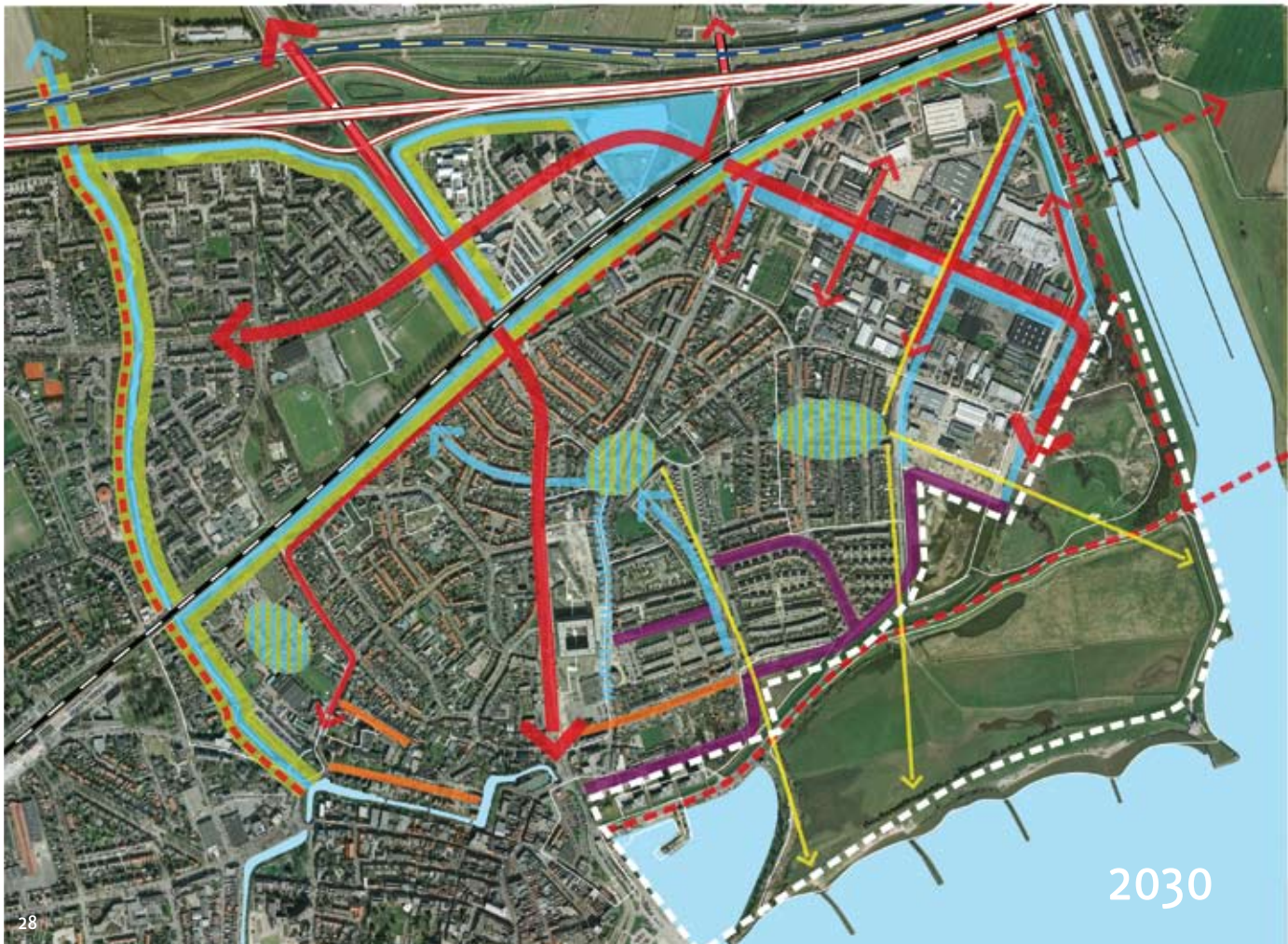
Drainage of water often results in problems in other places. The preferred solution is to retain water or store it temporarily. But it takes a lot of time to make the retention and storage possible. The residents of Tiel cannot wait for that. Experts therefore recommend an approach in different steps. In the preferred scenario the solid measures, such as the opening up of watercourses, will be effected in the longer term. Within about twenty years Tiel East will be durably climate-proof. In the short term the worst nuisance will disappear as a result of drainage in a part of the district.

## As good as possible

The preferred scenario is meant to tackle the problems of the district in the best possible manner. That means:

- solid: generously sized and natural
- durable: economical with the environment, energy and space
- climate-proof: resistant against high river drainage and heavy showers
- good quality of living: visible water, varied surroundings
- water conscious: living with water, on a small scale and on a big scale





2030

## LEGEND



The six components of the preferred scenario are:

### 1. Open watercourses

Open watercourses, such as ditches and ponds, have two advantages: they can store and drain rainwater. In the preferred scenario three new watercourses have been included.

The first watercourse will be located along the new arterial road from the A15. This will run via the extended “Laan van Westroijen” and

the business parks Westroijen and Latenstein to Tiel East. This new entrance is part of a traffic bundle that will cross through the whole of Tiel. Along the road there will be space for care institutions, retail trade and a home furnishings mall. The water must blend in properly with the space around these facilities and businesses. How this can be realized can be seen around the building of the Rivierenland Water Board. There the water got a place in all kinds of lovely ways.

The second watercourse is the “Doode Linge”, which already exists but will become much wider. This watercourse will moreover become more attractive with cycling tracks and foot-paths and public green. In this way cyclists will be able to ride to the polders north of Tiel via a new tunnel under the A15 and the Betuwe all-freight railway. The third watercourse is the Spoorsingel, which will be located south of the railway. Along the eastern part a separate cycle track and a walking area for the district will be created. The western part will also get a green layout and separate cycling tracks and a new thoroughfare for a better connection with the station.

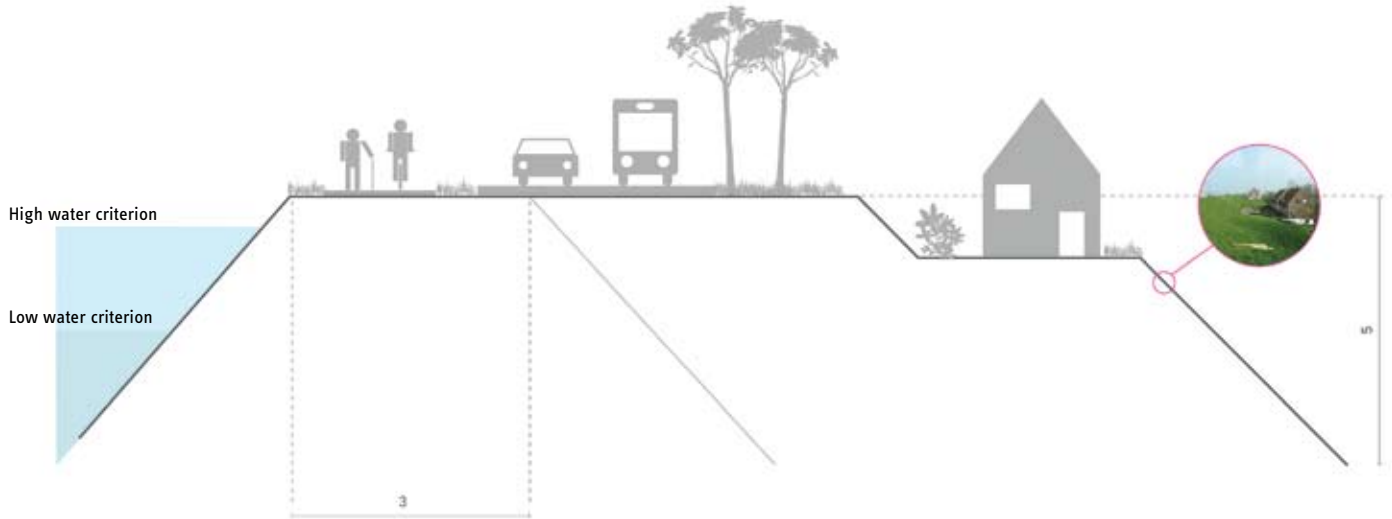
### 2. Wadis

Green spaces in Tiel East can store water by changing them into wadis. The low-lying wadis collect the water in the event of heavy rainfall and retain it for a while. In this manner it will reach the sewer less quickly. If it does not rain for a long time, they will be dry. It is important that the wadis are an attractive part of a park or a playground. In the long term the wadis may be connected with the planned new watercourses.

### 3. Water squares

Tiel East has space for three water squares: east of the “Doode Linge” in the Station area, halfway up the Grotebrugse Grintweg and in the middle of the Vogelbuurt. If water squares lie on the roof of an underground car park, the space will be used twice. Only when it rains very hard will the water squares be filled with water. The water flows there via gutters in the streets or green zones. The gutters of the new housing also lead to the water square. This relieves the sewer. Water squares may become prominent places in the district, with special playing facilities or another attractive layout. A beautiful integration requires proper consultation with all the landowners.

## Schematic profile of a mound dike



#### **4. North-south drainage**

In the middle of Tiel East one or more water connections are also necessary to drain off the excess water quickly to the circuit of open watercourses. Two tracks offer possibilities:

- via the southern part of the Grotebrugse Grintweg (in combination with new pavements);
- via the historic course of the Binnenboomse Wetering

With old maps the course of the Binnenboomse Wetering can be traced. In the past this watercourse provided the water drainage from the orchards in Tiel East. Restoration of the watercourse makes the water issue more visible and more perceptible.

#### **5. Climate dike**

The river dike occupies a lot of space, but that space can hardly be utilized. Building on or around the dike is bound to many rules, because the dike must remain strong and stable. By broadening the dike on both sides it becomes more stable and that offers new possibilities: a high-lying walking area overlooking the river, houses along the dike and building in the

Kleine Willemspolder. In Tiel East the climate dike will get the form of a mould dike. The dike will be broadened by laying mounds against it. The mould dike can be built in stages. Along the edge of the dike wadis will be realized.

#### **6. Drainage for quick result**

In the event of heavy rain the water will now flow very quickly to gutters and drain holes. In a short time the sewer will have to cope with much too much water. The preferred scenario will therefore start with an operation that will slow down the water flow to the sewer immediately: drainage. This operation could be carried out tomorrow, in a manner of speaking.

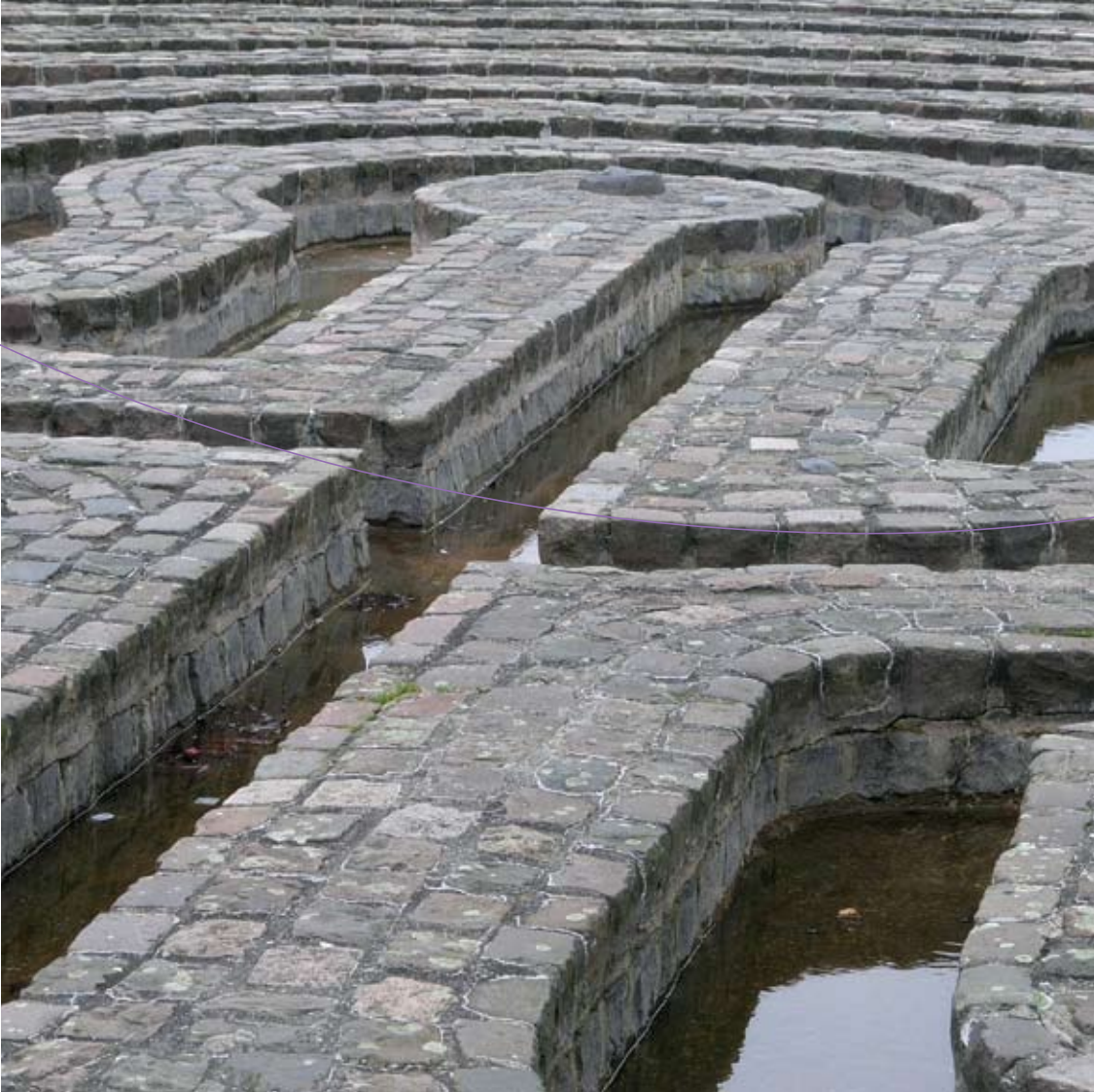
Ultimately drainage is not such a durable solution. It is an artificial manner to dry the ground and the maintenance of drainage pipes is expensive. Nevertheless it seems necessary to apply this measure in neighbourhoods where the groundwater nuisance is very big: the surroundings of Nachtegaallaan, surroundings of Hovenierslaantje, Vogelbuurt and the surroundings of Oude Medelsestraat and

Kanaalstraat. In the course of time durable solutions will replace the drainage.

#### **7. Water-conscious building and living**

The starting point of the preferred scenario is that each project in Tiel East will contribute to the reduction of the water nuisance from now on. In this manner it can be prevented that Tiel East will be in trouble again in a while. Big and small projects may contribute in various ways to the retention and storage of water. Examples are vegetation roofs on new buildings and permeable paving in parking places. The residents of Tiel East can also play their part by placing a rain barrel in the garden and by replacing paving with a lawn or plants.





## *Corné Nijburg ~ Living with Water*

“Tiel has set itself a complicated task: the water nuisance must be reduced, more houses must be realized and the quality of living of the district must be improved. That is quite something. But the municipality has chosen for a vigorous approach of the problem that other municipalities may benefit from as well. Tiel has stuck out its neck by having everyone join in the conversation and by developing plans together.

What I particularly like is that the parties have first painted a picture for the long term and only subsequently worked back to what is possible in the short term. The most acute problems must be tackled at once, because the residents are troubled by the water now and want to be able to go for a walk now. But you must not regret it in the long term.

Proven solutions such as drainage and more surface water are included in the plans. Tiel East may benefit a lot from this in the short term. But new ideas are also projected for the long term. A climate dike with houses for instance, and water squares. With water squares you attain a double advantage. You solve a problem and you make people conscious of “living with water”. It is important that people know how it works, because the authorities cannot control the water for a hundred per cent.”

*Living with water is a knowledge incentive programme with the following core messages: a new place for water, stimulating innovative water management, development and strengthening of the knowledge infrastructure. ([www.levenmetwater.nl](http://www.levenmetwater.nl))*





# From rain barrel to water square

**In the preferred scenario there are dozens of measures against water nuisance. They contribute to the retention, storage or drainage of water. This is how water nuisance can be tackled on all fronts.**

## **Retention**

### *Vegetation roofs*

Vegetation roofs are roofs that are grown with for instance sedum, a succulent. These roofs retain the rainwater for a long time before it flows to the sewer. The measure yields the best result with application on large flat roofs, for instance on business premises.

### *Removal of the paving*

Rain that falls on paved ground flows much quicker to the sewer than rain that falls on unpaved ground. By removing the paving less rainwater will end up in the sewer or it will reach the sewer less quickly. Where the ground-water level is not too high the rainwater can sink into the soil of the unpaved ground. This is how the load for the sewer will decrease even further. This measure is possible by converting squares into parks and verges into green strips or wadis. Private persons can also apply this measure by replacing paved garden terraces with grass, for example. In the preferred scenario the removal of paving is applied at many locations in the whole district.

### *Wadi*

Wadi is the Arabic word for valley. A wadi is a hollow where rainwater gathers and sinks into the soil. This is how the wadi forms a buffer in the event of superfluous rainfall. In general a wadi is grown with grass or rush. The plants ensure that the water becomes cleaner. A wadi can be created if paved ground is converted into unpaved ground, for instance a green strip.

### *Permeable paving*

Part of the paved ground consists of road surface. It is often not advisable to remove that paving. But the road surface may become permeable. The rainwater then flows between the joints of the paving bricks into the subsoil. The subsoil consists of lava rock for instance, which has a cleaning effect on the rainwater.





## **Storage**

### *Disconnecting*

Rainwater that falls on roofs usually ends up directly in the sewer via pipes. The District Water Board wants to disconnect part of the pipe system from the sewer and connect it to open watercourses. In that way the sewer and the sewage treatment system will be burdened less. At present disconnecting is still difficult, because there is only very little open water in Tiel East. If more watercourses are created it will become easier. In total the district water board wants to disconnect at least six hectares of paved surface.



### *Open watercourses*

Ditches and ponds give space to store water. When it rains the water does not flow to the sewer, but to the watercourses. It flows there via the ground or through pipes.

### *Rain barrel*

The well-known rain barrel is also a form of disconnecting. Rainwater that falls on the roof does not flow into the sewer, but ends up in the barrel. The water may subsequently be used for the garden, the flower boxes or to wash the car. The effect is small, but residents do play their part in this way.





### ***Water square***

Water squares are low-lying squares that store water in the event of heavy showers. They temporarily change into a shallow pond. In dry times they are regular squares where people meet and children play.

### **Drain off**

#### ***Drainage***

By putting drain pipes in the subsoil the groundwater level may be controlled better. It is a prerequisite that drainage via the drainage pipes does not cause problems in other places, for instance because the watercourses into which they flow become overloaded. Research must provide more insight into this.







## Huib van Heiningen ~ Historian and resident of Tiel

“Tiel is one of the oldest towns of the Netherlands, perhaps the Romans already lived here. Around 1500 the first watercourses were dug to drain off seepage water to the “Doode Linge”. So we have had ages of experience with water management and we must take advantage of that. Without knowledge of the history you cannot formulate policies.

In the sixties the municipality started to install sewers. The age-old watercourses were filled in, the water could after all flow to the sewer. In the beginning this also succeeded because the “De Betuwe” factory pumped away seepage water for the preparation of jam and fruit juices. But when that business closed its doors, things went wrong. When the river is high now, the seepage water flows into the cellars and in the street two days later. The sewer cannot cope with that mass of water. The best solution is obvious: open up those

old watercourses again. The “Binnenboomse Wetering” for instance. It lies exactly on the right spot, because in the past the water also flowed from high to low.

It is important that Tiel East will not be covered with buildings, because space is needed to stockpile the water. The lowest points must certainly remain free, it would be better to build a water square there. But it will never become dry as a bone in this district. I believe that the municipality should forbid parquet floors and underfloor heating in vulnerable houses.

People who come from the Randstad conurbation simply do not know that now and then it will get wet in Tiel”.

*met beeldmateriaal van*







# Weighed and found wanting

**A number of measures initially appeared attractive, but turned out to be unfeasible or impossibly expensive upon further studying. Those measures have not been included in the preferred scenario.**

## **High kerbs**

With high kerbs on both sides, streets can also store water temporarily. At such a moment the streets cannot be used by traffic and that may cause congestions. This measure was dropped for that reason.

## **Seepage quay**

Seepage quays were often built in the past. These are low quays lying at some distance from the river dike. Seepage water is collected in this area between the dike and the seepage

quay to keep the area behind the dike drier. But further on the nuisance actually increases. That is why this is not a sound solution.

## **Seepage screen along the dike**

The seepage water flows under the dike via a properly permeable sand layer. The seepage flow may be stopped by installing a seepage screen near the dike. The screen consists for example of sheetpile walls that must go all the way to the bottom of the permeable layer. In Tiel East the seepage screen would have to reach a depth of more than eighty metres. That is not a realistic solution.

## **Seepage ditch**

For a short time a seepage ditch seemed to be good manner to collect seepage water directly near the dike. Calculations show however that a seepage ditch actually attracts more water, also in the district.

## **Raising the ground level**

From a technical viewpoint raising the whole of Tiel East is the most effective solution to get dry feet. A raising of 0.50 to 0.75 meter would suffice. But the whole district would have to be demolished and rebuilt for this. That causes a lot of inconvenience, it is very expensive and hardly feasible. That is why this solution was abandoned. Raising the ground locally may be considered. A mound dike may be considered as a local raising.

## **Pumping to the Amsterdam Rijn Canal and the Waal**

The point of departure is that Tiel East does not shift the water problem to other areas or waters. Pumping to the Amsterdam Rijn Canal means that this canal will have to cope with even more water in times of high water levels. That is not a durable solution with regard to the climate.





### **Wadis on fallow land**

A few wadis have been included in the preferred scenario. In the preparation it was suggested that fallow lands offer space for even more wadis. That idea has not been incorporated because the construction of wadis costs a lot of money and it is uncertain in advance how long they can remain on fallow lands.

### **Impermeable layer Amsterdam-Rijn Canal**

Part of the seepage comes from the Amsterdam-Rijn Canal. If there is an impermeable (clay) layer at the bottom of the canal the seepage flow to Tiel East will become smaller. This measure tackles the problem at the source, but is very expensive. It is also difficult to check whether the layer is indeed impermeable.

### **Impermeable layer Waal**

A large part of the seepage water comes from the Waal. The seepage problem is tackled at the source by installing an impermeable layer at the bottom of the Waal. That is extremely expensive and the problems may shift to other areas. That is why this measure was abandoned.

### **Impermeable layer Tiel East**

In theory seepage water and groundwater can be stopped by installing an impermeable layer under the district, for instance a clay layer. This will only have effect if the whole of Tiel East is provided with such a layer. The installation will cause much inconvenience, is hardly feasible and extremely expensive. It is also difficult to prevent that the covering layer gets damaged, on account of the fact that people sink ponds or plant trees. For this reason this measure was abandoned.





## Next step

**The preferred scenario is promising. Tiel is going to consult with other parties whether the approach is feasible and affordable. If everybody decides to participate, the ground will soon be broken.**

From rain barrel to water square, the water nuisance in Tiel East can be tackled in many different ways. But the municipality of Tiel cannot do this alone. Other parties play a role as well, for instance the province, the district water board, the Department of Waterways and Public Work, project developers, housing corporation, entrepreneurs and residents. The first step is that the main parties approve the preferred scenario. To take that decision they must know how much the scenario will cost

and how they can pay it. When that has been arranged, the parties will jointly draw up a programme of execution. It will record who takes on which work and when it will be finished.

And then it is really going to happen. If the preferred scenario becomes reality, drainage pipes will soon be present in parts of the district. After that wadis, water squares, watercourses and other solid measures will follow to make the district climate-proof. That will undoubtedly cause a lot of inconvenience during construction. But after that the reward will follow: Tiel East nicer and drier.



***Bernard Teunissen ~  
Member of the  
Rivierenland District  
Water Board***

“Water nuisance is a serious matter. I would hate so see the wallpaper coming off the walls at my home or the cellar under water. It is unhealthy to live in a damp house. That is why I am happy that there are so many good ideas now. We can make this work.

Seepage water has always been there, it simply comes with a dike. It only becomes a problem when there are many buildings. Nowadays we impose demands on new building: there must be sufficient space for water storage. But within the new building projects in Tiel East that space is difficult to find, because the separate projects are so small. The solution entered the picture when we started to look at Tiel East as a whole. Then a lot more turned out to be possible, also in the old districts.

In addition we have called in the assistance of different experts. The contribution of the residents was very useful in this respect. I am impressed by their willingness to think along. The residents have enriched the plans with their personal experience and knowledge about the past of the district. That complete, joint approach in Tiel East may be an example to other municipalities.

I expect that we can now soon take the step to execution. The responsible parties are going to make clear arrangements about that: who is doing what and when will it be ready?”





It can be done. Water nuisance can be solved. With old familiar or innovative techniques we can fight the problems, also in swampy Tiel East. There is even space for more homes in this district on the Waal. This does require efforts on various fronts: fight the nuisance in the existing district, utilize the space around the high dike and create innovative building in the river foreland. Support of residents is essential, while realizing that not everyone can get what he or she wants. I often discuss this with residents. I have not met residents before who helped to think in such a willing and expert manner as in Tiel East. Professionally, not afraid of changes, with an eye for the interest of the district. That is a wonderful basis to make Tiel East drier and nicer.

Frans Tielrooij

*Ambassador of the Living with Water knowledge programme*