Fryslân Climate-Resilient 2050+

WETTERSKIP FRYSLÂN

provinsje fryslân
provincie fryslân

Water and soil as a basis for spatial planning in Fryslân

JULY 2023

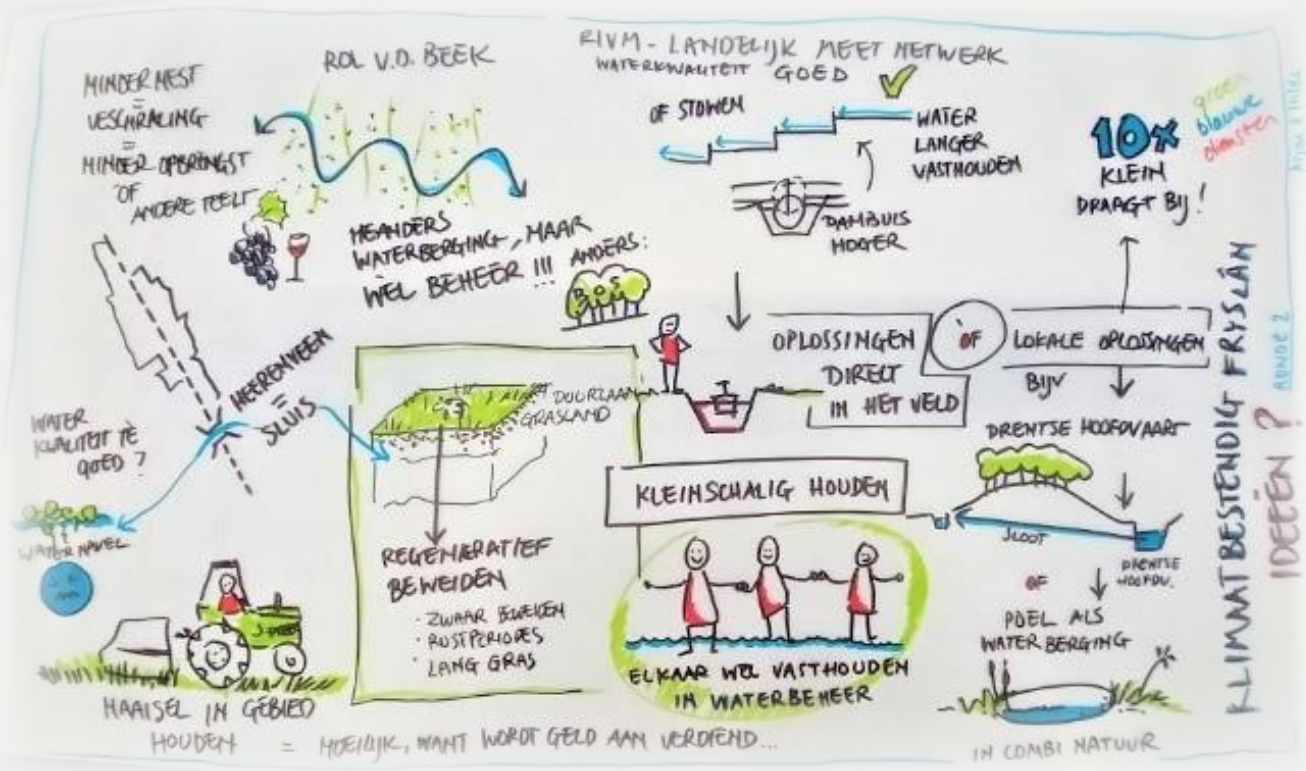
Summary

Towards a future-proof water and soil system in Fryslân

The Frisian surface water and groundwater systems are extremely interrelated. Due to the current way in which our water system functions, and because of future challenges, the Frisian water and soil system are reaching their limits. Drought on sandy soils, salinisation of groundwater and continuous oxidation of the remaining peat layers require measures. Furthermore, the availability of fresh water is under pressure; the water and soil system of Fryslân will eventually be too dependent on the water supply of lake IJsselmeer. Rising sea levels require us to keep working on dike reinforcements. Without intervention, these developments will lead to water safety issues, a decrease in production and consumption and loss of property value.

The water system of the future must be a system based on a long-term vision of a climate-resilient Fryslân, in which the natural principles of our water and soil system are guiding. A system that is future-proof; resilient to the effects of climate change, sea level rise and extreme weather events, while providing a healthy basis for human use, nature and biodiversity. This primarily means that the design of the water and soil system is a good basis for a sustainable fresh water balance throughout Fryslân. In the vision document Fryslân Climate-Resilient 2050+, the Provincie of Fryslân and waterboard Wetterskip Fryslân have outlined a vision for a climate-robust design of Fryslân for 2050 and beyond, with water and soil as guiding in principles in spatial planning.

[1] https://www.rijksoverheid.nl/documenten/kamerstukken/2022/11/25/water-en-bodem-sturend



The vision is not a blueprint for Fryslân in 2050, but an urgent call to partners and residents involved to bring about the necessary changes in the water and soil system together.

In November 2022, the Dutch Minister of Infrastructure and Water Management sent a parliamentary letter titled 'water and soil as a basis for spatial planning' (Water en bodem sturend in de ruimtelijke inrichting, WaBoS). Fryslân Climate-Resilient 2050+ not only describes a vision on future water management, but it is also the translation of the WaBoS-letter for the various sub-areas of our region: sand, clay, peat, the Wadden area and the built environment. With this, Fryslân Climate-Resilient 2050+ is also the input from our water and soil system for the Frisian execution of the national programs 'National Strategy on Spatial Planning and the Environment Extra' (Nationale Omgevingsvisie Extra, NOVEX) and National Rural Area Programme (Nationaal Programma Landelijk Gebied, NPLG)'
During the implementation we take into account external factors, such as changes in the water level of lake IJsselmeer, which may necessitate an update of the vision.

This vision was established in 2022 following three tracks (see Figure 1):

1. An active participation process with the Frisian 'Mienskip' (local community) and representatives of interest groups, and in co-creation with public officials and representatives of waterboard Wetterskip Fryslân, the province of Fryslân and the surrounding municipalities.
2. In addition, the specialists of Wetterskip Fryslân and the province of Fryslân have worked together on the substantiation of the vision. For this, long-term knowledge development and recent research into the Frisian water and soil system have been used.
3. This document is the Frisian translation of the national directive described in the letter 'Water and soil as a basis in spatial planning' (WaBoS letter) that was presented to the House of Representatives by the Ministry of Infrastructure & Water Management on 25 November 2022. This letter has a time horizon up to 2030. This letter will be translated into national policy programme 'water and soil'.

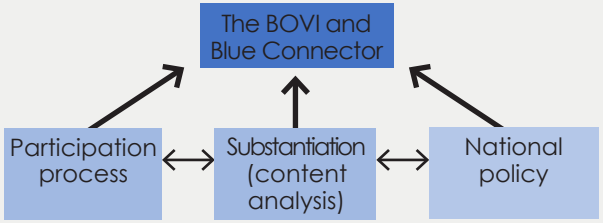


Figure 1 Three tracks of preparation of Blue Environmental Vision and Blue Connector

The challenges of the water and soil system

Fryslân is characterized by high sandy soils, low-lying peatlands and clay areas along the north-western coast. Distinctive are the lakes, the extensive system of interconnected canals and lakes (known as the 'Boezem') and the stream valleys in the eastern part of the province. The Frisian water system is an artificial 'polder' system combined with free-flowing sections , protected by flood defence along the lake IJsselmeer and Wadden Sea. It is largely an artificial system, aimed primarily at draining excess water, with a high dependence on supply of IJsselmeer water in periods of water shortage. The Frisian Boezem is important for fresh water drainage and supply, is a connector of ecological values, and used for shipping and (water) recreation.

Water and soil are closely linked. The soil is important for regulating moisture/water and nutrients, for production capacity and biodiversity and for supporting buildings and infrastructure. It is important to understand the relationship between the soil and water system as well as its functioning. This is depicted in Figure 2. It shows that the peatland areas have a major influence on the entire groundwater system of Fryslân, currently as well as in the future.

Analyzing the water and soil system makes clear that measures in the peatlands are crucial to obtain a sustainable and climate-proof soil system and water management in the future. The current system is reaching its limits, even more so by the effects of climate change. Towards 2050 and beyond, we are facing the challenges set out here.

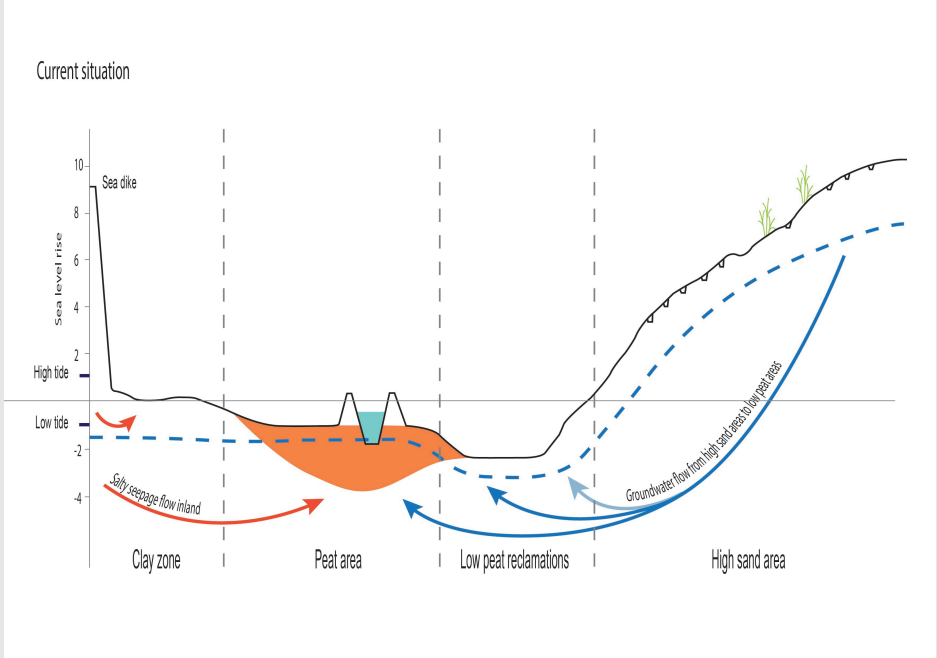


Figure 2 Cross-section from northwest (Wadden coast) to southeast (High sandy soils) that shows the interrelationship of the Frisian soil and water system

- It is becoming increasingly difficult to keep the peatland sufficiently dry for various functions. Oxidation of peat causes an increase in seepage from the subsurface and from the Boezem system. Land subsidence in these deep parts of the Frisian system strengthens and accelerates groundwater to flow from the sandy soils and from the clay area towards the middle of Fryslân. As a result, groundwater levels in the sandy soils drop and the deep saline groundwater flow moves further inland;
- Further sea level rise necessitates new dike reinforcements for water safety and increases salinisation;
- Decreasing security of fresh water supply from lake IJsselmeer;
- Water quality under pressure in dry and hot periods;
- The design of the water system is not resistant to extreme drought or extreme precipitation;
- Soil vitality (important for soil fertility and biodiversity) is under pressure, along with the ability of soil to retain water;
- The maintaining of a sufficiently large fresh water bubble below the Wadden Islands is under pressure due to sea level rise and water extraction;
- More frequent and severe periods of flooding and heat stress in the built environment.

Guiding principles for the blue environmental vision

To face these long-term challenges, eight guiding principles have been formulated. These principles form the mindset along which the vision for the future is drawn up for all the regions within Fryslân:

1. A resilient soil and water system, which forms a good basis for a sustainable fresh water balance throughout Fryslân. This requires a shift in focus from draining water to retaining water. It envisions a system which can better cope with extreme conditions. This also includes learning to deal with the risks of flooding and drought;

2. More area-based fresh water to be available (groud- as well as surface water). The normalcy with which we count on water inlet from the lake IJsselmeer might change. It is important to anticipate upon this now, reduce our dependency, and work towards a province that can cope with long periods of drought;

3. No passing on of current challenges to future generations, to other areas, or from private to public and vice versa. This means that we take climate change into account in a timely and sufficient manner during current investments;

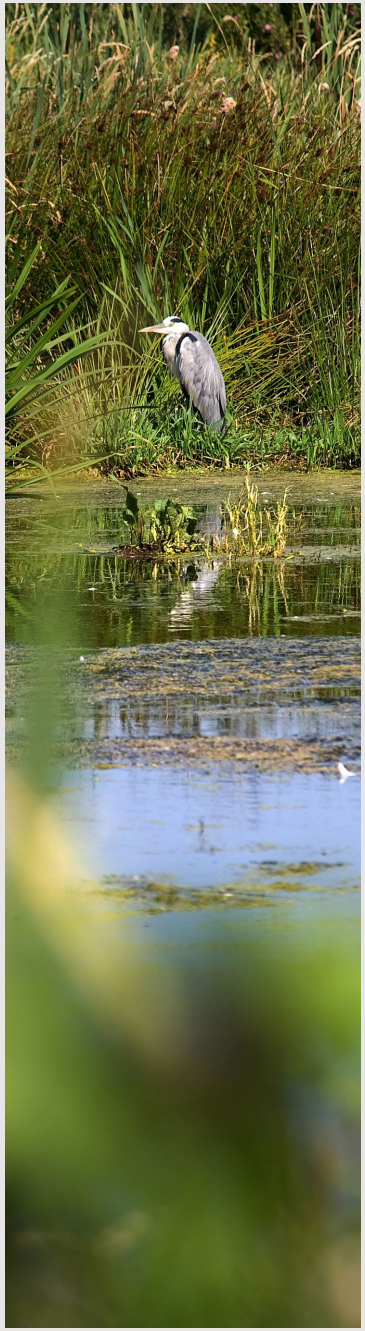
4. Soil vitality improves; we are committed to restoring, preserving and improving the chemical and biological soil quality; in this way we promote water retention capacity and biodiversity;

5. Water quality improves; this is essential for the restoration of natural values and biodiversity, for agriculture and for recreation;

6. We work on water safety following the multi-layer safety principle (robust primary flood defences, future-proof spatial planning, adequate crisis and risk management);

7. Circular (with special attention to CO2 retainment, energy transition, and the sustainable use of (raw) materials);

8. Partnership, because we can only meet the challenges together with everyone involved.



Visions on the sub-regions

Based on these eight principles, this vision presents the future of the water and soil system, specifically for the Frisian sub-regions towards 2050 and beyond. The vision provides soil and water users and officials with insight into the soil, surface water and groundwater system. The vision is not a blueprint for Fryslân in 2050 and beyond, but an urgent call to partners such as municipalities, interest groups, site managers, entrepreneurs and residents, to bring about the urgent reconsideration and integral change together. It concerns the interconnections and dependencies in the Frisian water system and the specific challenges and characteristics of the sub-regions in the sandy soils, peatlands, clay soils, Wadden Islands and the built environment. For our different regions we envision the following:

Sandy soils

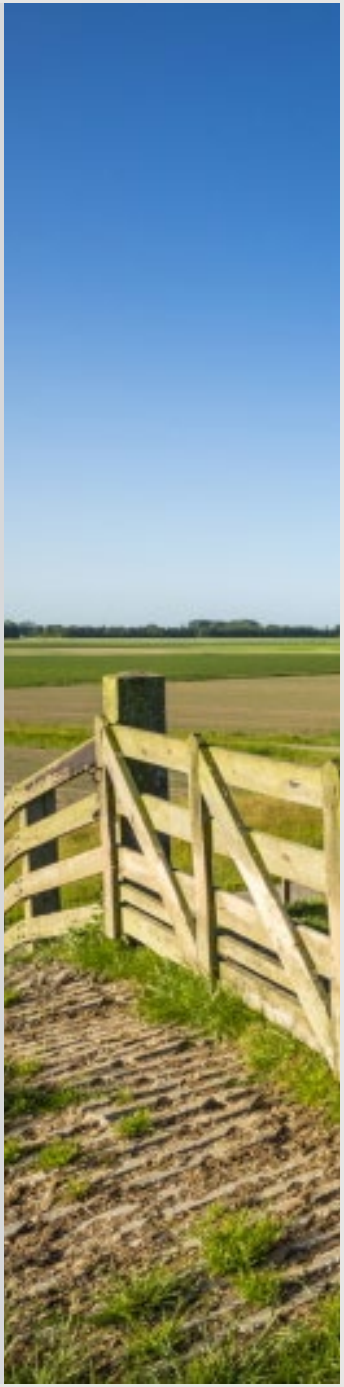
In 2050 and beyond, we will retain water longer on the sandy soils and drain more slowly. In the summer we no longer have to supply water from other regions. The stream valleys are crucial for this. We achieve a robust groundwater system. We retain water in vital soils with sufficient organic matter, in which the water can infiltrate on high soils to restore seepage in low parts. Despite these efforts, we also accept changes and temporary water nuisance in the sandy soils. Sometimes it will be wetter or drier than desired. This acceptance is important in dealing with climate change.

Peatlands

In 2050 and beyond, peat oxidation, subsidence and CO2-emissions in the peatland will have virtually stopped.
In this way, the drying influence of the peatland on the sandy soils is restricted and the inflow of the deep saline groundwater flow is slowed down.
We are gradually working towards a level where peat oxidation practically stops. In addition, retaining rainwater as much as possible is necessary to reduce dependence on fresh water from lake IJsselmeer. Without measures in the peatlands, the measures in other areas will never achieve an optimal result.

Clay areas

In 2050 and beyond, the coastal clay soils will remain being an important agricultural area of Fryslân with vital soil and robust fresh water lenses below the ground.
The entire clay area is protected by a flood defense, which does justice to the ecological connection between the parts inside and outside the dikes. This entails a need for soft transitions between fresh and salty waters that make it easier for animal species to migrate back and forth. In order to prevent further increase in salt seepage and salinisation as much as possible the groundwater levels are raised. Low parts are the first to suffer from salinisation and flooding. There is room for water storage in these low parts, which prevents flooding in areas where the conditions are still optimal for arable farming. The agricultural use of the clay area has no negative effects on water quality because soil particles, nutrients, and crop protection products no longer run-off to the water system. In addition to the functioning of the water system, the maintenance of the waterways is also geared to the ecological value of the waterways. Because we expect that in 2050 we will not be able to rely to the same extent on fresh water supply from the lake IJsselmeer as we do now, here we have to accept that it is not always possible to actively swill everywhere to prevent the salinisation of surface water.



Wadden Islands

In 2050 and beyond, the fresh water bubble on the Wadden Islands will be in balance, despite sea level rise and climate change. This means that the use and replenishment of fresh water are in balance. To achieve this, we are gradually raising the groundwater levels in the dunes and inner dune edge along with the sea level rise. In the polders we accept local salinisation and flooding. We do this per island in a way that takes into account the local characteristics.

Built environment

In 2050 and beyond, Fryslân will be climate-neutral and climate-robust. We build climate-robustly (in accordance with the water-robust building guidelines from the Environmental Ordinance of the province of Fryslân). Living and working on or in the vicinity of water will still be characteristic and an important quality of Fryslân in 2050. Heat stress, drought and flooding do not pose unacceptable risks to the quality of life.

Future water vision

Water and soil as basis for a climate-resilient Fryslân in 2050+

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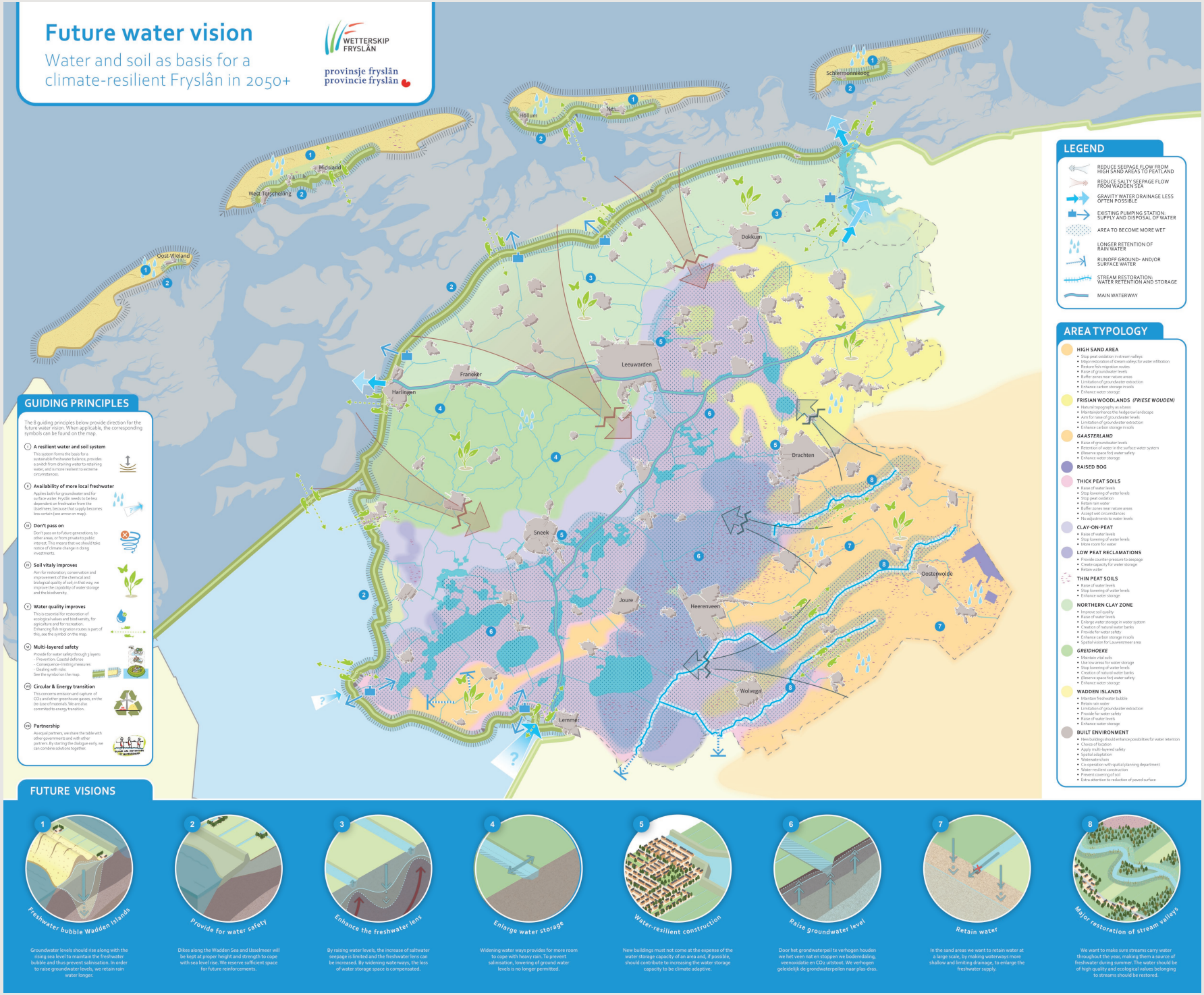


LEGEND

- REDUCE SEEPAGE FLOW FROM HIGH SAND AREAS TO PEATLAND
- REDUCE SALTY SEEPAGE FLOW FROM WADDEN SEA
- GRAVITY WATER DRAINAGE LESS OFTEN POSSIBLE
- EXISTING PUMPING STATION: SUPPLY AND DISPOSAL OF WATER
- AREA TO BECOME MORE WET
- LONGER RETENTION OF RAIN WATER
- RUNOFF GROUND- AND/OR SURFACE WATER
- STREAM RESTORATION: WATER RETENTION AND STORAGE
- MAIN WATERWAY

AREA TYPOLOGY

HIGH SAND AREA
- Stop peat oxidation in stream valleys
- Major restoration of stream valleys for water infiltration
- Restore fish migration routes
- Raise of groundwater levels
- Buffer zones near nature areas
- Limitation of groundwater extraction
- Enhance carbon storage in soils
- Enhance water storage

FRISIAN WOODLANDS *(FRIESE WOUDEN)*
- Natural topography as a basis
- Maintain/enhance the hedgerow landscape
- Aim for raise of groundwater levels
- Limitation of groundwater extraction
- Enhance carbon storage in soils

GAASTERLAND
- Raise of groundwater levels
- Retention of water in the surface water system
- (Reserve space for) water safety
- Enhance water storage

RAISED BOG

THICK PEAT SOILS
- Raise of water levels
- Stop lowering of water levels
- Stop peat oxidation
- Retain rain water
- Buffer zones near nature areas
- Accept wet circumstances
- No adjustments to water levels

CLAY-ON-PEAT
- Raise of water levels
- Stop lowering of water levels
- More room for water

LOW PEAT RECLAMATIONS
- Provide counter-pressure to seepage
- Create capacity for water storage
- Retain water

THIN PEAT SOILS
- Raise of water levels
- Stop lowering of water levels
- Enhance water storage

NORTHERN CLAY ZONE
- Improve soil quality
- Raise of water levels
- Enlarge water storage in water system
- Creation of natural water banks
- Provide for water safety
- Enhance carbon storage in soils
- Spatial vision for Lauwersmeer area

GREIDHOEKE
- Maintain vital soils
- Use low areas for water storage
- Stop lowering of water levels
- Creation of natural water banks
- (Reserve space for) water safety
- Enhance water storage

WADDEN ISLANDS
- Maintain freshwater bubble
- Retain rain water
- Limitation of groundwater extraction
- Provide for water safety
- Raise of water levels
- Enhance water storage

BUILT ENVIRONMENT
- New buildings should enhance possibilities for water retention
- Choice of location
- Apply multi-layered safety
- Spatial adaptation
- Waterwatercham
- Co-operation with spatial planning department
- Water-resilient construction
- Prevent covering of soil
- Extra attention to reduction of paved surface

GUIDING PRINCIPLES

The 8 guiding principles below provide direction for the future water vision. When applicable, the corresponding symbols can be found on the map.

I A resilient water and soil system
This system forms the basis for a sustainable freshwater balance; provides a switch from draining water to retaining water, and is more resilient to extreme circumstances.

II Availability of more local freshwater
Applies both for groundwater and for surface water. Fryslân needs to be less dependent on freshwater from the IJsselmeer, because that supply becomes less certain (see arrow on map).

III Don't pass on
Don't pass on to future generations, to other areas, or from private to public interest. This means that we should take notice of climate change in doing investments.

IV Soil vitaly improves
Aim for restoration, conservation and improvement of the chemical and biological quality of soil, in that way, we improve the capability of water storage and the biodiversity.

V Water quality improves
This is essential for restoration of ecological values and biodiversity, for agriculture and for recreation. Enhancing fish migration routes is part of this, see the symbol on the map.

VI Multi-layered safety
Provide for water safety through 3 layers:
- Prevention: Coastal defense
- Consequence-limiting measures
- Dealing with risks

See the symbol on the map.

VII Circular & Energy transition
This concerns emission and capture of CO_2 and other greenhouse gasses, en the re-luse of materials. We are also commited to energy transition.

VIII Partnership
As equal partners, we share the table with other governments and with other partners. By starting the dialogue early, we can combine solutions together.

FUTURE VISIONS

1 Freshwater bubble Wadden Islands

Groundwater levels should rise along with the rising sea level to maintain the freshwater bubble and thus prevent salinisation. In order to raise groundwater levels, we retain rain water longer.

2 Provide for water safety

Dikes along the Wadden Sea and Usselmeer will be kept at proper height and strength to cope with sea level rise. We reserve sufficient space for future reinforcements.

3 Enhance the freshwater lens

By raising water levels, the increase of saltwater seepage is limited and the freshwater lens can be increased. By widening waterways, the loss of water storage space is compensated.

4 Enlarge water storage

Widening water ways provides for more room to cope with heavy rain. To prevent salinisation, lowering of ground water levels is no longer permitted.

5 Water-resilient construction

New buildings must not come at the expense of the water storage capacity of an area and, if possible, should contribute to increasing the water storage capacity to be climate adaptive.

6 Raise groundwater level

Door het grondwaterpeil te verhogen houden we het veen nat en stoppen we bodemdaling, veenoxidatie en CO_2 uitstoot. We verhogen geleidelijk de grondwaterpeilen naar plas-dras.

7 Retain water

In the sand areas we want to retain water at a large scale, by making waterways more shallow and limiting drainage, to enlarge the freshwater supply.

8 Major restoration of stream valleys

We want to make sure streams carry water throughout the year, making them a source of freshwater during summer. The water should be of high quality and ecological values belonging to streams should be restored.

Spatial implications and how to proceed

The principle of ‘water and soil as a basis for spatial planning’ means that spatial planning will once again follow the logic of the landscape, instead of using technical measures to make everything possible everywhere. The starting point of water and soil will therefore be the ‘table’ on which the future puzzle of spatial planning and land use will be made. The process of putting this puzzle together is necessary, because if all plans are given the space they necessitate, we would need 1.8x Fryslân. That space is simply not available. Therefore, it is necessary to combine forms of land use and combine challenges as much as possible. There are opportunities and possibilities here: water storage and water conservation can, for example, go hand in hand with nature development, (adapted) agriculture, housing and recreation.

The province of Fryslân provides direction and frameworks for the considerations, choices and adjustments of the future space and land use in the province. Fryslân Climate-Resilient 2050+ elaborates on this and translates how water and soil contribute to achieving these tasks.

Proceeding with water and soil as a basis requires structuring choices and an area-oriented approach. The POVI and especially the FPLG are very important vehicles for this. Fryslân Climate-Resilient 2050+ makes clear which important consequences and possibilities this entails. It requires spatial planning to be based on the necessity of a more natural and climate-resilient soil and water system. This is the foundation for the future of land use. It is now necessary to act to seek and create opportunities and possibilities.

The proceeding of this long-term vision is also implemented in the policy cycle of waterboard Wetterskip Fryslân and the Frisian municipalities. There has not been conducted a social cost-benefit analysis.

As soon as this future vision becomes part of the FPLG and the provincial NOVEX puzzle, and as soon as the vision is translated into concrete goals and measures in the area-oriented approach, an integral assessment can take place. As soon as it is clear which water and soil-oriented measures must take place, and with what urgency, it can be examined whether implementation fits within the regular implementation of our current provincial and water board tasks, or whether additional funding is needed.

Above all, continuation requires broad consultation and cooperation, otherwise the described change will not come about. Fryslân Climate-Resilient 2050+ gives a number of spatial consequences, based on the area descriptions and analyses. These are further elaborated upon in provincial environmental programmes and the area-oriented approach.

Key role for the peatlands requires a careful area-oriented approach

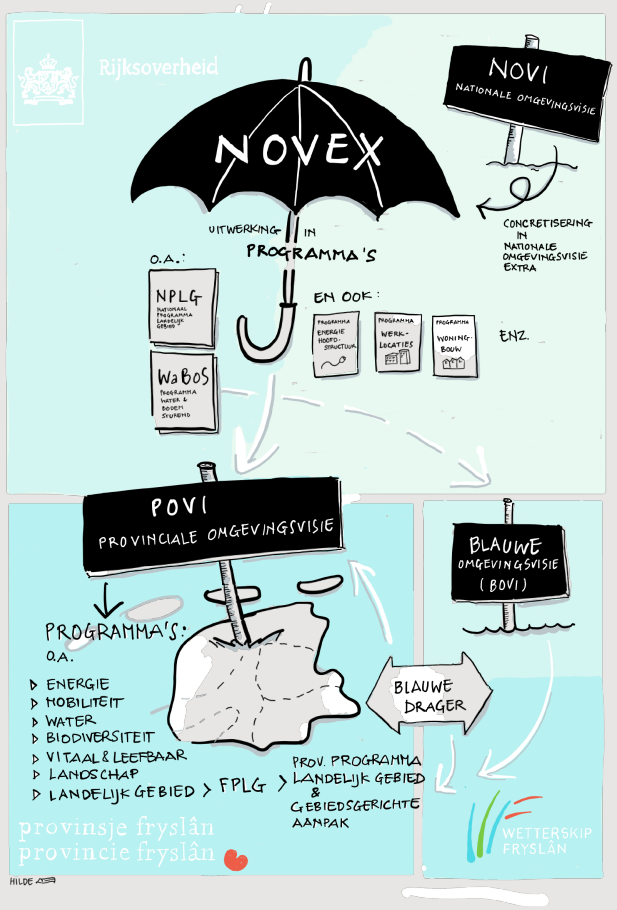
An important spatial consequence is the important position which the peatlands in the lower middle of Fryslân have. They play a crucial role in the future water system. Measures in this region benefit both the subterranean seepage flow of the high sandy soils and the 'Drents Plateau' and the reduction of the salinisation flow from the Wadden Sea. Water management and soil improvement measures in the other sub-regions will not achieve optimal results if measures are not implemented in the peatlands as well. The impact of autonomous developments such as peat oxidation and subsidence is large in the peatlands region and will increase as a result of climate change. Fryslân Climate-Resilient 2050+ is an extension of the course followed in the Peatlands Programme (Veenweideprogramma) but has a longer time horizon. Just like the Peatlands Programme, this future vision entails a transition in the area. In any case, this has consequences for agriculture, nature (management) and landscape development, but also for housing, infrastructure and recreation. Reserving space for the water system can come at the expense of agricultural land in all sub-areas, but at the same time contribute to the availability of sufficient surface and groundwater, also for agriculture, when necessary.

Droughts poses risks for the harvest; more (fresh) water retention can help prevent these risks. In the context of the FPLG, this requires a careful and responsible approach from the authorities, with an eye for

the human dimension and in close cooperation with land users, knowledge institutions and chain partners.

Space for more area-based water for green-blue connections and biodiversity

The restoration of natural values and biodiversity is supported by improving the hydrological conditions required for this. The long-term vision in Fryslân Climate-Resilient 2050+ focuses on limiting droughts with higher groundwater levels and restoration of stream valleys. In all sub-regions, more space is needed for the Frisian water system, for water retainment and for making water locally available. This supports the improvement of green-blue connections, biodiversity and water quality.



Built environment: increasing space for (Boezem-)water and opportunities for aquathermal energy

'Water and soil as a basis for spatial planning' means that expansion of the built environment takes place in a water-robust way, in sensible locations that contribute to reserving space for expansion of the main water system. This means that risks brought about by extreme weather events are taken into account. Such events, such as cluster showers or long periods of drought, will be more frequent due to climate change.
The prevention of peat oxidation by no longer artificially lowering or raising groundwater levels, in turn helps to prevent subsidence and foundation damage.
The Frisian ambition to become the aquathermal province of the Netherlands provides an opportunity to connect this to improvements in the water system. Thoughtfully increasing surface water near the built environment might provide the opportunity to extract warmth for heating from this surface water. This is on the condition that no deterioration, and where possible even an improvement, of the ecological water quality takes place.

Landscape, cultural history and new developments
The existing Frisian landscape is highly appreciated. The water-rich landscape and the Wadden Islands are characteristic for Fryslân's identity. The cultural history can be clearly read in the different landscapes. The changes in the water system outlined in Fryslân Climate-Resilient 2050+ are part of the further development of landscape, cultural history and heritage. An earlier provincial structural vision describes the three components of environmental quality: amenity value, use value and future value.

Spatial quality arises where these three components come together and are weighed amongst each other. Changes in the water system are tested for their effect on spatial quality.

Water recreation
A challenge for the future is to combine (water) recreation with improving biodiversity, constructing natural banks and continuing to work towards a water quality sufficient for bathing and swimming.

Mobility and infrastructure
Mobility, infrastructure, water and soil are closely linked. The groundwater level is important for existing infrastructure and level fluctuations can increase pressure on its foundations. Water level fluctuations and more space for water in the Frisian water system can affect the sailability of the waterways (temporary effects on passability of bridges or the loadability of ships). Nevertheless, in the future the Frisian water system will remain a very reliable transport system. In the case of (re) construction of infrastructure (such as vital works and the potential new railway connection 'de Lelylijn'), measures to future-proof the soil and water system must be taken in advance.

bron:
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