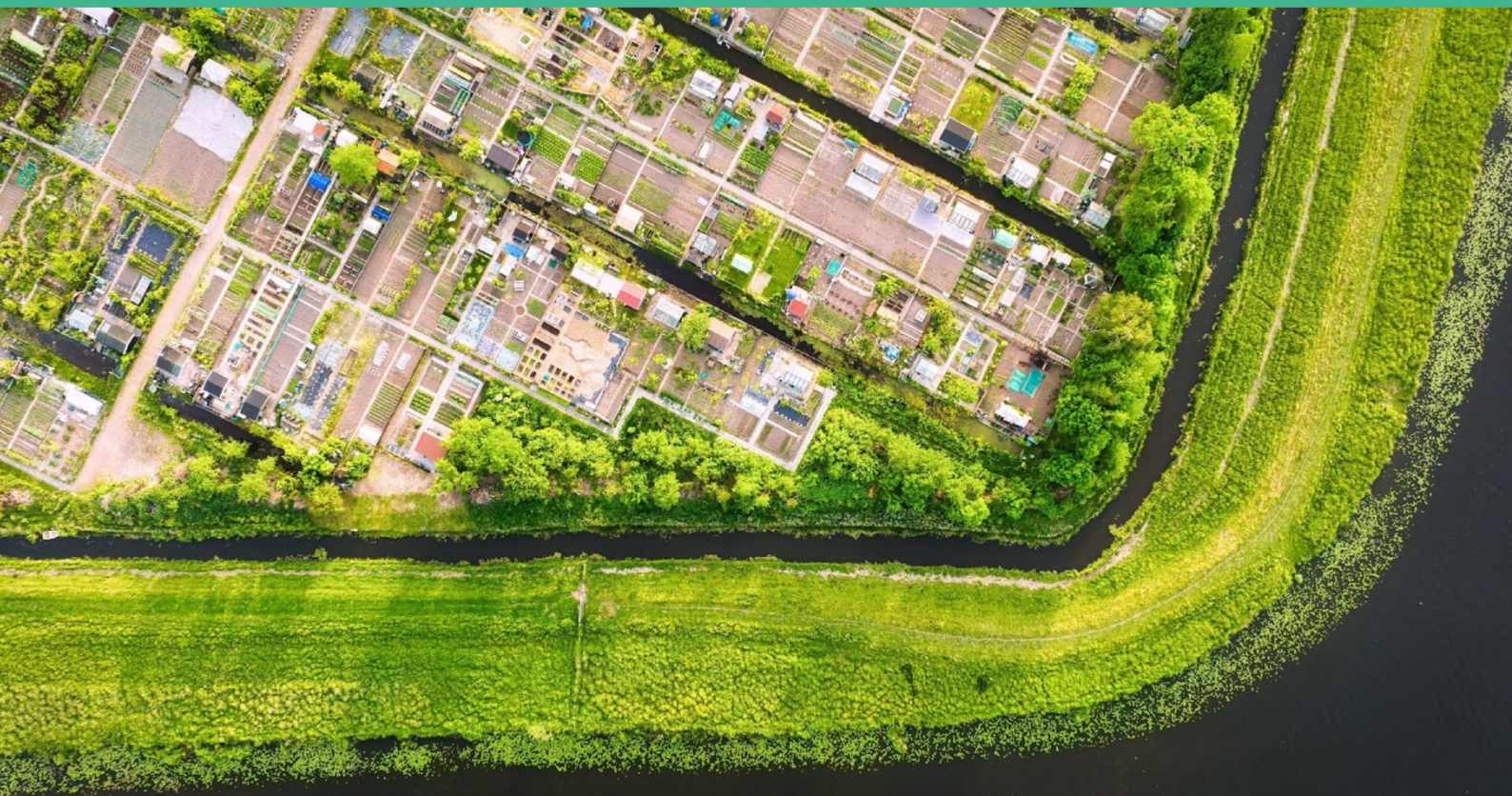


# From Ambition to Action: Translating "Water and Soil as Guiding Principles" into Practice



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# Executive Summary

The traditional Dutch spatial planning model, which generally prioritized development and treated water management as a subsequent technical challenge later, is facing mounting pressures. Escalating climate impacts, soil subsidence, and flood risks are pushing this reactive approach to its technical and financial limits. The "Water and Soil as Guiding Principles" (WBS) policy was introduced as a necessary paradigm shift to make the natural system foundational to spatial decisions. This report analyzes how this flexible national guideline is being translated—or failing to be translated—into binding, local action.

Our comparative analysis of seven diverse development projects reveals that WBS implementation is not automatic; it is highly variable and depends on local political, financial, and institutional contexts. This variation is defined by four central trade-offs:

1. The Financial Trade-off: Short-term viability vs. long-term resilience.
2. The Legal Trade-off: National flexibility vs. local enforceability.
3. The Governance Trade-off: Procedural efficiency vs. collaborative buy-in.
4. The Knowledge Trade-off: Specialized innovation vs. institutional standardization.

Success is not guaranteed; it is *constructed* locally. WBS gains traction only when provinces use it as a mandatory precondition (as in Gnephoek), municipalities create their own binding rules to fill regulatory gaps (as in Merwehaven), or water boards evolve from passive advisors to proactive co-designers (as in Rijnenburg).

To move WBS from a flexible "consideration" to a non-negotiable "condition," this report provides concrete recommendations for each layer of government. At the national level, this includes mandating technical baselines (e.g., for rainfall retention) and requiring Life Cycle Costing (LCC) in public tenders to create a level playing field. At the regional level, provinces must enforce WBS as a binding precondition in their environmental policies, while water boards must be formalized as co-design partners from a project's start. Finally, municipalities must build dedicated internal expert teams where possible to overcome institutional resistance and adopt innovative financing models that use housing revenue to fund public resilience goals.

# 1 WBS Context

## 1.1 Historical Context and Motivation for WBS

For centuries, Dutch spatial planning was inherently linked to its water and soil conditions. The Romans understood that in a Delta, one must first analyze the landscape before deciding where to live or farm. This system-based approach was later formalized into concepts like the "layer system," which distinguishes between the natural subsurface (water and soil), the infrastructure network, and the occupation layer (buildings). The goal was to align development with the natural system.

However, over time, a belief emerged that technical solutions could make development possible anywhere. The historical approach became one where spatial developers would create plans, and water managers would subsequently be tasked to "arrange it"—ensuring the area was kept dry and wastewater was removed. This practice disconnected the layers, treating the natural system as an afterthought rather than a starting point. The consequences of this approach became increasingly unsustainable, in some cases leading to severe issues like soil subsidence, groundwater problems, flood damage, and foundational issues with houses.

Faced with these growing problems and the intensifying effects of climate change, a consensus grew among water authorities and research institutes that this historical approach was no longer viable. Research institutes like Deltares co-authored influential essays, such as "Op Water Basis" ("Water Based"), arguing that the system was at its limits and a fundamental shift was necessary. Water boards had also been advocating for decades that "water should be a guiding principle". These and similar considerations created a basis for greater lobbying of the national government.

This sustained pressure culminated in the inclusion of a key sentence in the 2021/2022 national coalition agreement: "water en bodem should become guiding for spatial planning". This was seen as a critical moment for the water sector, finally placing the issue on the highest political agenda. The Ministry of Infrastructure and Water Management was then tasked with translating this ambition into concrete policy.

## 1.2 The WBS Principles and Policy Framework

The ministry released the formal policy in a Parliament letter (Kamerbrief) in November 2021/2022, making WBS official national guidance.

The letter outlined seven guiding principles:

1. Do not pass on: This applies to both future generations and areas or functions, and from private to public
2. Consider extremes more: We are increasingly dealing with heavy and prolonged rainfall and periods of heat and drought
3. Address water nuisance, drought, and soil in an integrated manner: Smarter management of the water and soil system to retain water during wetter periods to mitigate the effects of drought

4. **Multi-layered safety:** In addition to strengthening the dikes, spatial planning behind the dike and crisis management are essential to ensure the safety of our Delta
5. **Less covering, less excavation, no contamination;** It is important to handle soils wisely as soil-forming processes are slow, and restoration is complex and costly.
6. **Integral approach in the living environment:** Challenges in the area and the water and soil system are examined in conjunction to achieve optimal planning
7. **Comply or explain:** The structuring choices from the letter are leading, and deviating requires careful justification.

A key operational principle is "comply or explain," which provides flexibility but has been criticized for being too soft and lacking clear enforcement mechanisms.

We define two critical phases for analysis:

1. **Adoption:** The formal integration of WBS principles into a project's guiding documents (e.g., policy, strategy, agreements).
2. **Implementation:** The translation of these adopted principles into binding commitments and on-the-ground, constructed measures.

The policy provides a framework for provinces and municipalities by establishing a new norm for spatial planning. It is supported by tools like the spatial assessment framework map (ruimtelijke afwegingskader), which color-codes areas as "yes," "yes, but," or "no, unless" for development locations, and the maatlat (yardstick), which offers guidance on how to build. While the national policy itself is not legally binding, provinces have begun embedding WBS principles into their own binding environmental policies (omgevingsverordening). This means that municipalities within those provinces must adhere to these WBS-aligned rules, effectively giving the national guidance regulatory teeth at a regional level.

### 1.3 Political Shifts in WBS Wording and Intent

The WBS policy has been politically contentious, primarily due to the tension between its long-term goals and the short-term pressure to build houses quickly and cheaply. This led to a significant political shift in 2024, when the national government changed the official wording from "guiding/steering" (sturend) to "taking into consideration" ("rekening houden met").

The original intent of "steering" was to signal a paradigm shift, making water and soil the primary basis for spatial decisions—a change from solving problems afterward to preventing them from the start. However, this language was perceived by some as granting water authorities too much power, potentially slowing down development and increasing costs. The subsequent government, under Minister Keijzer, prioritized deregulation and rapid, affordable housing construction, viewing WBS as a potential obstacle. The shift to "taking into consideration" was a semantic change intended to soften the policy's perceived rigidity and rebalance the priorities back toward development feasibility. Some view this as a principled discussion about power, while others see it as a subjective political choice to accept more future climate-related damage in exchange for lower immediate building costs. Despite this national shift,

some projects or provincial programmes continue to uphold the original "steering" principle in their own policies, creating a "bureaucratic undercurrent" that sustains the policy's momentum.

#### 1.4 Current Legal Status

WBS gains its practical legal weight through a "trickle-down" effect, where its principles are integrated into legally binding instruments at lower governance levels. Provinces embed WBS into their environmental policies (omgevingsverordening) and implementation programmes. Municipalities, in turn, can enforce WBS through zoning plans and permits, while water boards use their own legally binding ordinances (watertoets and waterschapsverordening) to set project-level standards.

Although the national government softened the policy's wording in 2024 from "steering" to "taking into consideration," many stakeholders, including water boards and developers, are calling for stronger, uniform national regulations to create a level playing field. In essence, while WBS has powerfully shifted national ambition, its enforceability currently depends on its adoption into local and provincial regulations, not on a standalone federal law.

## 2 Study Methodology and Case Selection Rationale

**Research question:** How is the flexible national guidance of 'Water and Soil as Guiding Principles' (WBS), translated into locally binding development agreements, and what are the common organizational and political mechanisms that account for the resulting variation in WBS adoption and implementation across Dutch urban projects?

The objective of this study is to analyze the variation and similarities in the application of the national 'Water and Soil as Guiding Principles' (WBS) policy in Dutch urban development. We employ an inductive, multi-case research design based on a process-tracing methodology. This approach is utilized to build robust insights from empirical data, focusing specifically on how the flexible "comply or explain" principle of the WBS guidance is interpreted and enacted by diverse stakeholders.

Our study investigates seven area development projects across the Netherlands: Havenstad, Rijnenburg, Gnephoek, Merwehaven, Waelpark, Zuidpolder, and Plan Tij. Case selection utilized theoretical sampling to ensure broad representation across crucial variables, including different phases of completion, varying environmental challenges (outer-dike flood risk vs. deep peat polder subsidence), and diverse governance structures (municipal-led, private-led, and Public-Private Partnerships).

A key aspect of selection was including projects where WBS principles (such as climate adaptation and multi-layer safety) were central, even if the formal 2021/2022 policy was not explicitly named in early documentation. For instance, Plan Tij (completed 2008) serves as an important benchmark for early WBS-style practices driven by private innovation and market demand.

### **Data collection involved two primary sources:**

1. Extensive Project Documentation: Including Environmental Impact Assessments (MERs), Water Management Plans, Masterplans, Zoning Plans, and Governance Agreements (such as the Rijnenburg Akkoord).
2. Semi-structured Interviews: Over 20 key stakeholders were interviewed across the seven cases, including municipal officials, water board representatives, developers, designers, and consultants. There were also 13 contextual background interviews and 23 with private sector professionals.

The analysis focused on constructing detailed within-case narratives (process tracing) to identify critical junctures where WBS principles influenced decision-making, followed by cross-case comparisons to identify recurring factors—such as stakeholder continuity, financial feasibility, and governance quality—that drive or impede the shift toward water and soil-driven planning.

# 3 Case Overview & Comparison

## 3.1 Case Summary

CASE	TYPE	SCALE (# OF UNITS)	START-END (APPROX)	STATUS	KEY STAKE-HOLDERS IN WBS
<b>1</b> Havenstad Amsterdam	Port regeneration	40,000 - 70,000	2010s - 2050	1 phase completed out of 12, MER completed 2017, Masterplan per phase area	Gemeente Amsterdam   Port of Amsterdam   Waternet (AGV)   ONE Architecture, AMS Institute, Sweco etc.
<b>2</b> Rijnenburg Utrecht	Polder greenfield & mixed energy landscape	25,000	2017 - 2050	Programmatic Exploration complete, Masterplan and MER due 2027, construction begins 2035	Rijnenburg Consortium BV (AM, AMVĚST, BPD largest)   Gemeente Utrecht   Ministries of I&W and I&KR   Hoogheemraadschap de Stichtse Rijnland   Posad Maxwan, Sweco, Goudappel etc.
<b>3</b> Gnephoek Alphen aan den Rijn	Polder greenfield	5,500	2017 - 2040	Masterplan presented to city council in Oct 2025, prep for MER, amendment of Provincial Environment Policy ongoing	Gemeente Alphen aan den Rijn   Province of South Holland   Ministry of VRO   Hoogheemraadschap van Rijnland   BPD & AM, Volker Wessels Vastgoed & Van Ommen&De Groot   Wim Kuijken, Kuiper Compagnons, Arcadis, BoschSlabbers, Deltares
<b>4</b> Merwehaven Rotterdam	Port regeneration	2,700	2010s - 2032	MER, Masterplan, and Zoning complete, building begins 2025	Gemeente Rotterdam   Port Authority of Rotterdam   Maker's District   Hoogheemraadschap Delfland   Haskoning, Antea Group etc.
<b>5</b> Waelpark Westland	Greenhouse area / polder regeneration	1,200	2008 - 2030	Last phase of 6 in construction	PPP Ontwikkelingmaatschappij "Het Nieuwe Westland" (ONW)   Gemeente Westland   ABB, Dura Vermeer, others   Hoogheemraadschap van Delfland   RPS Engineering Advisory, Kuiper Compagnons, Stec Group, Antea Group
<b>6</b> Zuidpolder Barendrecht	Ecological park & greenfield	300	2008 - 2025	Housing phase in construction	Gemeente Barendrecht   Waterschap Hollandse Delta   GKB, JP Project Ontwikkeling, and Ouwehand Bouwen   RoosRos Architects, Lindeloof Landscape, Stroming Consulting
<b>7</b> Plan Tij Dordrecht	De-poldering	78	2000 - 2008	Completed	Gemeente Dordrecht   Volker Wessels Vastgoed   VIA Landscape, Klunder Architects   Waterschap Hollandse Delta

### Havenstad, Amsterdam

Havenstad is a large-scale, long-term port regeneration project in northwest Amsterdam aiming to deliver up to 70,000 homes starting in 2029. Located in a complex area with high flood risk – including direct exposure to water-level variations in the Noordzeekanaal in some places – and brownfield soil conditions, the project is led by the Municipality of Amsterdam in a multi-level governance setting involving numerous public and private stakeholders, including the Port of Amsterdam and Waternet. The project integrates Water and Soil as Guiding Principles (WBS) through jointly created water guidelines, an early environmental impact assessment, and measures like ground elevation and green-blue zoning percentages. However, implementation faces significant uncertainty due to its phased nature, high costs, and political tensions, such as national interests in defense and port functions overriding housing goals.

This case highlights the challenge of embedding flexible WBS policy in a politically complex, capital-intensive urban transformation where ambitions are high but binding commitments and financing remain unclear.

### Rijnenburg, Utrecht

Rijnenburg is a planned development of approximately 25,000 homes in a deep peat polder south of Utrecht, with construction anticipated to start around 2035. The project's location presents significant physical challenges, including high groundwater, soil subsidence, and a lack of natural drainage. After years of political debate over competing land uses, WBS principles became central to the planning process, largely due to the regional water board's (HDSR) firm stance on climate-proofing. This led to the co-creation of binding "Water Principles" and their inclusion in the 2024 Rijnenburg Agreement, signed by the municipality, developers, and the water board. Measures include significant rainwater retention, a "retain-store-discharge" approach, and a green-blue network.

Rijnenburg exemplifies how strong environmental advocacy from a water board can institutionalize WBS principles early in a contentious, large-scale development, shifting the governance dynamic toward co-design.

### Gnephoek, Alphen aan den Rijn

Gnephoek is a development of 5,500 homes planned in a deep, low-lying peat polder historically designated as a non-buildable "green buffer" previously protected within the "Green Heart". The project emerged from intense political pressure to address housing shortages, overcoming initial strong opposition from the province. WBS principles were explicitly integrated into the 2023 Contour Plan as a prerequisite for provincial approval and national funding. The governance model evolved into a public-private partnership (PPP) with a 50-50 stake between the municipality and developers, who own 70-80% of the land. Key measures include concentrating development on more stable soils, creating a large nature reserve, and establishing significant water retention capacity.

Gnephoek illustrates how WBS can serve as a negotiating tool to unlock development in environmentally sensitive and politically contested locations, driven by a combination of top-down requirements and collaborative planning.

### **Merwehaven (M4H), Rotterdam**

Merwehaven is the first phase of a major port regeneration project (M4H) in Rotterdam, planning 2,500 homes in an outer-dike, brownfield industrial area exposed to river flooding. M4H is co-led by the Municipality of Rotterdam and the Port Authority, while Merwehaven is led by the municipality, with a strategy focused on "living with water" rather than solely keeping it out. Although WBS is not explicitly named in key documents, its principles are embedded through a Water Adaptation Strategy, an Environmental Impact Assessment (EIA), and measures like plot elevation, green roofs, and wet ecological zones. Governance is complex, with the municipality setting ambitions but relying on private developers for implementation on individual plots, creating uncertainty around the enforcement of "softer" green-blue measures.

M4H demonstrates an adaptive, technically-driven approach to WBS in a high-risk environment, highlighting the challenges of translating vision into binding requirements in market-led developments.

### **Waelpark, Westland**

Waelpark is a phased development of 1,200 homes integrated with a climate-adaptive ecological corridor in a low-lying peat polder. Governed from its inception in 2002 by an established public-private partnership (ONW) that includes the municipality and the regional water board, the project has a long history of adapting to external pressures. The original ambitious plan, featuring a large water retention basin and floating homes, was significantly revised after the 2008 financial crisis due to feasibility issues. The current design embeds WBS through a jointly-created Water Management Plan that informs legally binding zoning, featuring decentralized storage, flexible water levels, and connection to an existing ecological corridor.

Waelpark shows how a long-term, collaborative governance structure can embed and adapt WBS principles over time, even when forced to compromise on initial ambitions due to financial and technical constraints.

### **Zuidpolder, Barendrecht**

Zuidpolder is a hybrid project combining a 52-hectare recreational landscape park with a small, 300-unit residential development. The housing component was added later as a financial mechanism to fund the completion of the larger climate buffer zone, which is part of a regional "Blue Connection" network. Located in a deep peat polder, the design was heavily influenced by a consultancy specializing in natural systems, focusing on improving water quality, biodiversity, and climate resilience. While WBS is not explicitly named, its principles are evident in measures like a fine-meshed water network, seasonal water level fluctuation, and nature-friendly banks.

This case illustrates a trade-off logic where a small-scale, privately-developed housing project enables broader public ecological goals, demonstrating how WBS can be implicitly adopted through design-led, financially pragmatic planning rather than formal mandates.

## Plan Tij, Dordrecht

Completed in 2008, Plan Tij is a small, innovative development of 78 owner-occupied homes built on stilts in a depoldered, outer-dike tidal zone. Predating the formal WBS policy, this project serves as an early example of its principles in practice, driven by the site's inherent flood risk and the municipality's "living with water" strategy. The project was led by a private developer consortium after winning a municipal competition that called for an ecological and water-centric design. Key features include elevated homes, rainwater buffering, and the creation of a tidal habitat. Its success was enabled by a market for high-end housing and the developer's capacity to manage technical innovation.

Plan Tij highlights how market demand and private-sector leadership can pioneer WBS-style solutions, particularly in small-scale, high-value contexts.



Plan Tij, Dordrecht  
*Visual by Klunder Architecten*

## 3.2 WBS Status

The below table summarizes the most up-to-date status of WBS adoption and implementation in our cases.

CASE	WBS ADOPTION		SUMMARY	ALIGNMENT WITH WBS
	Main measures	Current form		
<b>1</b> Havenstad Amsterdam	Phased elevation between 1-2 m +NAP   Water retention of 70-90mm per 2 hours   Green-blue zoning - 40% water, 30% green, 30% paved   Nature-based design in watercourses (ecological banks)	Development Strategy and Sustainability Work Plan act as frameworks for later stages   Guidelines for a Water Robust Havenstad signed by water managers, but recommends stricter measures - explicit mention of WBS	Water safety and cost efficiency under tight political pressure	Combines natural system and housing design (#3 and 6) with climate scenarios (#2) for water safety in both polder and partially unembanked areas.
<b>2</b> Rijnenburg Utrecht	Retention in low, soil sensitive Northern portion   Concentrate buildings on higher ground   Retain-store-discharge approach   Green-blue framework of 7 layers/locations   Closed soil balance   70mm rainwater retention required to compensate for paved surfaces   Multi-layered safety	WBS explicitly referenced in 3 major documents   Water Principles co-created by municipality and waterboard   Rijnenburg Agreement sets joint goal for climate adaptivity	High level of urbanization in a vulnerable polder to achieve regional housing vision	Accounts for climate extremes (#2), independence from polder to surrounding areas (#1), and integrated design (#3, 6) with multi-layer safety (#4) and a closed soil balance system (#5).
<b>3</b> Gnephoek Alphen aan den Rijn	Concentrate buildings on higher ground   Peak rainfall storage for 120 mm per day   20% of whole area dedicated for surface water   Ecological mosaic of green space with 60 ha nature reserve and partial flexible water levels   Multi-layer safety	Contour Plan and Masterplan outlines explicit WBS foundation   Subreport soil, water and climate outlines research and measures   Governance Agreement makes WBS a guiding principle	Integrated, adaptive living environment within limited, vulnerable polder	Plans to be independent from surrounding area (#1) and combine natural systems and housing (#3, #5, #6) with climate extremes (#2), multi-layer safety (#4) and flexibility (#7).
<b>4</b> Merwehaven Rotterdam	Partial elevation to 3.6m + NAP   Climate adaptive design through wet and dryproofing   Multi-layer safety 50mm of rainwater storage compensation   Green network between 3 ecosystem hotspots for biodiversity	Urban Development Plan elaborates on measures in Zoning and Masterplan for public space   Municipal Issuance Policy sets new minimum elevation of 3.8m for unembanked areas	Water safety and resilience in an unembanked landscape	Uses multi-layer safety approach (#4) and updates climate scenarios (#2) as a framework to combine housing with complex water and soil system (#3, #6) through both elevation and wet and dry proofing.
<b>5</b> Waelpark Westland	Partial depoldering and flexible water level in northern portion   Decentralized surface water network with 22,000 square meters - deficit in south compensated with surplus in north   Peak water storage area   Connection of 2 basins in southern portion   Enhanced ecological corridor	Water Management Plan sets principles and rules for future phases   Zoning Plan for Waelpolder (final phase) sets measures for final phase currently in construction	Climate resilience in a tight, demanding space	Combines the updated water system, public space, and housing design (#3 and 6) with climate scenarios (#2) from early conception.
<b>6</b> Zuidpolder Barendrecht	Fine water grid   Part of an established climate buffer zone   Flexible water levels and localized retention   The 3 V's for habitat and biodiversity (food, breeding, safety)   3,500 square m surface water compensation	Area Vision acts as guiding document for climate, water, and soil in later phases   Zoning Plan elaborates with measures for recent construction start	Housing as a tool for larger climate buffering and recreation goals	Combines water system, public space, and housing design (#3 and 6) with climate scenarios (#2) to add on to a climate buffer and achieve wider ecological goals in the park.
<b>7</b> Plan Tij Dordrecht	Depoldered tidal zone in unembanked area   Flexible water level   Stilted houses 3.6-4m +NAP   Nature-based design of banks	Tendering document sets conditions for design character   Zoning Plan incorporates Urban Water Management Plan   Completed in 2008	Water safety and ecology for unique character	Integrates water safety with ecological character (#3, 6). Reflects municipal journey to multi-layer safety (#4) approach.

The ‘alignment’ column reflects how aligned the project is with the 7 principles from the Kamerbrief based on their respective plan documentation, and not necessarily their ‘true’ representation in current or future built form. Noticeably, the most prevalent aligned principles are taking climate extremes into account (2), integrating water and soil (3), multi-layer safety (4), and an integral approach to the living environment (6). Climate extremes are coming more into focus across the country as data quality improves and key junctures like the 2021 flooding in Limburg give legitimacy to the threat of extreme weather events. Multi-layer safety was introduced by the national government in 2008 and has since rooted itself as a common framework for water safety across the country, with some cities like Dordrecht even creating city-wide strategies. ‘Integration’ of climate extremes, water system design, soil concerns, and living environments has become increasingly popular in Dutch development, and all the cases outline how they plan to combine functions and embrace climate-adaptive design. Notably, the most absent principles are do not pass on (1), better soil management (5), and comply or explain (7). Indeed, this is partially due to the case selection, since the bulk of planning was completed pre-2022-Kamerbrief for some cases. But even in later cases, the intention to not pass on burdens to other areas or generations is not explicitly noted or explained, novel approaches or extra attention to researching the soil system is limited, and there is no process outlined for how or with whom to implement the comply or explain principle.

The following passage describes the process of adopting WBS-related measures and thus these principles, as well as their true or expected implementation. See Appendix A1 for 2 case timelines, exemplifying the process of moments of adoption and implementation.

### Havenstad, Amsterdam

**WBS Adoption Process:** Havenstad’s adoption evolved through multiple phases (2017, 2021, 2022/23) and was led by the municipality, drawing heavily on expertise from Waternet as an arm of the regional water board (AGV), and external firms like ONE Architecture. Adoption mechanisms included a MER Water Advice (2017) and the subsequent Sustainability Working Plan (2021) and Spatial Water Strategy (2021). Crucially, the Water Guidelines for a Water Robust Port City (post-2022, initiated by Waternet) is the only document found so far that directly references WBS principles, setting key collaborative boundary conditions.

**Measures:** Key measures at the outset of planning involved choosing a combination of ‘conservative’ and ‘more ambitious’ measures from a *MER Water Advice* that then became 3 strategic choices in the *Development Plan*: 60mm per hour rainfall retention, phased elevation of 40 cm where necessary, and a coherent surface water system. With the lead up to the *Sustainability Working Plan*, which took into account updated climate scenarios and involved water expertise from the local waterboard and design firms, plans broadened for goals like biodiversity and greenery, but also sharpened to increase elevation to 1-2 m above NAP and rainfall retention of 70-90 mm per 2 hours. Most recently, the *Guidelines for a Water Robust Havenstad* outline a joint combined ‘ambition’ between regional water authorities and private and public bodies to collaborate more intensively and make water and soil guiding.

**Implementation Outlook & Differentiation:** Implementation is highly uncertain due to the project's massive scale (up to 70,000 homes in 12 phases) and political precarity. It highlights the difficulty of implementation in multi-level governance where private actors are expected to carry much of the financing and execution. Unlike other projects, national interests (defense and militarization) have already overridden housing urgency, leading to the cancellation of 9,600 units in one zone. The 'comply or explain' logic for WBS remains unclear, and interviewees express doubts about the technical feasibility and cost of elevation.

### Rijnenburg, Utrecht

**WBS Adoption Process:** Adoption was primarily driven by the regional Water Board (HDSR) using climate concerns as a point of contention and leverage against development in the deep polder. This environmental pushback catalyzed co-design. The water board used the request to sign the Rijnenburg Agreement (2024) strategically, requiring that the ambition for climate-adaptive building be added as a precondition for its signature. WBS is further formalized in the jointly authored Water Principles (2024).

**Measures:** The adoption of WBS in the Rijnenburg case is now a repeated leading principle, but began contentiously. The earliest plans recognized the polder's vulnerabilities, but expected double the amount of housing and indiscriminate locations. After repeated pushback from the HDSR waterboard, the *Design Study* included WBS language and chooses the energy landscape for the more sensitive northern portion instead of buildings. This location choice has remained the central measure thus far, but has since sharpened with waterboard input and concern for climate extremes to include a potential peak water storage and overflow zone (1 million m<sup>3</sup> ambition). WBS was first referenced as 1 of 6 main principles in 2023, which has since been elaborated in the *Programmatic Exploration* to include the core measures: "retain–store–discharge" approach, green-blue framework, rainwater retention standards (70mm per hour for hardened surfaces, 15mm on-site for private plots), multi-layer safety approach, and closed soil balance.

**Implementation Outlook & Differentiation:** Rijnenburg serves as a key example of the institutionalization of WBS through politically contentious consensus. Commitment is shown through requirements that water infrastructure be in place before construction begins. The water board actively sought involvement at the "front-end" of spatial planning, contrasting sharply with the traditional, later-stage role observed in Gnephoek. The long construction timeline (projected start ~2035) remains a significant uncertainty for full implementation.

### Gnephoek, Alphen aan den Rijn

**WBS Adoption Process:** Elaborations on climate robust design and inclusion of water experts were included as specific requirements by the Province of South Holland in 2022 to lift its ban on building in the controversial Green Heart polder. This political conditionality was essential for provincial approval and securing national funding. The resulting Contour Plan (2023) explicitly references WBS and includes a Subreport Soil,

Water and Climate detailing alignment with WBS principles. The waterboard (Rijnland) took a mediating role to introduce water and soil concerns into the political debate.

**Measures:** The original plans presented to former Minister de Jonge on his visit in May 2022 showed 8-10,000 units combined with green space and water retention. But as an answer to the provincial letter demanding a climate-adaptive design and the independent advice of Wim Kuijken to build less houses in a water and soil steering manner, the main measures in the *Contour Plan* now include: limited and targeted development of half the original number of units on higher, more suitable soil in the southern and eastern portion, an ecological mosaic of 90 ha green space and surface water, 60 ha nature reserve, and 30 ha urban greenery and water with flexible water levels, and peak rainfall storage of 120 mm per day. The binding Management Agreement solidifies WBS as a guiding principle, with space for changes in elaboration (comply or explain).

**Implementation Outlook & Differentiation:** Gnephoek showcases an evolving governance model. A 50-50 public-private PPP was established later in the process to secure financing and manage risk, resulting in a legally binding Management Agreement signed by public parties endorsing WBS ambitions. The case contrasts with Rijnenburg and Waelpark because the water board, while supportive, explicitly defined its role as an advisor early on and manager later, rather than a co-designer, in order to maintain objectivity for final permit approval.



## Gnephoek, Alphen aan den Rijn

*A visual of the project's Masterplan by the municipality*

### Merwehaven (M4H), Rotterdam

**WBS Adoption Process:** Adoption was driven by the site's outer-dike status and the municipality's internal intent to manage flood risk. Its integration relied on commissioned external expertise, resulting in the 2019 Water Safety Adaptation Strategy (written by Haskoning). The municipality leveraged WBS as a justification in its updated (2025) policy for unembanked areas. Notably, despite key documents being produced post-2022, WBS is not explicitly mentioned in the Masterplan or Zoning Plan; an interviewee reflected that the project team felt the design was already WBS-aligned and the added label was unnecessary.

**Measures:** An initial multi-layer-safety-based approach for water safety in the unembanked M4H started with a combination between 'keeping water out' and 'living with water' approach. This was used as input for the MER and Masterplan, which name: elevation to 3.6m above NAP where possible, and otherwise climate adaptation through wet and dryproofing measures like green roofs, elevated vital functions, and more. Most recently, the Urban Development Plan increases this elevation to 3.8m and elaborates on a green-blue framework for public space and wider elevation plans. This reflects a move towards the 'keeping water out' approach and water safety concerns based on the newly tightened municipal Issuance Policy for elevation in unembanked areas and updated climate scenarios for flood risk.

**Implementation Outlook & Differentiation:** M4H is distinct as a large-scale, adaptive, outer-dike redevelopment. The implementation struggles with complexity arising from multi-actor, market-driven development and conflicts between the Municipality and the Port Authority. The water board's role is minimal, as the area is outside its jurisdiction, prompting the Municipality to develop its own standards and rely on external consultants to fill the technical expertise gap.

### Waelpark, Westland

**WBS Adoption Process:** WBS principles were embedded early through the project's original vision (1997) and sustained via the long-established Public-led PPP (ONW). Key adoption occurred via the 2018 Water Management Plan, co-developed by the PPP, municipality, water board, and external experts (RPS Engineering), which outlines water responsibilities for plot owners, the municipality, and the water board. The plan was drastically reoriented after 2008, dropping plans for floating homes and a large central basin due to technical and financial infeasibility.

**Measures:** Waelpark shows the most drastic changes in measures, going from a 26ha basin with potential for floating houses, to decentralized water storage and smaller scale depoldering. The emphasis has evolved over the course of phase-specific Master and Zoning Plans, but most especially the Water Management Plan, to include connection with an ecological corridor, use of circular building materials where possible, a peak

water storage location with 25,000 m<sup>3</sup> capacity, flexible water levels in the partially depoldered northern portion, and connection of 2 basins in the south.

**Implementation Outlook & Differentiation:** Waelpark offers insight into collaboration within an established PPP. It highlights the fragility of innovative WBS measures when projects must adapt to external financial pressure. The water board's active involvement in designing the water system (e.g., setting water retention goals and maintenance agreements) differentiates it, although short-term commercial interests in the PPP often led to trade-offs, overriding public long-term maintenance goals.

### Zuidpolder, Barendrecht

**WBS Adoption Process:** WBS-related measures were integrated through design-oriented, non-binding guidance in the 2021 Area Vision. The project's original motivation was ecological (creating a landscape park and climate buffer), with the housing component (300 units) added later as a financial compromise to fund the park's completion. The adoption was steered by the municipality's initial environmental goals and expertise from external consultants (Stroming).

**Measures:** With the Area Vision, recommendations and principles for WBS measures outlined measures for biodiversity, flexible water levels, enhancing the pre-existing climate buffer, and peak rainfall absorption. Later documentation like the Zoning Plan and Image Quality Plan adopt and solidify these measures and elaborate on surface water compensation, a fine water grid, automated weirs, wastewater management, and biodiversity measures.

**Implementation Outlook & Differentiation:** Zuidpolder illustrates the trade-off logic used in peri-urban development: using a small amount of housing to finance larger ecological outcomes. Although implementation is generally high, WBS opportunities were partially limited by the municipal Spatial Quality Commission's preference for traditional aesthetics (e.g., rejecting green roofs and wooden materials for housing designs resembling surrounding barns) over more innovative sustainable designs.

### Plan Tij, Dordrecht

**WBS Adoption Process:** Plan Tij is an example of WBS-style design principles applied before the policy framework existed. Adoption was driven by a municipal tendering competition (2000) that specifically sought an ecological design for an outer-dike area. Private developers were motivated by high expected returns on low-value land, enabling them to pursue innovative, water-centric designs.

**Measures:** The requirement for water-based homes with both ecology and water safety in mind in an unembanked area began with the municipal tendering competition, and resulted in a design with a depoldered tidal zone (flexible water levels) and stilted houses up to 4m. These were elaborated in the zoning plan with rainwater discharge plans, water quality requirements, and nature-friendly bank development based on Dordrecht's Urban Water Management Plan.

**Implementation Outlook & Differentiation:** This case is unique for its fully private-led governance model and small scale. It demonstrates how financial capacity, driven by the luxury market, enabled the uptake of technically difficult or innovative approaches that other projects (like Waelpark's original design) later deemed unfeasible due to cost. Implementation was swift (completed 2008), though design adjustments were made for cost efficiency during construction.

### 3.3 Key WBS Adoption and Implementation Factors

Building on the case comparisons and their adoption and implementation processes, our analysis reveals that the variations in WBS adoption and implementation are not random. They are consistently driven by three interconnected sets of factors:

1. The timing and nature of expertise and capacity;
2. The structure of governance and relationships;
3. The impact of finances and external influences.

These factors determine how WBS principles are translated into practice. See Appendix A2 for a table overview of adoption factors with case examples and interview quotes and Appendix A3 for implementation factors.

#### **Expertise and Capacity**

The successful adoption of WBS is critically dependent on both the timing and nature of expert involvement. This expertise often originates from regional water boards, but their role varies significantly. In Waelpark, the water board acted as a direct co-designer of the water system, while in Gnephoek, it took on a mediating, advisory role to “enrich” a political debate that had been narrowly focused on mobility. In cases where water boards are jurisdictionally absent, such as the unembanked Merwehaven, this “knowledge vacuum” is filled by external consultants (like Haskoning) hired to develop the foundational technical strategies. The timing of this involvement is crucial. In Rijnenburg, the water board's early requests to be involved were delayed, slowing the uptake of their suggestions, whereas the early commitment in Waelpark allowed WBS principles to carry through multiple design iterations.

#### **Governance and Relationships**

Expertise alone is insufficient; its effectiveness is mediated by the project's governance structure and the quality of stakeholder relationships. Projects with fragmented governance and “conflicting institutional logics,” like Havenstad, become paralyzed by competing spatial claims and political stalemates, preventing structural WBS choices. Successful projects, in contrast, actively construct mechanisms for alignment. Gnephoek, for example, commissioned external research to design its 50-50 PPP and formalized commitments in a binding Governance Agreement explicitly committing to WBS. Similarly, Rijnenburg used its multi-party Agreement to secure WBS ambitions as a precondition for consensus. Beyond these formal agreements, the analysis highlights that informal “constructive chemistry” and “trust” built during “pressure cooker” design

sessions (Gnephoek) are essential for providing the political resilience needed to navigate conflict and stakeholder turnover.

### **Influences (Financial and External)**

Finally, the adoption and implementation of WBS are highly vulnerable to external financial and political influences. The financial outlook is often the “most influential trigger”. A weak or traditional (GREX) financial model treats WBS as a cost to be cut; this was seen in Waelpark, where the 2008 financial crisis, along with technical barriers, forced the project to scrap its innovative floating homes in favor of a cheaper, phased approach. Conversely, a strong business case in a traditional real estate model (VEX), like the high-end market for Plan Tij, can enable WBS innovation by framing it as a value-creator. Public funding can also be decisive; Gnephoek’s feasibility was secured by an unusual 60.5 million national contribution and Rijnenburg’s new transportation infrastructure will require some government funding. Non-financial forces are also critical. In Havenstad, a renewed national focus on militarization led to the cancellation of 9,600 housing units, overriding WBS-related planning. In Gnephoek, the political stalemate was only broken by the external intervention of Minister de Jonge and his appointed advisor, Wim Kuijken, whose advice was a key trigger for WBS adoption.

## **3.4 Key Stakeholder Landscape in Adoption & Implementation**

The different stages of the adoption and implementation of WBS principles involves complex negotiations among various public and private stakeholders, each with distinct motivations and levels of influence. Municipalities, developers, and water boards are the central actors, with national and provincial governments setting the broader context. The success of WBS often depends on the governance structure—whether it is municipality-led, a joint development, or driven by developers—and the ability of these actors to align competing interests.

- **Municipalities:** As lead planners and major landowners, municipalities like Amsterdam and Rotterdam are primarily concerned with delivering housing, ensuring project feasibility, and managing public spaces. They often initiate and lead planning in larger area developments, but depend on other actors for technical expertise and implementation, navigating tensions between housing targets, climate ambitions, and infrastructure constraints.
- **Private Developers & Landowners:** Often holding significant land positions (owning up to 85% in some cases) and capital, developers are crucial for implementation. Their main goal is financially viable development, but they can be powerful partners in co-designing and financing WBS measures, as seen in the public-private partnerships in Gnephoek and Waelpark. They also arrange networks of contractors/construction companies and realtors, sometimes internally. Housing associations and corporations also occupy a pivotal role in the Dutch context, and nonetheless assume the role of a private entity.
- Local **residents and citizen groups** often contribute to working groups and feedback sessions.

- **Regional Water Boards:** Their role is evolving from technical facilitators to proactive agenda-setters. Some, like HDSR in Rijnenburg, take a hard stance, using their authority to make climate-proofing a prerequisite for development and co-authoring binding principles. Others maintain a still-earlier but more traditional advisory role to preserve objectivity for final permitting.
- **National Government:** Primarily focused on the housing agenda, national ministries can exert top-down pressure to accelerate construction, sometimes overriding local WBS-aligned ambitions with competing interests like defense or economic functions. They also provide critical funding that can incentivize WBS adoption.
- **Provincial Governments:** Provinces act as a key intermediary, occasionally blocking changes to environmental policy that would allow development in unsuitable locations, but later approving projects contingent on the explicit integration of WBS principles, effectively making the national guidelines a binding local requirement.
- **External Consultants & Experts:** Engineering firms, architects, and planning consultancies play a vital role in providing the technical knowledge and design vision that translates WBS principles into concrete plans and measures, shaping the approach from early stages.

## 4 Discussion of Main Insights

### 4.1 Legal and Regulatory Environment

The legal status of WBS is a primary differentiating factor, as the national policy itself is not a binding law but a guideline introduced via a Parliament letter. Its effectiveness critically depends on how it is translated into enforceable rules at lower governance levels.

**Proposition | WBS effectiveness hinges on its strategic translation from a flexible guideline into binding, project-specific agreements enforced by local authorities.**

**Trade-off |** National flexibility vs. local predictability and enforceability.

**Justification |** Many interviews show that almost all stakeholders are struggling with the uncertainty surrounding the regulatory environment. They 'deal with' this in various ways, including consulting experts, making governance arrangements to secure commitment, and generally collaborating to define 'goals' and move towards them. This process is translated into planning documentation through instances of adoption.

Our analysis identifies a central paradox of the WBS policy: its national-level "soft law" status versus its tangible local-level impact. The national guidance, particularly the "comply or explain" principle, is described by the sources as ambiguous and lacking direct legal teeth. This is compounded by the documented national shift in 2024 from *sturend* ('guiding/steering') to *rekening houden met* ('taking into consideration'), which has only increased this "ambiguity." This lack of clarity can also lead to overlapping or conflicting regulations from municipalities, provinces, and water boards on the same subject, creating confusion and barriers for developers. The policy's power is not inherent; it must be activated by a local or regional authority that strategically translates it into a "hard law" instrument to solve a specific, pre-existing problem. See Appendix A4 for a table of important policy and programmes across the national, regional and local ecosystems for environment and spatial development in the Netherlands, as well as ongoing regulatory debates.

The case evidence demonstrates this translation mechanism clearly. In Gnephoek, the project was in political gridlock. The Province of South Holland used WBS as a political tool, making proof for investigating the water and soil systems and opportunities for climate-adaptivity an explicit, mandatory precondition for amending its Provincial Environmental Policy, which had initially banned the project in the Green Heart. Here, WBS was not a "guideline" but a non-negotiable condition for political approval. WBS was

then baked into documentation like the Governance Agreement to grant itself formal project-scale regulation.

A different mechanism is seen in Merwehaven. As an unembanked, outer-dike area, it exists in a "jurisdictional vacuum" where the regional water board has minimal regulatory or advisory involvement. The municipality, driven by its own significant financial liability and public responsibility concerns, made its own binding regulations to fill this "regulatory gap." It did so by updating its internal "Issue Level Policy for the Outer Dike Area" (2025). This sets binding elevation standards at 3.8m + NAP, explicitly cites the 2022 WBS Kamerbrief as a justification, using the national policy to legitimize its own self-imposed "hard" rule, although comply or explain is included as a principle. A guidebook for water and soil guiding for the city was recently made by Rotterdam WeerWoord and municipal employees in the Urban Development and Urban Management team reflects a similar move and outlines 9 principles, elaborated with practical guidelines and tips.

The stalled case of Havenstad illustrates this proposition by its absence. As a massive, multi-decade project, it suffers from conflicting institutional logics. Because no single, binding, multi-party agreement or mandatory precondition has yet been established, WBS remains just one "consideration" among many, lacking the conditional, binding power to break the political and institutional gridlock.

**Re: trade-off |** The national "comply or explain" policy was intended to be flexible, encouraging negotiation and context-specific solutions. However, our analysis shows this flexibility is often a weakness, leading to inaction (as in Havenstad). To be effective, local actors (like the Province in Gnephoek or the Municipality in Merwehaven) must sacrifice this flexibility and create a hard, binding, "comply or fail" rule. The trade-off is clear: you can have a flexible national policy that risks being ignored, or you can have a rigid local rule that gets WBS implemented, but at the cost of the intended local flexibility and "comply or explain" nuance.

## 4.2 Financial / Commercial Constraints

Financial feasibility is a critical and often decisive factor. WBS-aligned measures are perceived as more expensive, and projects frequently face a tension between long-term sustainability and short-term financial viability.

**Proposition |** The project's financing model dictates whether WBS is embraced as a value-creator or rejected as a cost-constraint, often necessitating a "trade-off logic" to be feasible.

**Trade-off |** Short-term financial viability vs. long-term climate resilience.

**Justification |** The analysis reveals that financial logic consistently overrides abstract WBS ambitions. WBS measures are often perceived as significant, front-loaded capital expenditures (CAPEX). The decisive factor for their adoption is how the project's core

financial model (e.g., GREX vs. VEX) treats these measures. See Appendix A5 for a table describing common financing methods used in area development in the Netherlands.

The evidence shows that traditional public land-exploitation (GREX) models consistently treat WBS as a cost-constraint. In Waelpark, an ambitious WBS-aligned design featuring floating homes and a large central water basin was created before the 2008 financial crisis. After this external shock, the financial model was no longer viable. Combined with then-apparent technical infeasibility, the original WBS measures were the first items to be "value-engineered" out, making it the most influential trigger in the plan's sequencing. A similar constraint is visible in Merwehaven, which is also bound by a municipal GREX. An interviewee explicitly notes that the initial elevation height was capped at 3.6m + NAP precisely because the municipal calculation required the project to reach "at least at a zero, not lose money," setting a hard financial limit on climate ambition.

In contrast, cases that rely on real estate development (Vastgoedontwikkeling, VEX) were able to translate WBS to a financial asset based on the added value to unit sales. Plan Tij, a small-scale, private-led project, embraced a high risk location. Zuidpolder represents the most explicit "trade-off logic." The project began as a 52-hectare public ecological park and climate buffer, but public funds ran out. The solution was to introduce a small, high-end housing component (300 units) specifically to finance the completion of the public WBS goals for climate buffering and biodiversity. This VEX component was not the project's goal, but its financial engine. See Appendix A6 for table comparing GREX and VEX arrangements in interaction with WBS.

In some cases, external funds are needed to access expertise or ensure feasibility. In Gnephoek, after the Contour Plan was accepted and identified a deficit of 50 million euros, the national government made a contribution of 60.5 million in 2024, ensuring the plan's financial feasibility. The elaboration of some WBS measures in the Contour Plan was identified as conditional based on proving spatial and financial feasibility, which could be further threatened without this unusual public contribution. External subsidies from the Stimuleringsfonds were used in both Gnephoek and Havenstad to hire design firms and conduct further research into water safety and soil systems.

**Re: Trade-off** | This is the clearest trade-off in our analysis. The Waelpark case (scrapping floating homes after 2008) and the Merwehaven case (capping elevation at 3.6m to keep the GREX at zero) are perfect examples. They demonstrate that when a project's immediate financial viability is threatened, long-term WBS ambitions are the first thing to be sacrificed. The "trade-off logic" we identified in Zuidpolder (300 homes to fund 52-hectare park) is the solution to this, offering a pragmatic, if imperfect, way to balance the two competing goals. Consultants and developers are currently researching how ecosystem services and long term value provided by climate adaptation can be included in financing models.

### 4.3 Governance / Coordination Issues

The structure of governance and the quality of coordination among stakeholders are fundamental to WBS success. Case studies fall into the traditional categories of public-

led, private-led, or joint development, but all show that early and sustained collaboration is a hallmark of success, while fragmented or contested governance leads to struggles.

**Proposition | Successful WBS translation requires an empowered public partner to move from an advisory role to a proactive co-design role, using both formal agreements and informal trust as leverage.**

**Trade-off |** Procedural efficiency vs collaborative buy-in.

**Justification |** Our research demonstrates that WBS principles do not survive the development process within traditional, siloed governance models. The stalled Havenstad project illustrates this. The project is described as being in "political gridlock" due to "conflicting institutional logics" between the Municipality and Port and political tension with the national government. This gridlock is now exacerbated by top-down external blocking: the cancellation of 9,600 housing units due to renewed national security priorities and militarization. The sheer scale and length of the project, and thus vulnerability, shows how multi-level governance conflicts can divert attention away from structural WBS-related decisions to a focus on pure project feasibility.

The cases where WBS is successfully adopted illustrate how this gridlock is overcome. In Rijnenburg, the water board (HDSR) explicitly rejected its passive advisory role. Recognizing its new political leverage, HDSR strategically refused to sign the multi-party "Rijnenburg Agreement" (2024) - which was essential for political consensus - until its demands for "climate-adaptive building" were explicitly included. This tactic fundamentally shifted its role from advisor to proactive advisor and agenda-setter. In the Gnephoek case, the Rijnland waterboard used its mediating stance to "enrich" debates between the province and municipality that were previously dominated by concerns for mobility and the 'Green Heart dogma' with water, soil, and climate management concerns.

One key aspect in adoption is organizational intent of the steering stakeholder, regardless of public or private stance. Cultures of social responsibility, concern for liability, or even individual pioneers can be hugely influential in the introduction of WBS principles. In Merwehavens, the municipality's self-proclaimed partial responsibility for water safety resulted in the early-stage water safety strategy and issuance policy for minimum elevation in unembanked areas, leading to relatively conservative plans for elevation and climate adaptation measures. In Plan Tij, the private landscape architect firm had a strong internal culture of basing designs on the landscape first, and then innovating on what was available. Despite push back from real estate brokers, they maintained plans for the relatively novel tidal zone plans and reaped the benefits.

Gnephoek indeed demonstrates the necessity of both formal and informal mechanisms. Formally, the project's governance evolved into a 50-50 Public-Private Partnership (PPP) and a Management Agreement after consultancy on an optimal governance arrangement for the entire project lifecycle was commissioned. However, participants repeatedly emphasize that this formal structure was insufficient on its own. It was the informal governance—the "chemistry" and "trust" built between key individuals during intensive

"pressure cooker" multi-day design sessions—that provided the political resilience to navigate years of conflict. This informal trust, championed by a persistent municipal project leader, is what allows the formal agreements to survive and is essential to future implementation.

**Re: trade-off** | The traditional, siloed model (municipality designs, water board advises) is, on paper, faster, simpler, and cheaper on short time scales of 4-10 years. It has clear roles and requires fewer meetings. However, our analysis shows this "efficiency" is a false economy, leading to gridlock (Havenstad) or weak outcomes. The "new" model—co-design, workshop sessions (Gnephoek), and multi-party agreements (Rijnenburg)—can be slower, more expensive, and politically complex, but can avoid more conflict down the line. The trade-off is sacrificing short-term speed and simplicity for long-term political resilience and a more integrated, robust final plan.

## 4.4 Knowledge Creation & Organizational Capacity

The creation, translation, and application of knowledge are crucial for moving WBS from an abstract concept to a practical framework. On a case-by-case basis, this primarily involves bridging the gap between technical water expertise and spatial planning.

**Proposition** | External specialized expertise is instrumental to translating the WBS guidelines into feasible designs, but this knowledge can be constrained by the institutional resistance of internal departments.

**Trade-off** | Innovative expertise vs. institutional standardization.

**Justification** | Our research suggests a critical two-step process in WBS implementation: knowledge creation (which is successful) and knowledge implementation (which is a primary bottleneck). The core problem is that WBS is a complex ("vague"), system-level concept, and municipal planning departments often lack the specialized, in-house technical expertise to translate it into actionable, buildable designs. Water authorities can also lack capacity and struggle with their changing role in becoming more involved in front-end spatial planning. Some are beginning to hire landscape architects, lobby for stricter regulations, and sometimes even refusing explicit design involvement.

The knowledge creation step shows a consistent pattern: a "knowledge vacuum" is filled by external experts. In Merwehaven, where the water board was jurisdictionally absent, the municipality hired the consultant Haskoning. Haskoning's 2019 Water Safety Adaptation Strategy, based on multi-layer safety principles, became the de facto technical and conceptual framework for the entire project. This pattern is repeated in Zuidpolder, where the consultant Stroming authored the 2021 Area Vision that introduced the core WBS principles (ecological park, climate buffer). Relatedly, a key element of the added capacity and expertise is its timing. In the Gnephoek, an interviewee admits that the waterboard could have indeed been involved earlier to have more substantive discussions about risk and potential measures. Regardless, the

injection of actionable WBS expertise through a knowledge-laden 'champion' is a success factor.

The implementation bottleneck is where this knowledge gets blocked. Merwehaven is the clearest example, where a participant explicitly states that the municipal engineering department was "not open to innovation" regarding the routing of cables and pipes. This institutional lock-in, prioritizes traditional methods and highlights established path dependencies. A similar "knowledge gap" occurred in Gnephoek, where a design firm involved in soil research has thus far not been re-hired to implement it, reportedly for cost reasons. This could break the link between vision and execution. Therefore, simple access to knowledge is insufficient; WBS fails if the internal, culturally-embedded resistance of established departments is not overcome.

**Re: trade-off |** Our analysis indicates that innovation is typically outsourced to hired experts. This knowledge can then be rejected by internal, established methods that focus on cost-benefit analyses and the path of least resistance. Departments optimized for cost control and standardization, and steering partners focused on other spatial claims, can result in trade-offs for "greener" designs.

## 5 Private Market Actors

The adoption and implementation of the Water and Soil as Guiding Principles (WBS) policy is partially determined by private market actors, who drive spatial designs and control financial leverage. The most important types of private actors include Developers (e.g., Synchron, BPD, Ballast Nedam), and hired Consultancy/Design firms (Haskoning, Sweco, Posad Maxwan, Bosch Slabbers). These actors' commercial decisions influence the four central WBS trade-offs defined previously.

### 5.1 Market Drivers and Trade-offs

The private market is the core decision-maker in the finance trade-off of short term viability vs. long term resilience. Considering their controlling role of finances and on-the-ground construction of implemented measures, developers often access their financial, land ownership, and lobbying capacity to steer projects, especially when combined as one consortium. They are pivotal intermediaries that translate practical requirements from governing bodies into the language of designers and contractors. Developers are motivated by maximizing profit and housing yield with immediate-term benefit, and if WBS measures are invisible (ex. underground or rooftop) or only considered beneficial for residents, and thus not monetized, it is sacrificed for affordability. This can also clash with water authorities and designers who think on longer time horizons and when housing program goals are included by the municipality, the need for affordability can make extensive measures infeasible, and many developers cite difficulty with the general tension between meeting housing program demands while also incorporating climate adaptivity. Traditionally, public parties are seen as responsible for such measures in public space.

To navigate this complexity and financial struggle, larger developers with higher staff capacity and 'more at stake' in terms of reputation and public reporting duties are increasingly using dedicated staff to actively research alternative methods, such as including natural benefits in cost efficiency models. These staff are also tasked with translating what policies like WBS "mean" for business operation from a continuity standpoint, indicating the legal and regulatory mist surrounding flexible policies. Networks like Klimaatadaptief Bouwen voor de Natuur (KAN), made up of developers and designers, shows demand for knowledge sharing and combining forces to navigate design and policy challenges.

Consultancy and design firms act as "knowledge champions" who bridge the knowledge trade-off of Expert Vision vs. Institutional Lock-in. They develop advanced tools, support planning documentation like Environmental Impact Assessments and Zoning Plans, and

translate ambitions to design based on their specialized expertise. They often use research-by-design methodologies and harvest results from high-intensity design days between stakeholders as input for advice, and then present and adjust where necessary. However, they are also not independent from the client, and thus limited by commercial factors like budget and timeline that can dampen more ambitious measures. On the other hand, smaller municipalities that do not have dedicated in-house staff rely on hiring external expertise, but sometimes lack the financial capacity to continue working through the lifetime of the project, which is often a success factor. This dynamic is even seen as a vulnerability by some; without technical knowledge, public staff may not be able to make informed decisions about what plan is being ‘sold’ to them. This can result in infeasibility, lack of alignment with longer-term visions, or a patchwork of incoherent, small-scale input from multiple contesting consultancies.

Private actors consistently lobby for clear national rules to address the legislative trade-off of regulatory flexibility vs. market predictability. Some argue for national standardization on core technical criteria (e.g., required rain storage, 70mm/hr versus 90mm/hr) to ensure a “level playing field”, stating that currently, “competition is unfair” if some firms ignore WBS to gain a cost advantage. Overlapping regulations or standards at each level of government may use different data sources, and thus show competing results. One interviewee calls this a ‘party of the public organizations’, where public parties discuss what’s important and make regulations, but exclude those that work under them practically. Developers thus call for not deregulation, but shifted, more specific regulation: either stronger, singular national rules with less local regulation, or stronger local mandates and no higher-level, vague rules. This need for clear mandates forces them to request that local authorities translate soft WBS principles into binding agreements.

## 6 Conclusion / Implications for Policy

The success of the Water and Soil as Guiding Principles (WBS) policy hinges on overcoming the four structural trade-offs identified in practice. These recommendations assign concrete, actionable steps to the National, Provincial/Regional, and Municipal/Local governance layers to close the implementation gap.

### I. National Level: Hardening the Framework and Reforming Finance

The national government must resolve the Trade-Off of Regulatory Flexibility vs. Market Predictability by establishing non-negotiable standards, thereby creating the "level playing field" demanded by private developers. It should also clarify the national stance towards WBS.

- 1. Mandate Technical Floors:** The Ministry should introduce mandatory, standardized technical floor requirements for WBS, particularly for criteria that should be uniform nationally (e.g., minimum required rainfall retention and standardizing elevation policy in high-risk zones).
- 2. Use LCC in Federal Instruments:** The National Government should mandate the use of Life Cycle Costing (LCC) analysis spanning at least 50 years in public land exploitation (GREX) rules and major private tenders.
- 3. Take a stance:** One of the most common requests/recommendations across interviews is requests for partnering with local government and developers to stimulate pilot case studies that provide concrete examples for feasibility. This can clarify practical outcomes for what the 7 principles in the Kamerbrief 'mean' while showcasing local flexibility and setting precedents. This would benefit from the simultaneous creation of a knowledge network or platform where cases and methods are made accessible for practitioners to reference and 'compare notes'.

**Implementation Rationale:** This action directly addresses the financial trade-off of short-term viability vs. long-term resilience. By quantifying the costs of long-term damage (subsidence, flood repair) and maintenance, LCC analysis shifts WBS from being viewed solely as expensive CapEx to a necessary long-term financial asset. This mandate ensures that the national ambition is not diluted by short-term financial pressure, as occurred in Waelpark after the 2008 crisis forced the elimination of costly WBS measures. Alternative contracting methods that emphasize co-benefits between different interests - not just monetary - through a joint venture should be tested for area development, such as the Alliantie, which has been used in a handful of infrastructure projects in the Netherlands and beyond since the 2000s.

### II. Provincial/Regional Level: Establishing Binding Agreements and Co-Design

Provincial authorities and Water Boards must act as the primary engines for translating national soft law into binding instruments and leveraging their authority to enforce collaboration. Provinces can also use their legal and financial power to engage in and stimulate more pilot case studies that both provide an example for practitioners and further develop the province's framework.

- 1. Enforce WBS through Provincial Environmental Agreements:** Provinces should use their power under the Omgevingswet to integrate WBS as a binding, non-negotiable precondition for amending their Environmental Policy (Omgevingsverordening) for contentious or environmentally sensitive developments. Provinces can also use their legal and financial power to engage in more pilot case studies that both provide an example for practitioners and further develop the province's framework.

**Implementation Rationale:** This action resolves the local ambiguity identified in the trade-off of Regulatory Flexibility vs. Market Predictability. As demonstrated in Gnephoek, the Province successfully forced the municipality and developers to integrate WBS principles into their plans by making it one of the mandatory conditions required to lift the ban on building in the Green Heart. This leverages the WBS policy as a powerful political tool to enforce compliance where soft guidance would otherwise fail.

- 2. Formalize Co-Design and Strategic Agreements with Water Boards:** Water Boards must be formally empowered as mandatory co-design partners, not mere passive advisors, and be included as signatories on project-specific Strategic Agreements from the project's initiation phase.

**Implementation Rationale:** This directly addresses the governance trade-off of Procedural Efficiency vs. Collaborative Buy-in. Formalizing this commitment through documents like the Rijnenburg Agreement prevents the institutional gridlock observed in cases like Havenstad. In Rijnenburg, the water board (HDSR) used the political necessity of signing the agreement as leverage to insert its demand for "climate-adaptive building," fundamentally shifting its role to proactive agenda-setter and ensuring environmental integrity.

### III. Municipal/Local Level: Prioritizing Capacity and Financial Innovation

Local authorities (municipalities) are the executors, responsible for overcoming internal inertia and structuring projects to ensure financial viability for WBS measures.

- 1. Establish Dedicated WBS Expert Teams to Counter Institutional Lock-in:** Municipalities must establish dedicated, interdepartmental WBS expert teams with explicit political backing and mandate to approve technical deviations from standard operating procedures (SOPs) for infrastructure, thereby mitigating "institutional lock-in".

**Implementation Rationale:** This confronts the knowledge trade-Off of Expert Vision vs. Institutional Standardization. While private consultants and designers act as "knowledge champions" their innovative designs can be countered by internal municipal engineering departments due to established path dependencies, standardization, and cost-control. These expert teams ensure that specialized knowledge is retained internally and given the authority to challenge standard, cheaper practices (that compromise green WBS solutions).

**Conclusion:** Our analysis of seven development projects shows that Water and Soil as Guiding Principles (WBS) is not a checklist but a transformation in how we plan and build. Translating a flexible national guideline into concrete local action exposes four recurring trade-offs: short-term viability versus long-term resilience, efficiency versus collaboration, flexibility versus enforceability, and innovation versus institutional routine.

Success is never automatic — it is built locally. Merwehaven demonstrates how municipalities can create their own binding rules. Rijnenburg shows the power of water boards acting as co-designers. Gnephoek proves how provinces can use WBS as a condition for approval. Together, they reveal that WBS only works when it moves from being a consideration to a requirement.

Looking ahead, the question is how to make this shift structural. Implementing WBS may require new governance models — stronger alliances between public and private actors, or hybrid frameworks that bridge the gap between GREX and VEX. These partnerships could turn WBS from an isolated ambition into a shared working method: one that treats water and soil not as constraints, but as the foundation for a resilient future.

# APPENDIX

## A1. Case Examples of Adoption and Implementation Processes

Process tracing WBS adoption and implementation instances, using the Gnephoek and Waelpark, exemplifies both variation factors between cases and triggers for inclusion of WBS or related principles.

In Gnephoek, WBS is used as a conditionality and way to gatekeep political endorsement of the project. External influence and governance agreements have also been key in the process given the intensity of the multi-stakeholder environment (both in number of stakeholders and amount of political tension, like a ground zero). WBS is used as a way to achieve multiple goals and gain legitimacy in a region both very highly pressured for housing and heavily criticized for poor building conditions/location choice. More verifiable moments of ‘implementation’ are limited, since the plan is still pre-construction.

On the other hand, Waelpark offers a completed case where external pressure/factors were also influential, but more based on financing and expertise than politics or specific governance challenges. The multiple iterations of the plan (starting as early as 2009, changing in 2012-2025) are due to loss of financial capacity after the financial crisis. Using water as a key feature was present from the very beginning, and manifested to its current state based on mostly finance-related triggers that resulted in changes in project phasing, measures used, and technical feasibility.

*Blue cells = moment of adoption*

*Orange cells = moment of implementation*

### Gnephoek

2000s	Gnephoek established as VINEX location, private parties speculatively buy property
2017	Research into potential development begins. Plans for 10,000-12,000 units.
2018-2020	Waterboard revises internal water policy plan (#5) to express intention to be involved in plans earlier (6-year sequenced plans)
March 2021	Motion from Tweede Kamer to clarify situation and possibility of building in Gnephoek
2021	Municipality invites waterboard to become involved
April 2022	Letter from Provincial Executive stating Gnephoek not suitable and 3 conditions need to be met for approval
May 2022	Minister de Jonge visits the Gnephoek at the invitation of the Municipality and in the presence of the Deputy of Province of South Holland
June 2022	Minister de Jonge appoints former Delta Commissioner Wim Kuijken as independent advisor for the Gnephoek
September 2022	Letter ‘Perspective for Gnephoek’ from Wim Kuijken to Minister de Jonge naming 3 possibilities for development in the Gnephoek, one being the ‘hockey stick’ design for 5,000 units and 60 ha of nature reserve that was then chosen by the municipality to pursue.

June 2023	Contour plan initially released to municipality for review. Appendices include: <ul style="list-style-type: none"> <li>• Subreport soil, water, and climate</li> <li>• Governance advice for area development, final report published by Fakton Consulting</li> <li>• Waterboard memo ‘advice and points of attention for water system’</li> </ul>
June 2023	Province of South Holland coalition agreement 2023-2027 accepts Gnephoek as a development location.
July 2023	Final Contour Plan published
Sep 2023	Op Bodem Basis report published. Landscape architect not re-hired to implement soil-steering plans developed in report.
October 2023	Contour Plan adopted by city council
November 2023	Provincial government endorses plan and agrees to change provincial environmental policy, given 3 conditions
March 2024	Start of participation process
June 2024	National contribution of 60.5 million allocated in letter to House of Representatives from Minister de Jonge
October 2024	Management Agreement signed, including ambitions for water and soil (legally binding?)
November 2024	Memorandum on Scope and Level of Detail released (initiating Environmental Impact Assessment process)
March 2025	PPP officially established
October-December 2025	Draft amendment to provincial environmental policy and bylaw
October 2025	Masterplan submitted to city council
2027	Technical elaboration of first phase
2028	Ground preparation
2029	Ground breaking ceremony

## Waelpark

1999	Development plan ‘Het Nieuwe Westland’ made for entire region
2002	ONW PPP formed
2004	Merging of 5 municipalities makes one Gemeente Westland

2006 -2008	<p>Masterplan created under “Poelpolder” name. Water already given a steering position.</p> <ul style="list-style-type: none"> <li>Westland Water Policy up to 2030 passed, including more space for water. Water Test Guidelines 2004 from waterboard also taken as point of departure for future plans. Seen as an opportunity to use ‘no regret’ measures through ecological design and management. Described in zoning plan; “With water as a binding and basic element, the project will have to be trendsetting for special urban planning and architectural designs with various, mostly water-bound or water-related forms of housing”.</li> </ul>
2009	Original Zoning plan approved.
	<p>Financial crisis triggers need for re-financing and re-designing</p> <ul style="list-style-type: none"> <li>More ground level homes instead of floating on one centralized water retention (also rejected by waterboard and municipal engineers for technical unfeasibility)</li> <li>Phased development instead of at once</li> </ul>
2013	Planning session/event between multiple stakeholders to strategize new plan
2015	New Masterplan accepted with name “Waelpark”. 26 ha open basin for water retention replaced with decentralized storage along an ecological corridor.
2016	Existing regional water barrier updated and greenhouse land remediated.
2018	Water management plan published by waterboard, RPS engineers, and municipality. Acts as basis for future zoning plans.
2018	First sections completed.
2020	Subsidy (unknown amount) granted to Municipal Executive for Waelpolder through national government’s Housing Incentive Scheme.
	ONW unable to meet water retention goals in Northern portion, writes letter to waterboard effectively ‘promising’ to compensate with more retention space in the last phase.
2023	Zoning plan for final section accepted (Waelpolder).
2025	Realization of last phase.

## A2. Overview of Adoption Factors

Key factors influencing adoption	Case	Example	Quote
Timing of introduction to project	Waelpark	Early. Formed base for following zoning plans	*
	Rijnenburg	Later, but still relatively early in process (pre-masterplan). HDSR Asks to be involved twice (2020, 2022), water and soil eventually officially added to programmatic exploration and water guidelines in 2024 at request of waterboard	<p>“Well, I think it's always important. Important to be to be at. The table in the beginning because that's the easiest way to influence the, the plan and and then. If you have already a plan and you say as a water authority ‘Well, this is not our plan and we want it differently’ it's more difficult. While if you have a good landscape architect and we say well we want this and this and this, it's easier to, well, to implement it into the plan. But if you're, if you're at the table at an early stage you have to keep working until, well, the real development so. Yeah, you have to start at the beginning. You have to you have to keep informed and keep influencing until the very end.” (4C5C)</p> <p>Main objective “to give substance to a climate-proof and future-proof design of the area” added to Agreement at request of HDSR in 2024.</p>
Involvement of water managers	Gnephoek	Addition of water and soil to the discussion that previously focused on the Green Heart and mobility	“It [involvement of Ministry and advice of Wim Kuijken] turned out more or less a mediation process in which we as a water board took a more mediating role, because for us, there was much less at stake than what province and the municipality, and we used that position to promote <i>water en bodem sturend</i> , and we had success in that process because at the

			<p>time, the critique of the province for adaptation only concerned arguments about mobility, bird habitats, building outside the red line so to speak of the Groene Heart, and it didn't contain any arguments about water and soil management. And during the mediation process we, well, we put water and soil as our, as an argument...so we enriched that discussion with accommodations about water and soil management, which doesn't exclude development of the location, only made clear what the right way to do it would be." (2D)</p>
	Havenstad	Need Waternet approval and expertise.	<p>"But I [Waternet] could work together with more strategic and innovative thinkers in that organization to Yeah, to think ahead to the longer term and to get some experimenting well time, basically, to make test designs and to find out where we can take measures that both benefits water safety and rainwater issues...so in Waternet there were one or two people who had a bit of a more strategic, free role that, that felt like they wanted to work on Havenstad." (1B)</p> <p>"They have been involved in all kinds of stages, and also very early, because we need them. We also need their approval in the end, but we also need them for the for the bigger picture, because now this water quality study, we are doing it also together with the watershap, because some things they need like certain parameters...And so we must know what to do. And the waterschap just has to make sure that everything is okay. And if you're too late, then you cannot change certain things anymore." (3B)</p>

Involvement of external advice	Merwehaven	Haskoning water safety adaptation strategy	<p>“Let's try to come up with multi-layer protection and not only focusing on one, but trying to to also do in in other directions and not always put everything in protection, but also try to think in different segments. So in the Netherlands itself, it's it's been applied to some extent, but actually what you can see also for our consultancy worldwide that then actually we started doing this in a in a much broader way. Really having a like a choice between protect fully or have areas that are that can flood or might flood with extreme events but are then capable of. Yeah, of handling...A lot of these companies also in the port there don't have the funds just to raise it or to build a or or build a flat wall...that's also why I'm here in this profession. So I think any organization would do that, hire capacity to to make these plans outside of your daily operation as a as an organization, so. No. So what they have is for the like the day-to-day operations. City of Rotterdam has assigned employees to actually manage and guide and and strategize what they need to do, but really on the content they they would hire from from consultancies.” (2E)</p>
	Zuidpolder	Stroming - how to use housing to finance last phase of the park	<p>“Of that polder area, about 50 hectares that was not there was no finance anymore available from from the public authorities to change the land use from arable production into recreational and ecological area. And then one of the companies that is in the area, and so they are at home, so to say, they initiated the idea. And I know this, this, this company, and I know the municipality, of course. So we in about 2015 or 16, we launched the idea, if you need, if you want to change the last phase of the Zuidpolder also, but you have no money, you could try to adapt one of our concepts,</p>

			<p>new markten, into that area, because then you can, with a small amount of houses, you can gain enough money to do the investments from agriculture to nature. And that was, that was the reason why we were involved. I think it's about 2020, that we were asked by this company, GKB, you know, I think you must know, because they still are active in the area. And they are not a project developer in itself, but they are in a water management, a water dredging company. And they are founded and grounded in the municipality of of partner. So they know all the players. They know all the land owners. And they they took the initiative to buy land. And in that period, they asked us, as a consultancy, to develop the plan, the design for how could it be done, and that, I think you have that document [2021 Area Vision]" (2G)</p>
<p>Internal organization intent, including pioneering individuals</p>	<p>Merwehaven</p>	<p>Sustainability set as main goal, own municipal policy about building in unembanked areas</p>	<p>"I think it's mostly the yeah, wishes of the municipality or I think, yeah, the water board is not really involved in the blue-green strategy or so and it's not really involved in flood risk in unembanked area. So those are all. Yeah, municipality responsibilities, we'd like to develop the the area in the right way, in a sustainable way and that's why we think of flood risk for future residences and and. Also a sustainable and a bit natural type of green and a nice way or a nice yeah, that's what well, it's really [name] work. It should be a nice environment to live in and that way you also have to think about. Blue and green and and how it works in there. So I think those things really come from the municipality" (3E)</p>
	<p>Plan Tij</p>	<p>Via Landscape</p>	<p>"The development company, well, they knew us from from earlier projects, so they also understood that when they asked us to make a plan. That they. They don't get the typical plan which all other firms make and they well, you could see that there's a risk or you can see that as a necessity to make sure that you win this, this standard. When you enter a</p>

			<p>contest, you should always, as a commercial person, figure what's the best way to make sure that you can actually do this development. They knew already that we are landscape-based...we were quite lucky to have a client who choose us and believed in us, but also believed in this concept as the the one which was. Not only the the right answer, but also one that brought them a lot of money.” (1H)</p>
	Gnephoek	Project manager’s importance	<p>“There's a lot of credit needs to go to him, because he he with, with the help of his politician, his Alderman, I think you say it in English, they really pulled this through for the for the municipality.” (3D)</p> <p>“So it was actually a combination of, with a strong leadership from the municipality as well. I think the Alderman from the municipality was responsible for us. I think the lucky thing is that he was there in place, or he is there in place for a couple of rounds of elections, which guaranteed continuation.” (4D)</p>
Explicitly shared intentions	Gnephoek	Governance research and agreement	<p>“We wanted to make a future agreement, but then an official a document...in which all the agreements we made would be put and signed by the water board, the province, the municipality in the region, which is very special because this was one of the first time that the water board would sign an agreement like that.” (1D)</p>
	Rijnenburg	Akkord	<p>“And with the Rijnenburg Akkoord [Agreement] from last year this we were asked to to sign this agreement, but at the beginning there was nothing in it for us. Well, to to say why we should. Why we sign this now. It's not our responsible responsibility to build houses, so why would we sign something like this if there's nothing in it for us? So that's why we've asked to add this. I don't know the 4th, 4th main point that it will be built in a climate adaptive way. That's and that's</p>

			<p>gave us the, Well, the right and. The support from also our board to to sign this agreement.” (4C5C)</p>
	<p>Gnephoek</p>		<p>“...And the second one is, which is also always the case. But I think the chemistry between the people working on this project for the last few years is very constructive, very good, very positive, also very we had a lot of in the negotiation part phase two. We had a lot of rough and sharp discussions, and we had to do all sorts of breaks and one on one or one on three. So it was hectic and very fun. And a lot of I learned myself a lot from the process as well. But I think they reached a certain level of trust, a certain level of confidence, which makes it very agile, very stable and very sustainable for them to ride storms...Very strong. And to be honest, as well. I don't know if you look at that, but if you go through such a rough or interesting and quite hectic period, always with outside pressure of reaching an agreement before a deadline, a public opinion, politicians, shareholders, who are saying, Okay, we have invested in this land, and now we want our money. And if you reach an agreement, there's there's it which gives a kick and some some sort of euphoria. So that and it, and it builds long term relationships. So if you, if you reach that point, then you're very suitable, or, I would say, Not suitable, but, but you're prepared, and you and you've shown that you can work together through rough times as well. So that's positive, very positive.” (3D)</p> <p>“Relations, relationships. It starts with relations. Yeah. So when you have a good relation management and the governance according to that relation management, then you're already have our own speaking terms and have a basis for collaboration. I think that is the best success factor in your process, because in the formal, formal, formally seen,</p>

			we only have a formal role. We are formal in charge at the end of the process. Everything earlier, your process, earlier is by invitation, by goodwill, by relation.” (2D)
External influence/ factors	Gnephoek	Political endorsement	“I think also that the hogheemraadschap (waterboard), they've already been talking to the waterboard before we wrote the letter and already told them that if they wanted to develop here. That they needed to work with these principles. What I think did, I think it was the start of the turning point, because the biggest turning point was of course the advice of the of the of Wim Kuijken, the Former Delta commissaris and in the original plans they the municipality wanted to build also in the northern part of the Gnephoek called the Vrouwgeestpolder where it now turns out that it would have been really difficult to build there because it gets a bit technical.” (1D)
	Havenstad	Cancellation	<p>Speaker 1: Do you think it's possible that some entire phased areas just won't go through?</p> <p>Speaker 2: Yeah, absolutely. Yeah, yeah, yeah. And and yeah, a very recent thing is actually because one of the areas of Havenstad on the north side is, is, is, is a shipyard. And very recently, because of the the the sort of increasing threat from Russia and because of Trump's push to to invest much more in military infrastructure, these docks, may be, uh needed much more to uh uh repair uh Navy ships...Certainly there's there's there's a new urgency for for these kinds of functions and if they are already there in the city. Yeah, then why not keep them there? So, but if that's the area where you also plan 10,000 housing units, that means quite a change...I think it was at the beginning this year that in a couple of months time the city lost about 40,000 housing units of</p>

			capacity and with various locations where sort of there was a pushback from the industry. Saying that they won't just abandon their, their, their, their spots in the city.” (4B)
Financing outlook	Plan Tij	Timing in local context, demand for housing, low land values	“I think one of the biggest successes was, it was the first large project in Dordrecht since a long time where they built luxury houses. So there was a big demand of the these kind of houses.” (2H)
	Rijnenburg or Havenstad	Transport Phasing	“So even though the complete area around are social areas which really look shit, this was sold three times over in the first weekend that they this came to market. We saw we had three options on each house where the brokers told us that in this. Shitty social low area. These very expensive houses in this neighborhood without gardens would never sell. It did. So what? What did we have? We had a client which knew that they had little costs. They had a lot of very expensive houses they could sell easily. They had a lot of faith that they were, that we were. Both on the right track, we didn't believe the brokers and basically that was the difference between because there there was this point in time where with the broker said this is not possible, the environmental people told us that we were demolishing the existing nature of the Biesebos. There were a lot of people thinking that we did wrong, but we had, together with the client, a strong belief that this was the correct solution, but also of course. Would bring the most value to this area and we're happy that because it's always a gamble and you never know.” (1H)

### A3. Overview of Implementation Factors

Key factors influencing implementation	Case	Example	Quote
Finances	Plan Tijn	Promise of high returns, original land prices low	See above
	Merwehaven	Elevation (also for accountability, safety vs adaptation, mortgage lending)	<p>“The factor that we decided for making it higher was per se, making kind of a barrier in the public space would be less expensive, but it would be more fragile. It can break, and then if something happens, the municipality doesn't mean, it doesn't want to be accountable for because you also need, you also need to make it sometimes opening so everything is accessible, but if it floods, these openings need to be closed. So it was kind of an accountability issue. The other issue, yeah, I told you, it's because developers doesn't want to, like, build houses on that low because the banks wouldn't give mortgages, and so that was a thing. And making everything higher is probably, I think, one of the most expensive options, but was the safest one. Like, should we make it like 3.60 NAP or 3.80 and we know that 3.80 is actually safer, and all the new developments bottlenecks, we want to make it 3.80 but we decided, for this part of Merwehavens, to make it 3.60 Because the GREX, is like, when you have these gebiedsonwikkelings (area developments), the municipality makes, like this economic calculation for this area, it needs to be at least at a zero, not lose money, right? And if we were to make it like 3.80 we would lose money in because the 3.60 was already in the calculations. Like [name] knows more about it, he can tell you more, but this was also one of the factors. Money.” (1E)</p>

Communication of expectations to developers	Merwehaven	Since individual plots developed via tender by private actors, municipality can require things like minimum elevation but otherwise need to communicate from very beginning	“So, So what it's about is important is is is whenever actually people start buying developments and and projects there that they that it is communicated in what kind of area they will start. And and that is also, yeah, that is also the the the responsibility of the of the city.” (2E)
	Havenstad	Elevation	“That is the most difficult part, actually, because it is a lot of things. We still don't know how to do that in the Netherlands with this area. Is it, is it a good investment to raise the ground level, or is it maybe a better investment to do a lot of crisis management with routes that will be available for ambulances, stuff like that, or maybe a mixture that is quite complex...It will be very difficult to implement this because of the technical difficulties with the fixed points and the cables and the pipes in the ground, you cannot just raise the ground a lot, then they have to be renewed. That's also a problem that if they have to give permission for that” (3B) (all others too)
Technical feasibility and changes in technological norms	Zuidpolder	Floating homes, not good to have one big area of water anymore	<p>“I read the plan and I said, it's not possible there, because when you have a floating apartment complex, you have to be when it you run on a, let it flow, float, you have to be dig very deep for water, and then the salt water will come up. But that they, they didn't realize that when they make that plan. So they and they changed it to the plan that you were seeing with the houses. Normal, no more houses and and they started with, maybe, I don't know exactly 12, 1200 houses, but now it's 15, 1500. It's it's more to make more. So there are more houses in area than the original plan. That's the most, yeah, to keep to make more money. (2F)</p> <p>“because the last few years, the solutions are really different. So like from 2020 we looked at open water, and we always emphasize open water, open water. But now we have new policy that also other solutions could be possible. So that's really a changing thing in the last four or five years, and that's not really implemented in this,</p>

			in this, in this plan, but in new plans, it is...new insights, maybe that's also part of water en bodem sturend. So that's maybe an influence. Yeah, I could imagine that's an influence, but not only from that part. But yeah, what about water en bodem sturend is itself influenced by" (1F)
Political environment	Merwehaven	Political contingency for budgeting Changing coalitions (municipal elections every 4 years, common to all cases)	"Yeah, like, every four years we have new politicians in Rotterdam, so it influences how much money we get for, like, how much money we get for Green projects. it also changes a little bit how they see cars and parking cars, and also accessibility. I wouldn't say it changes, like, completely, because we already have, like, a master plan that is, like, it's signed in. It shouldn't change a lot, but it does change a little bit of the nuances and how budget we have for something...It could be that, like, we get less money for making green in the projects, this kind of stuff, or that could be that there's more, like political pressure to make parking spaces in the streets, you know." (1E)
Stakeholder continuity (who is involved and what is their level of commitment)	Rijnenburg	Continuity of people involved (keeping the same people on projects means more likely to succeed)	<p>"We have people who are for years with knowledge of this area. So it's not just blah blah blah on on ambition level. There's a use of technical know-how in-house also also with [name - water and climate adaptation advisor] here at our own municipality but also at the water board. People there were involved also in 2010 in the plans then, so there is a strong know-how." (2C3C)</p> <p>In the beginning, everybody says, yeah, we have to do this and it's and it's our good principles we'll, of course we will do this! But yeah, when we start to draw and we start to [pause] calculate, then it's getting more a discussion. Everything has to be paid and and then it's about financing all the the the measurements. But I think in the in the principles that we've made. Uh, yeah, about water en bodem sturend, it is good anchored. So yeah, at this at this point. I guess it's it's OK, but yeah, we have to see how it's. going to be...If I if I can add to that, if I would bet a bottle of wine on it, then I would bet for that it will be a very climate adaptive neighborhood, but I wouldn't put a lot of money on it because I'm, I want to be optimistic and I and I, I really want it to be good and I think we will have to take this leap of faith perhaps. But, but it needs a lot</p>

			<p>of work and it won't go by itself. We have to. I think we all have to work hard for it” (4C5C)</p>
	<p>Gnephoek</p>	<p>Project leader keeps pushing throughout (for plan generally, not exactly WBS)</p> <p>Designer not re-hired to implement soil research into plan</p>	<p>“It was also one of the case studies, the Gnephoek, and we, as a firm, we also, yeah, wanted to have that project, but another firm got the projects, but they're not really doing the the approach that we propose...We were a bit disappointed. I mean, it's fair that another firm gets the project. But we thought, like, okay, municipality, we did this whole project with you about how we can do things differently and then you don't implement it. So that was a bit, I, yeah, it was a bit painful” (26A)</p>

## A4. Important pieces of policy or programmes with repeated mention

(part of the ecosystem that sets the stage for WBS in area development)

Important pieces of policy or programmes with repeated mention		
National	Regional	Local
Ruimtelijk afwegingskader (spatial planning framework) - where to build	Provincial environmental policy	Watertoets - per waterboard and municipality. Given more weight with Ow but municipalities decide 'how' they involve waterboard
Nationale Maatlat (National standard or yardstick) - how to build	Building Covenants - ex. Province of South Holland Covenant on Climate Adaptive Building	By-laws and forthcoming waterschapsverordening (waterboard ordinance) - per waterboard
Multi-layer safety - 2009 Dutch National Water Plan	Climate adaptation strategies - per province through coalition agreements and implementation programmes (uitvoeringsagenda)	Waterboard afwegingskader - ex. HDSR waterboard stress test

Besluit Bouwwerken Leefomgeving (Decree on the Construcion of the Living Environment) - energy, health, safety, and sustainability guidelines for permitting	Climate stress tests - per province (as part of DPRA)	Individual tools used by developers in the absence of 'better', more 'detailed' tools, ex. EBW scan and Heijmans afwegingskader
National Climate Adaptation Strategy	Provincial suitability maps/spatial planning frameworks, or ruimtelijk afwegingskaders (ex. Utrecht)	Climate stress tests - per municipality (as part of DPRA)
Delta Programme - incl. Delta Plan on Spatial Adaptation (DPRA)		Risk dialogue - per municipality (as part of DPRA)
National Omgevingswet (Ow) (Environment and Planning Act)		Climate adaptation strategies - per municipality through coalition agreements and implementation programmes
2026 Nota Ruimte (Spatial Planning Document, draft released 26/9/25, previously NOVI - National Omgevingsvisie(2020)) - instrument of Ow		
NOVEX		
College van Rijksadviseurs research programme		

### Important junctures with repeated mention

Limburg flooding 2021

## Regulatory debates/other things happening in the sphere

The Risk Dialogue

Climate labels

Building and insurability in unembanked areas

STOER

Case law of 4-6 times where waterboard has held developer and/or municipality liable for negative effects of a project on watersystem

Defining cross-sectoral roles and responsibilities (Vylon/VVV, Ministry project)

EU Water Quality (Water Framework Directive)

## A5. Non-exhaustive list of common financial mechanisms

	Description	Notes
Land exploitation (GREX)	Grondexplootatie - an integrated budget drawn up by or on behalf of municipality or province to serve as framework for negotiations and basis for operating agreements. Identifies land costs (purchase, preparation) and revenues (contributions, subsidies, real estate) of a spatial development plan.	Can be active, passive, or joint (in behalf of all parties), includes division of responsibilities and risks.
National contributions	Incl. Housing Incentive Scheme	direct contributions (Gnephoek), scheme (Waelpark)
Other external contributions	Such as from the municipality or external investors	
Subsidies	Through waterboard, EU, etc.	Zuidpolder, Buro Lubbers
Housing as a finance tool for nature/green	For example, working on LEX concept (landscape exploitation)	Zuidpolder, Rebel Group project, BPD
Above-Plan Investment (BPI)	Investments in green spaces with purpose of benefitting the area (not a very clear instrument, something to do with Env and Planning Act)	Havenstad - used for climate-adaptation measures (roads and waterways)
Real estate development (VEX)	Traditional model that uses development as an investment in later revenue recovered from housing sales	Zuidpolder, Plan Tij

Alliantie

Newer model of joint venture, mostly used for infrastructure, that outlines co-benefits for partners, and not just monetary.

Started in 2000s, about a dozen in the Netherlands

## A6. GREX vs VEX characteristics and interaction with WBS

	GREX (Land Exploitation)	VEX (Real Estate Development)
<b>Dominant Actor</b>	Public authorities (Municipality, Province)	Private developers, consortiums, and investors
<b>Financing Motivation</b>	<i>Cost-Recovery and Balanced Budget.</i> The goal is to achieve a zero-sum or balanced financial result. It is a framework for budget control and avoiding a negative financial outcome (infeasibility).	<i>Profit Maximization.</i> The model is focused on maximizing financial returns, primarily derived from real estate price or net future income from rents.
<b>Funding Source</b>	Public funds (municipalities or provinces)	Housing sales or net future rental income
	External support: National contributions (e.g., the Housing Incentive Scheme in Waelpark or direct contributions in Gnephoek), municipal infrastructure funding or contributions from landowners. External grants, such as the Stimuleringsfonds Creative Industrie, are sometimes accessed for research and planning.	

<b>Financing Arrangement</b>	<p>Arranged as an integrated budget that identifies costs (purchase, land preparation, plan-making, infrastructure works outside the site) and revenues (contributions, subsidies, real estate) of a development plan.</p>	<p>Arranged as an investment model where Returns (from sales price or rents) minus Investment costs (building, construction, risk) yields a Residual land value, which must result in a positive business case.</p>
<b>Collateral/ Risk Bearing</b>	<p>The public entity (municipality/province) traditionally bears the complete land development risk (planning and issuance). Costs are treated as expenses that jeopardize the budget.</p>	<p>Private developers bear the commercial risk. Success relies on the marketability of the developed product to generate high returns (e.g., strong demand for luxury, water-based housing).</p>
<b>Case Examples</b>	<p>In Merwehaven, the initial elevation was restricted to 3.6m + NAP because the GREX calculation could "not lose money," overriding the safer 3.8m height.</p>	<p>Plan Tij used high returns on luxury housing to fund costly innovation (stilted homes). Zuidpolder used VEX revenue (housing) to fund the publicly unfeasible ecological park.</p>

**Vulnerability to WBS Costs**

High. Non-mandatory WBS measures are often the first items scrapped.

Lower, if WBS creates perceived added market value.

# COLOPHON

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<b>Publication date</b>	November 2025
<b>Acknowledgements</b>	With thanks to Cees Oerlemans (TU Delft), Maria Pregolato (TU Delft), Richard Jorissen (Rijkswaterstaat), Zac Taylor (TU Delft & Resilient Delta initiative) and all interviewees for their collaboration and valuable input.

This project was funded and supported by the Resilient Delta initiative, a collaboration between Erasmus University Rotterdam, Erasmus Medical Center and TU Delft (jointly known as Convergence).

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