

The Role of Water Authorities in Water Management in the Netherlands

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I. Introduction

The Netherlands, renowned for its advanced hydraulic engineering, faces unique challenges in water management due to its distinct geography. Approximately 26% of Dutch territory lies below sea level, exposing the country to constant flood risks (Netherlands Water Partnership, 2024). To address these challenges, 21 water authorities, known as *Waterschappen* in Dutch, play a vital role in managing water resources. Their core responsibilities include regulating water levels, protecting against flooding, treating wastewater, and ensuring water quality. Each *Waterschap* operates within a specific geographic area and works closely with the government to manage these critical resources effectively, while minimizing environmental impact.

II. Goals and Strategies of the Water Authorities

Water authorities in the Netherlands play a crucial role in defining the goals that guide national water resource management. This goal-setting process is driven by the need to address both immediate concerns and long-term strategies to ensure the sustainability and resilience of aquatic systems. These goals are developed through rigorous assessments of current environmental challenges, anticipation of future climate-related risks, and a commitment to high environmental standards.

A. Qualitative Goals

The qualitative goals focus on the immediate improvement of water quality and aquatic ecosystems. These include reducing pollutants,

enhancing wastewater treatment infrastructure, and limiting the environmental impact of human activities on water systems. For instance, initiatives may involve urban waterway cleanup projects aimed at restoring biodiversity and improving urban quality of life. Such actions are often implemented in collaboration with local organizations and community groups to ensure they are tailored to regional needs.

In Rotterdam, for example, a major Rhine decontamination project was launched to address pollution caused by industrial and urban activity. An initial analysis identified high levels of heavy metals and organic contaminants. To address this, advanced filtration technologies and biological treatment methods were implemented along the river, resulting in a notable reduction in pollutants and the reintroduction of aquatic species previously displaced from the area.

This project was supported by water authorities, the local government, and environmental organizations, which not only funded operations but also engaged the local community through educational programs. This partnership played a key role in the project's success, illustrating how collaboration and innovation can revitalize urban aquatic ecosystems while improving residents' quality of life.

B. Strategic Goals

The strategic goals of Dutch water authorities aim to embed sustainability across all aspects of water management. These include climate adaptation projects, such as constructing new hydraulic infrastructure that not only prevents flooding but also promotes natural water retention in the landscape. Another key focus is the development of innovative technologies for water recycling and reuse, thereby reducing reliance on traditional freshwater sources.



Image . Photo du Eastern Scheldt Barrier. Le plus grand barrage des Pays-Bas, construit dans le cadre du projet Delta, mesurant 9km.

In response to climate change and rising sea levels, the government launched the **Delta Programme**, which directly involves water authorities in developing long-term strategies to secure freshwater resources. The programme aims to keep the Netherlands protected from flooding while ensuring access to potable water. Water authorities collaborate with the government to implement solutions such as adjustable dams and more flexible water management systems that can adapt to changing climatic conditions (Ministry of Infrastructure and the Environment, 2012).

C. Collaboration with Government

Collaboration between water authorities and the Dutch government is essential to align water management goals with national environmental

and sustainability policies. This cooperation includes the co-creation of laws, regulations, and strategic plans that support the implementation of water authority objectives. The government provides a legal framework and the financial support necessary for these initiatives. This synergy ensures that water management strategies are both effective and well-integrated.

A prominent example of this collaboration is the **Room for the River** project, launched to improve flood management and increase river discharge capacity during high water events. The project includes widening riverbeds, restoring adjacent wetlands, and relocating dikes. In the IJssel Delta, for example, the navigation channel was deepened and an overflow canal constructed between two dikes. During flood periods, this canal fills with water, allowing the river to discharge larger volumes more quickly, thus reducing flood risks (Rijkswaterstaat, 2024). The Dutch government supported this project through substantial funding and by facilitating the necessary regulatory changes for land reallocation and environmental protection.



III. Applied Research in Water Management: The Role of WUR (Wageningen University & Research)

A. Impact on Agriculture and Irrigation

Wageningen University & Research (WUR) seeks to link water management research to the specific

needs of the agricultural sector. By utilizing open data collected by water authorities, WUR develops optimized irrigation practices that minimize water use while maximizing crop yields. For example, using models such as SWAP and WinSRFR, irrigation depth can be reduced from 162 mm to 81 mm, increasing application efficiency from 47% to 92% (Wageningen University and Research, 2022). This research promotes more efficient water use, contributing to the sustainability of Dutch agriculture. Additionally, projects like **CropMix** aim to diversify crops and improve the resilience of agricultural systems in the face of climate change (CropMix, 2024).

B. Data-Driven and Modeling Approach

Wageningen University & Research (WUR) adopts a data- and model-based approach to predict and manage extreme water events, such as floods and droughts. In collaboration with water authorities, WUR uses advanced models that incorporate data on precipitation, river levels, and weather forecasts. For instance, the **WALRUS** model (Wageningen Lowland Runoff Simulator) was developed to simulate hydrological processes in low-gradient catchments, allowing a better understanding of water dynamics (Wageningen University and Research, 2024). This collaboration provides researchers and managers with accurate, real-time information on water systems, supporting informed decisions that reduce risks to infrastructure and communities.

IV. Financing the Water Authorities

Managing water resources in the Netherlands requires solid financial support to meet the objectives set by the water authorities. This section explores the different funding sources for water authorities, including taxes and levies, contributions from local and provincial governments, and European Union funds. These financial mechanisms ensure the long-term viability of the authorities' activities and their ability to sustainably protect water resources.

A. Budgets and Expenditures

Dutch water authorities play an essential role in managing national water resources. In 2023, their total revenue amounted to €3.514 billion, reflecting the scope of their responsibilities and operations (Centraal Bureau voor de Statistiek, 2024). These funds are allocated to a range of projects, from maintaining existing infrastructure to implementing new technologies to improve water management.

For 2024, projected revenues are expected to rise to €3.950 billion. This increase reflects proactive planning to address future challenges such as climate change and population growth (Centraal Bureau voor de Statistiek, 2024). The *Waterschappen* plan to invest in resilient infrastructure and innovative technologies to ensure sustainable and efficient water management.

B. Taxes and Levies

Taxes and levies are the primary source of revenue for Dutch water authorities. These funds are vital for financing water resource management, maintaining infrastructure, implementing new technologies, and protecting against floods. Water authorities adjust these taxes based on environmental impact and the specific characteristics of each taxable entity, thereby promoting sustainable water management.

For example, a rental home occupied by a single person, with one pollution unit, is subject to an annual tax of €156, while a single-occupant owner-occupied home is taxed at €235. Larger households, such as multi-person owner-occupied homes, are charged €358 per year for three pollution units.

Businesses are also taxed based on their activities. For example, a farm with 50 hectares of land pays €3,568 annually for three pollution units. Food

production companies, with greater environmental impacts, can face much higher charges, such as €22,672 annually for 300 pollution units. These figures show how water authorities use taxation to incentivize sustainable practices and fund ongoing protection of water resources.

Objet	€/ an
Logement locatif pour ménage unipersonnel, 1 unité de pollution	156
Foyer unipersonnel occupé par son propriétaire, 270 000€, 1 unité de pollution	235
Habitation locative pour plusieurs personnes, 3 unités de pollution	277
Maison multi personnes en propriétaire occupant, 270 000€, 3 unités de pollution	358
Entreprise agricole, 500 000€, 50 ha de terrain, 3 unités de pollution	3,568
Espace naturel, 1 000 hectares	5,945
Vente en gros, € 2.600.000, 7 unités de pollution	1,265
Entreprise de production alimentaire, 13.000.000€, 300 unités de pollution	22,672

Table 1. Examples of water authority taxes in 2022.
Source: Unie van Waterschappen, 2022.

C. Government and Provincial Funding

Government and provincial funding provides essential support for water authorities, supplementing revenue from taxes and levies. This funding supports major infrastructure projects as well as initiatives to improve and modernize water management systems.

According to the table above, the distribution of water management costs among different entities highlights the importance of government support. In 2012, water authorities covered 42% of total costs, or €2.79 billion, demonstrating their central role in managing water resources. Municipalities and drinking water companies accounted for 20% and 21% of the costs respectively, showing the involvement of local authorities and private actors in water management and distribution.

The Ministry of Infrastructure and Water Management covered 15% of costs, or €1.01 billion, while provinces contributed 2%. This cost-sharing arrangement reflects a cooperative approach among various levels of government, each playing a specific role based on its

competencies and capacity to address water-related challenges. This shared financing ensures a balanced and integrated approach to effective and sustainable water resource management.

Organismes de gestion de l'eau	Répartition des coûts	
	Coûts totaux par établissement	% des coûts
Ministère des Infrastructures et de la Gestion de l'Eau	1 010	15 %
Provinces	136	2 %
Water boards (waterschappen)	2 790	42 %
Communes	1 360	20 %
Sociétés de distribution d'eau potable	1 370	21 %
Total	6 670	100 %

Table 2. Distribution of total water management expenditures in 2012 (in millions of euros). Source: OECD, 2014.

D. European Union Contributions

EU funding plays an important role in supporting environmental initiatives in the Netherlands, although such grants are less frequent compared to other sources. For example, under the **Water4all** programme, eight Dutch projects received more than €2.3 million in total funding. Of this amount, €1.6 million was co-financed by Dutch ministries, while €700,000 came from the European Commission (Smart Water Magazine, 2024).

These funds are typically allocated to research and development projects, as well as sustainable water management initiatives. The *Water4all* programme aims to improve water security across the EU. For the Netherlands, it offers an opportunity to strengthen the resilience of its water management system by integrating innovations from other member states and collaborating closely with European partners.

V. Conclusion

As central actors in flood prevention and water quality protection, Dutch water authorities represent a proactive and integrated approach that is vital to the country's environmental security and sustainable development. Their work, guided by rigorously defined qualitative and strategic goals, is key to addressing both immediate and long-term challenges posed by climate change and natural resource management.

Close collaboration with the government, as demonstrated by projects such as *Room for the River*, and the use of diverse funding sources, highlight the effectiveness of coordinated water management. The Dutch water authorities thus provide a model of water governance that could inspire other nations facing similar challenges. Their ability to integrate science, policy, and finance into a coherent framework is the cornerstone of their success—enabling not only protection from natural risks, but also the promotion of a future where water resources are balanced and sustainable.



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