***Research Question:*** *How do interest gaps between stakeholders influence the decision-making process in designing AI-enabled flood mitigation in the Netherlands?*

# 2 Case description & Analysis

To begin analyzing this wicked problem, we first introduce the actors and stakeholders involved in the decision-making process. Next, we will organize the Power-Interest grid and Actor coalitions on shared values based on our information, and then briefly discuss the timeline.

## 2.1 Actor and stakeholder identification

The main actors and stakeholders in the decision-making process include those with direct and indirect participation. These are categorized into two main groups: actors (who make decisions) and stakeholders (who are affected but do not have a say in the decision-making process). These 2 groups can be categorized into three groups: government and other official institutions, citizens, and research institutes.

(If follow the example on BS, these detailed explanations can be put in the appendix.)

Actors (Decision Makers):

* **Bestuurlijk Platform Zoetwater (BPZ)**: BPZ advises on the strategy for river plans and determines on what the Deltafondsbudget can be spent. The Deltafondsbudget is a budget for climate-adaptive and water-robust infrastructure in the Netherlands (https://www.deltaprogramma.nl/deltaprogramma/deltafonds).
* **Slim Watermanagement (Slim WM)**: Supports regional water authorities with the implementation of national policies and plans and is part of Rijkswaterstaat (https://www.slimwatermanagement.nl/programma/programma-slim/).
* Rijkswaterstaat: As the national agency under the Ministry of Infrastructure and Water Management, Rijkswaterstaat manages the Netherlands' main water defense systems, including dikes, dams, and storm surge barriers. Rijkswaterstaat play a significant stake in evaluating flood risk assessments, designing and implementing flood defense measures, and ensuring the long-term integrity of infrastructure.[https://www.jice.or.jp/cms/kokudo/pdf/reports/autonomy/river/kaigan/gijutsu\_05.pdf]. Leads the policy discussion on a national level with Slim WM, allocates funding for ML implementation at RWS, and establishes regulatory frameworks for ML use in public safety. RWS is part of the Ministry of Infrastructure and Water Management.
* **Regional Water Authority Brabantse Delta (Hoogheemraadschap Brabantse Delta)**: Takes the initiative on implementing modeling for policies in its water region. Ensures good water quality, sufficient water supply for irrigation, regional flood control measures, and sewage treatment.
* **Waterschappen**: also known as water management boards, are responsible for managing regional water systems such as canals and dikes. They ensure good water quality and maintain sufficient water supply, especially for irrigation purposes. Waterschappen are also responsible for regional flood control measures and sewage treatment to protect the local environment and public health[ https://www.rijksoverheid.nl/onderwerpen/water/waterbeheer-in-nederland ]. In the context of AI, Waterschappen can leverage AI for real-time data analysis and predictive maintenance of water systems.
* Research Institutes: Academic and research organizations play a crucial role in advancing the scientific and technical aspects of flood mitigation. They conduct studies, publish findings on AI effectiveness, and recommend best practices. Their involvement ensures that AI tools are scientifically sound and practically applicable [Bhuyan K, Van Westen C, Wang J, et al. Mapping and characterising buildings for flood exposure analysis using open-source data and artificial intelligence[J]. Natural Hazards, 2023, 119(2): 805-835.]. e.g. **Deltares**: A research institute that assists in ML model development for the water authorities (<https://www.deltares.nl/>).
* Ministry of Infrastructure and Water Management: This ministry oversees overall water management and flood protection policies in the Netherlands. They set national flood risk standards, provide financial support for flood defense projects, and coordinate with other ministries on water-related issues [https://www.government.nl/topics/water-management/water-management-in-the-netherlands, <https://www.rijksoverheid.nl/documenten/rapporten/2022/03/18/bijlage-nationaal-water-programma-2022-2027>]. The ministry leads policy discussions on incorporating AI-based thresholds that adapt to changing conditions, allocates funding for AI implementation, and establishes regulatory frameworks for AI use in public safety.
* Ministry of Economic Affairs and Climate Policy: Focuses on national economic development and climate change adaptation. They balance flood protection with economic interests, particularly for businesses and infrastructure[https://www.rijksoverheid.nl/ministeries/ministerie-van-economische-zaken-en-klimaat]. This ministry can facilitate the collaboration between businesses and research institutes to demonstrate AI capabilities and address concerns about reliability and ethical use.

Stakeholders (Affected Parties):

* **Citizens**: Water use is influenced by decisions made by water authorities and municipalities. Farmers, in particular, are highly affected by policies on water use set by water authorities.
* **Municipalities**: Affected by decisions made by water authorities, particularly in drought situations. For instance, media coverage highlighted dissatisfaction among farmers regarding irrigation bans set by the water authority Brabantse Delta (Omroep Brabant, 2021).

The government and official institutions, including Rijkswaterstaat, Waterschappen, Ministry of Infrastructure and Water Management, and the Ministry of Economic Affairs and Climate Policy, play crucial roles in the decision-making process and are responsible for developing and implementing relevant policies, regulations, and flood defense measures. These institutions ensure public safety, manage natural resources, and maintain national infrastructure, making them the main decision-makers on flood mitigation plans. Although citizens are usually not directly involved in the decision-making process, they are significantly impacted by flood prevention measures. The safety and well-being of citizens in flood-prone areas should be fully considered in the decision-making process. Companies and research institutes often provide important technical support and feedback to ensure transparency and sustainability.

|  |  |
| --- | --- |
| Actors and Stakeholders | Responsibilities |
| Bestuurlijk Platform Zoetwater (BPZ) | - Advises on the strategy for river plans  - Determines on what the Deltafondsbudget can be spent |
| Rijkswaterstaat | - Management of main water defense systems (dikes, dams, storm surge barriers)  - Evaluating flood risk assessments  - Designing and implementing flood defense measures  - Ensuring long-term integrity of infrastructure  - Allocates funding for ML implementation  - Establishes regulatory frameworks for ML use in public safety |
| Waterschappen | - Management of regional water systems (canals, dikes)  - Ensuring water quality and quantity  - Implementing regional flood protection and wastewater treatment  - Leverages AI for real-time data analysis and predictive maintenance of water systems |
| Slim Watermanagement (Slim WM) | - Supports regional water authorities with the implementation of national policies and plans |
| Regional Water Authority Brabantse Delta | - Takes initiative on implementing modeling for policies in its water region  - Ensures good water quality<br>- Ensures sufficient water supply for irrigation  - Implements regional flood control measures  - Manages sewage treatment |
| Research Institutes (e.g., Deltares) | - Conducts studies  - Publishes findings on AI effectiveness  - Recommends best practices<  - Ensures AI tools are scientifically sound and practically applicable |
| Citizens/Communities | - Concerns regarding evacuation plans  - Potential disruptions  - Influenced by decisions made by water authorities and municipalities  - Highly affected by policies on water use set by water authorities |
| Municipalities | - Affected by decisions made by water authorities, particularly in drought situations  - Media coverage highlighted dissatisfaction among farmers regarding irrigation bans set by the water authority Brabantse Delta |
| Media | - Provides public opinion and communication |

### 2.1.1 Power-Interest Chart

The Power-Interest Chart is a common tool for stakeholder analysis. Its idea and application can be traced back to Mendelow's Stakeholder Mapping Model, which was first proposed in a conference paper in 1981 [https://web.archive.org/web/20220306155706id\_/https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1009&context=icis1981]. According to existing literature and information, flood mitigation design in the Netherlands involves stakeholders at multiple levels, including national, regional, and local government agencies mentioned in the previous section, as well as companies, research institutes, and citizen communities. The following is an analysis of the main stakeholders and their interests:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Actor and Stakeholder | Power | Interest | Position in Matrix | Analysis |
| Bestuurlijk Platform Zoetwater (BPZ) | high | high | High power-high interest | Advises on strategy for river plans and budget allocation. |
| Rijkswaterstaat | high | high | High power-high interest | Core strength needs to be managed with focus. |
| Waterschappen | high | high | High power-high interest | Implementing regional flood protection and wastewater treatment |
| Slim Watermanagement (Slim WM) | High | High | High power-high interest | Supports regional water authorities with policy implementation. |
| Regional Water Authority Brabantse Delta | High | High | High power-high interest | Implements modeling for regional policies and ensures water quality |
| Research Institutes | Middle-high | high | Middle power-high interest | Conduct research and provide scientific evidence on AI effectiveness |
| Municipalities | high | high | High power-high interest | Affected by decisions made by water authorities, particularly in drought situations |
| Citizens | Low | high | Low power-high interest | Care deeply about the results and need to actively participate. |
| Media | Middle-low | Middle-low | Middle-low power- Middle-low interest | Public opinion and communication |

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### 2.1.2 Actor Coalitions on Shared Values

When analyzing stakeholders in the decision-making process of flood protection in the Netherlands, Actor Coalitions on Shared Values can be identified through the analysis in the previous sections:

* **Municipalities and Residents**: There are obvious common interests between municipalities and residents. The main concern for both is to ensure the safety and well-being of residents, so their cooperation on evacuation plans and flood risk assessments is particularly important. By working together, municipalities can better understand and address the concerns of residents, ensuring that flood mitigation measures are effective and publicly supported.
* **Rijkswaterstaat and Waterschappen**: These entities share the responsibility for managing and maintaining the country's main and regional water defense systems. They work together to design, implement, and maintain effective flood protection measures to ensure long-term sustainability. Their combined efforts in leveraging AI for real-time data analysis and predictive maintenance can enhance the overall efficiency and reliability of the water management systems.
* **Ministry of Infrastructure and Water Management and Research Institutes**: The alliance between these entities is based on a common concern for sustainable flood management. They can promote the integration of economic development and environmental protection through official and private efforts. Research institutes provide the necessary scientific and technical expertise, enabling the Ministry to formulate policies that are both effective and grounded in the latest research.
* **Ministry of Economic Affairs and Climate Policy and Companies**: This coalition focuses on balancing economic development with climate change adaptation. Companies can demonstrate AI capabilities and provide technical guidance, while the Ministry facilitates collaboration and addresses concerns about reliability and ethical use. Together, they ensure that economic activities are resilient to flooding and contribute to overall climate adaptation strategies.
* **Slim Watermanagement and Regional Water Authorities**: Both entities support the implementation of national policies at the regional level. Slim Watermanagement provides guidance and resources, while regional water authorities, such as the Regional Water Authority Brabantse Delta, take the initiative to implement modeling and ensure local water quality and supply. Their collaboration ensures that national policies are effectively adapted to regional contexts.
* **Bestuurlijk Platform Zoetwater (BPZ) and Rijkswaterstaat**: BPZ advises on strategies for river plans and the allocation of the Deltafondsbudget, while Rijkswaterstaat manages the main water defense systems and leads policy discussions. Their coalition ensures that strategic planning is aligned with practical implementation, optimizing the use of available resources for flood mitigation.
* **Municipalities and Media**: Municipalities rely on the media to communicate flood risk assessments, evacuation plans, and resource allocation decisions to the public. The media plays a crucial role in shaping public opinion and ensuring that residents are well-informed about flood mitigation measures. This partnership is essential for maintaining public trust and ensuring compliance with flood protection strategies.

Through the above theoretical Actor Coalitions on Shared Values, all stakeholders can better coordinate and cooperate in the design and implementation of AI-driven flood mitigation strategies, ensuring that diverse goals can be integrated and ultimately achieving sustainable flood prevention solutions.