September 2022

Policy evaluation Marker Wadden 2022

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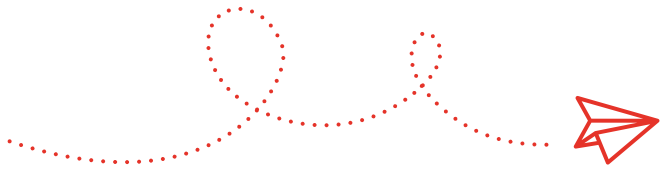

Front page picture: Peter Leenen

Executive summary (part 1 of 4)

The water quality of the Markermeer is in bad shape and the quality of flora and fauna has deteriorated significantly in recent decades. The Markermeer has no connection to the sea or rivers due to several dykes and dams, and the reclamation of land has caused the disappearance of almost all natural shores.

Marker Wadden addresses this problem in an innovative way. Among other things, the project aims to contribute to the restoration of nature in the Markermeer by creating islands with sediment from the Markermeer, as well as a surrounding underwater landscape including a silt trench and a number of sand extraction wells. Silt from the bottom of the Markermeer will be reused as a substrate for the islands. This should improve both the water quality and the underwater habitat, while creating a new area for nature and recreation. As far as we are aware, sediment has never before been applied on this scale for the creation of a natural landscape and ecosystem restoration.

This policy evaluation deals with the efficiency and effectiveness of the Marker Wadden project. This concerns both the extent to which the objectives have been (or will be) achieved and how this can be explained, based on how the project is being executed. The objectives of the Marker Wadden project are:

1. Improving the ecological qualities and recreational uses of the Markermeer and thereby contributing to a Future Proof Ecological System (FPES).
2. Developing a bird paradise with an optimal contribution to the Natura 2000 objectives for the Markermeer and the Netherlands.
3. Learning, monitoring effects, and innovating.

Executive summary (part 2 of 4)

Due to the unique nature of this project and the lack of comparative material, it is hard to give a definitive statement on the effectiveness of the project. Nevertheless, given the combination of goals, involvement of different organisations with their own interests, realisation within budget and planning, and cost-efficient management, Marker Wadden has many characteristics of an efficiently executed project.

The extent to which the goals have been achieved varies per goal. It is clear that a piece of new nature has been created with a large diversity of vegetation, migratory birds and resident birds. As is the fact that visitors rate their visiting experience highly. Moreover, a lot of new knowledge has been gained. It would have been ideal, however, if the impact of the project on the water quality of the Markermeer was already clearer at this moment, and if the knowledge gained from research would have yielded more, both within the project and in other projects. And since the islands are still developing in terms of flora and fauna, in part we do not yet know the "final picture" either. The Marker Wadden project shows positive outcomes on all goals, but whether it is effective at system-level will have to be proven by the results of further (ecological) monitoring.

The policy evaluation does not include a recommendation on a possible continuation of the Marker Wadden project. That is a separate policy decision, beyond the scope of the study. However, the evaluation does contain a number of lessons and recommendations for future, similar projects. These follow hereafter.

Executive summary (part 3 of 4)

For the Marker Wadden project, the choice was made to apply an approach of **expeditious realisation and tight budget control**. This approach is largely reproducible, especially for projects with similar characteristics. Prerequisites were a good cooperation between the clients themselves and with the contractor, as well as a willingness to make pragmatic choices. For instance, it was possible to slightly adjust the total land area that was to be constructed, depending on the course of the project. The choice to place the management of Marker Wadden with Natuurmonumenten is well-founded, but a **long-term strategy on management** and any risks that may emerge in this process is missing.

Because of the learning effect of Marker Wadden, it will be possible to have more focus on **sustainable realisation and clearer goals** in the future. But this should not be taken too far either. KPI's that are set too ambitiously can cause a culture of judgement and a too narrow perspective on ecological value. The innovation in the process of Marker Wadden was in working with trends rather than rigid targets. Where uncertainties about expectations remain, it is good to make that explicit.

The **public-private partnership** of the project was innovative because the project was co-commisioned by a civil society organisation: Natuurmonumenten. The collaboration worked well. Success largely depended on the individuals and their attitude - the will to think and act constructively and from the interest of the project. It succeeded in attracting private money to a lesser extent than expected. In theory, the ecosystem services around the nature islands do offer **opportunities for private co-financing**.

Executive summary (part 4 of 4)

The knowledge development within the project was valuable, but could be better embedded in a broad **strategic knowledge infrastructure**. It makes sense to link the various knowledge programmes of large water and nature projects nationwide, in order to compare results and identify best practices across project boundaries. Then strategic research assignments can also be given to specific projects, the results of which can be used more widely. A learning point from the project is that there is added value to be gained by **running realisation and knowledge development simultaneously.**

Marker Wadden is iconic. In an innovative way, a recognisable piece of nature has been added to our country. **Propagating the iconic value** can lead to positive spill-over effects, provided a party takes explicit responsibility for this. Core to the Marker Wadden approach was building with silt. The project produced many new insights regarding this, including things that did not work well. It is valuable to share that information widely, for a possible continuation of the project and for other nature projects, but also to strengthen the Netherlands' leading knowledge position. The global shortage of sand means that building with silt is attracting **international attention.**

1. Policy evaluation background

1. Policy evaluation background

1.1 The Marker Wadden project

The quality of nature in the Markermeer has deteriorated tremendously in recent decades. Due to the various dykes and dams, the Markermeer has no open connection to the sea or rivers. In addition, the reclamation of land has ensured that there are hardly any natural shores left. As a result, a thick blanket of silt has deposited itself on large parts of the bottom of the Markermeer. The silt is not only disastrous for the life on the bottom of the Markermeer, but when stirred up (by strong winds) it causes murky water. As a result, fish and bird populations have declined sharply.

The Marker Wadden project aims to address these issues. Marker Wadden should (among other things) contribute to the restoration of nature of the Markermeer by creating islands with sand, clay and silt from the Markermeer, and a surrounding underwater landscape including a silt trench and a number of sand extraction wells. As far as we are aware, sediment has never before been applied on this scale for the creation of a natural landscape and ecosystem restoration.

The objectives of the Marker Wadden project stem from various policy notes and documents, and are formulated as follows in the Monitoring and Evaluation Programme Marker Wadden as well as in the KIMA Synthesis Report:

1. Improving the ecological qualities and recreational uses of the Markermeer and thereby contributing to a Future Proof Ecological System (FPES).
2. Developing a bird paradise with optimal contribution to the Natura 2000 objectives for the Markermeer and the Netherlands.
3. Learning, monitoring effects, and innovating.

On 31st of December 2020, Marker Wadden (the first phase) was officially completed. The extension of the first phase is currently being realised. The policy evaluation of the Marker Wadden should provide insight into the overall success of the project and possible learning points for future, similar projects. This document contains the outcomes of the policy evaluation.

Figure 1 – Top view of murky Markermeer [A]

1. Policy evaluation background

1.2 History of Marker Wadden

For some time, civil society organisations and governments have been considering the future of the Markermeer. Since the separation of the Markermeer from the IJsselmeer by the Houtribdijk in 1975, the ecological situation of the Markermeer has deteriorated sharply. A challenge arose to improve the ecological state of the Markermeer. There were also spatial and economic ambitions (e.g. recreation and housing). In 2013, these tasks came together in the adoption of the "Rijk-Regioprogramma Amsterdam-Almere-Markermeer" (RRAAM). RRAAM envisages an urban leap by building 60,000 new homes in Almere, an accessibility leap for the Noordvleugel, and a green-blue leap with the FPES as future perspective. [1]

Murky Markermeer
Originally, the bottom of the Markermeer consists of clay. The top layer comes loose from the bottom as soil organisms churn it up. Loosened clay is called silt. Silt can float around in the water, but it can also settle. Settled silt is easily swirled up by wind. Since the closure of the Markermeer by the Houtribdijk, the floating silt can no longer be washed away. As a result, the water becomes murky more often. This affects the Markermeer's food supply. Phytoplankton adhere to the silt, making it less suitable as a food source. As a result, the silt directly affects the biological state of the Markermeer. The western part of the Markermeer contains clearer water than the eastern part, due to the (south-)westerly wind dominant in the Netherlands, a thinner silt layer in the western part and the presence of more aquatic plants and filtering mussels. [2]

Part of the FPES is a large-scale and dynamic land and water area in the north of the Markermeer. Its development also had to take into account the tasks arising from European rules and regulations (Natura 2000, Water Framework Directive) as well as national policy such as the Deltaprogramma (freshwater supply and water safety) and spatial adaptation. Besides meeting these tasks, there was a desire to apply the innovative "Building with Nature" concept: an approach to the realisation of nature that uses natural processes as much as possible. Partly with the aim of strengthening the Netherlands' knowledge position on hydraulic engineering and nature development. [2]

The initial thinking on this matter took place during the drafting of the RRAAM. In 2012, the respective government authorities launched a competition in search of cost-effective ideas to make the ecosystem in the Markermeer future-proof. Parallel to this competition, Natuurmonumenten submitted the current plan for Marker Wadden. [2]

Natuurmonumenten did not enter the competition at the time, because, as stated in the interviews, it did not want to comply with the requirement that the intellectual property of the plan would be transferred to the State. The plan for Marker Wadden was therefore submitted at the same time as the competition deadline, but not as an entry. In the end, Natuurmonumenten's plan was chosen. This formed the starting point for the Marker Wadden project.

1. Policy evaluation background

1.2 History of Marker Wadden

In our view, the process of how Marker Wadden came to be can be interpreted as a typical example of the creation of a "policy window". This is a theory from political science that states that policy is created when three “aspects" come together:

- the problem must be known,
- there must be a solution available,
- there must be political space (including financial resources) to realise the solution.

For Marker Wadden, a situation occurred in the period 2010 to 2015 where these aspects came together. The RRAAM established the ambition for the Markermeer to "improve the quality, for nature, recreation and landscape". At the same time, that vision includes a problem description. In other words, RRAAM gave political attention to the problem, and created political space for the search for solutions.

Simultaneously, the solution was also at hand: the idea of Building with Nature was already in development, and the specific idea of Marker Wadden had been generated within Natuurmonumenten. Eventually, a special fund from a national lottery (the so-called Droomfonds) provided the seed capital, bringing the three aspects together.

1. Policy evaluation background

1.3 Characteristics of the project

The first phase of Marker Wadden consists of the construction of five islands and a surrounding underwater landscape of shallow water, a silt trench and several deep (sand extraction) wells. It involves about 500 hectares of terrain above water and about 500 hectares underwater. The project was completed by the end of 2020. The extension of the first phase consists of the construction of a sixth and seventh island and surrounding landscape. This is currently under construction. This will bring the total area to about 1,300 hectares. [2] A further extension of the project into a second phase is currently being considered.

The construction of Marker Wadden was done in a rather innovative way: first by spraying sand to form quays. This created separate compartments, which were filled with holocene clay. The clay was extracted from the bottom of the Markermeer. After some time of consolidation, the process was repeated (depositing a new amount), to the point that land emerged above water. The intention was to experiment with silt (cause of the murkiness) as a building material. The goal was to create a situation in which silt from the bottom of the Markermeer would be reused as the basis for nature islands, thereby improving the water quality and underwater habitat and creating a new area for nature and recreation. [2]

The harbour island - one of five islands - is open to the public and accessible by boat. There is a ferry service and space for a limited number of boats to moor in the harbour. The harbour island has one catering facility (beach pavilion) and a number of cottages where visitors can stay overnight. There are also many hiking trails and viewpoints for nature lovers. The remaining four islands are not open to the public. Here, birds rest, forage and breed.

Figure 2 – Layout of Marker Wadden [B]

1. Policy evaluation background

1.3 Characteristics of the project

The plans for Marker Wadden originated in 2012, as outlined earlier. Between 2012 and 2015 was the initiation phase, during which Natuurmonumenten's plan continued to take shape. Natuurmonumenten found the first part of funding from a national lottery. It was decided to set up a public-private partnership, with Natuurmonumenten and Rijkswaterstaat jointly taking on the role of central direction and the commissioning of the project. [2] Concrete agreements were laid down in 2014 in a *cooperation agreement* between Natuurmonumenten, the State (specifically the ministry of Economic Affairs and the ministry of Infrastructure and Water Management) and the province of Flevoland, including the financial contribution of each. At the same time, (i) Natuurmonumenten and Rijkswaterstaat entered into an *implementation agreement* containing the mutual division of tasks and responsibilities, (ii) the State and Natuurmonumenten entered into a *ground lease agreement* for the transfer of the ground lease right and (iii) the parties entered into a *framework agreement* with an environmental development fund (Nationale Groenfonds) regarding the management of the money.

The tender for the construction of the Marker Wadden was published in 2015. After a competitive dialogue (with three remaining parties), the contract was awarded to a consortium led by Boskalis. Construction of the five islands, silt trench and sand extraction wells started in spring 2016. [2] On the 8th of September 2018, the first island was officially opened. This meant that the island was no longer a construction site and the area was formally transferred to Natuurmonumenten in a partial ground lease agreement. The other four islands were also largely completed in 2018, with the first birds settling almost everywhere in the first few weeks after completion. Formal completion of the five islands took place on the 31st of December 2020. [2]

Boskalis bore responsibility for the management until the completion date. From 2021, management (for at least a 30-year period) passed to Natuurmonumenten, with the exception of maintenance on the sandy edges. For this, Boskalis - based on the Design-Build-Maintain agreement - remains responsible until 10 years after delivery. [3]

1. Policy evaluation background

1.4 Scope of the policy evaluation

The policy evaluation Marker Wadden 2022 focuses on the efficiency and effectiveness of the Marker Wadden project. This concerns both the extent to which the objectives have been (or will be) achieved and how this can be explained, based on how the project is being executed. Explaining the results (output and outcome) aims to identify failure and success factors and gain insight into what is going well, what could be improved and whether the right things are being done.

The parties involved in the construction of Marker Wadden envisaged the following three objectives: [2]

1. Improving the ecological qualities and recreational uses of the Markermeer and thereby contributing to a Future Proof Ecological System (FPES).
2. Developing a bird paradise with an optimal contribution to the Natura 2000 objectives for the Markermeer and the Netherlands.
3. Learning, monitoring effects, and innovating.

In the Monitoring and Evaluation Programme Marker Wadden, these three objectives have been elaborated into several sub-questions. The sub-questions are discussed in sections 3.1, 4.1 and 5.1 of this report. Answering these sub-questions individually is beyond the scope of the policy evaluation. However, we do form an overall picture of the extent to which the above three goals were achieved, because that is one of the specific evaluation questions we were asked.

In this evaluation, we look at the first phase of Marker Wadden, of which the last of the total of five islands were completed in 2020. The extension of phase 1 is outside the scope. This evaluation does not include any recommendations on whether or not to proceed with any follow-up phase of the project. However, we do make recommendations for future, similar projects.

Monitoring of effects of Marker Wadden was (and still is) carried out while many construction activities were still taking place. The whole area is in a pioneering phase. Therefore, besides an **ex-post evaluation** (in particular on the extent to which concrete objectives have been realised), an **ex-ante** component is also central in this evaluation (in particular on the extent to which further developments and results can be predicted). A feature of Marker Wadden is its innovative character, in policy preparation, funding, construction as well as in research. Therefore, a **learning evaluation** is needed to determine which success and failure factors influenced the results and how the approach can be improved upon in the future.

These three components are articulated in several sub-questions for the policy evaluation. We present these on the next page. We answer the sub-questions concisely in appendix I. For detailed substantiation, we refer to chapters 2 to 6 of this document.

1. Policy evaluation background

1.4 Scope of the policy evaluation

Research questions, part 1: Ex-post evaluation

1. To what extent was the approach to Marker Wadden efficient, both in its preparation and realisation, e.g. think of the use of silt as a construction material?

2. To what extent have the three policy goals been realised, both locally and nationally, e.g. think of N2000? Is this temporary or has there already been a structural break in the trend? Quantified as much as possible based on available information.

3. How can these results be explained? Can any parts of the concept Marker Wadden be identified as being crucial for this, for example in approach, design and location?

4. Could all evaluation questions in the MEP be adequately answered? If not, what is the reason these questions could not be answered and does this affect the answer to the question whether the policy objectives are met?

5. What effect has Marker Wadden had in a broad context? Not only on water quality and nature, but also specifically on the appreciation of Marker Wadden by visitors of the Markermeer area?

Research questions, part 2: Ex-ante evaluation

6. The concept of large-scale transitions of land and water are an important part of FPES. Is there now an expectation that this approach will also lead to achieving FPES targets? What is decisive in this regard?

7. Succession and management are inextricably linked. Can some pioneer species be preserved with management, and what is the action perspective of the managing party in this regard?

8. Work is underway on a follow-up to Marker Wadden (phase 2) as part of the future policy for large waters (Programmatische Aanpak Grote Wateren, PAGW). Is this expected to be efficient and effective, and what future areas of concern exist in knowledge development and innovation? Which areas of concern are there for future management?

Research questions, part 3: Lessons learned

9. What lessons can be learned from the cooperation between the various initiators during the planning phase, the construction and in the knowledge programme, and what experience has been gained for a more general follow-up?

10. Can we learn lessons from how Marker Wadden deals with N2000 objectives for future projects in the Netherlands?

11. What are the pros and cons of building with silt and can this concept be applied elsewhere?

12. How is the way of working in the knowledge programme appreciated, and can we use it in other areas?

1. Policy evaluation background

1.5 Some preliminary notes

Policy evaluation vs. technical evaluation
The policy evaluation was conducted through a combination of document review and stakeholder interviews, complemented by internal analysis by the evaluators. Appendix II contains a list of documents and organisations we consulted. The policy evaluation was guided by the Steering Committee, consisting of Rijkswaterstaat, Deltares, Natuurmonumenten and NIOO-KNAW, and by a separately formed guidance group consisting of the Ministry of Infrastructure and Water Management, Rijkswaterstaat, the Ministry of Agriculture, Nature and Food Quality, the province of Flevoland, Natuurmonumenten and Deltares.

It is important to note that a policy evaluation involves research at a different level than evaluations of a technical nature. Much ecological and morphological research has been done in the context of Marker Wadden. Facts and figures have become widely available in the KIMA Synthesis Report, which comes from the overarching research programme (Kennis- en Innovatieprogramma Marker Wadden, KIMA). There is more on KIMA in section 2.4. The policy evaluation is explicitly not a summary of the outcomes of that programme. It is a study at a higher abstraction level, with key questions being whether Marker Wadden was implemented efficiently and proved to be an effective instrument to achieve the underlying objectives. For this policy evaluation, written sources are equally important as inputs as the perceptions of the people involved in all phases of the project.

Taking a closer look at the goals
A general challenge when doing policy evaluations is that goals are often not (concretely) described. For example, the objective in the 2014 cooperation agreement reads as follows:

"The objective of the parties with the Project is to realise an important first step towards improving the ecological qualities and recreational possibilities of the Markermeer and thus a first step towards the Future Proof Ecological System. The starting point for all parties is, without diminishing what is stated above, that the Project will be designed in such a way that, within the frameworks of the Project budget, an optimal contribution is made to the N2000 objectives for the Markermeer." [4]

Neither the process goal ("first step") nor the formulated ambition ("improve", "optimal contribution") are objectively testable. Unlike many other projects, Marker Wadden did subsequently choose to formulate some concrete goals and to operationalise them. This led to the three objectives as described earlier, which are central to this evaluation. As for the conceptual choice "Bird paradise", it is not possible to trace how this came to be, but it is clear that this objective was explicitly named in the selection document of the tender in 2014. [5]

Judgements on project effectiveness
Marker Wadden is a project in a dynamic environment. Construction was completed not long ago (and continues for the next two islands), making measurements available for only a fairly short period of time and also somewhat disturbed by construction work. Added to this is the fact that the objectives were formulated rather openly, and that there are always multi-causal relationships in such a dynamic environment. For this evaluation, we have been asked to give judgement on the effectiveness of the project, but the above should be taken into account as a "disclaimer".

2. Project and knowledge governance

2. Project and knowledge governance

2.1 Stakeholders and roles

Distribution of roles in general
The 2014 cooperation agreement describes the organisation of the Marker Wadden project. A Steering Committee is responsible for directing the project, for the Implementation Organisation and for managing the project budget. The State, Natuurmonumenten and the province of Flevoland participate in the Steering Committee. The Implementation Organisation – as the name implies - deals with the implementation of the project. It follows up on decisions taken by and is accountable to the Steering Committee. [4] The implementation agreement stipulates that Natuurmonumenten and Rijkswaterstaat staff this Implementation Organisation. [6]

Public-private partnership
The public-private commissioning by Natuurmonumenten and Rijkswaterstaat is one of the peculiarities of the project. The project team was organised to match the core qualities of the organisations. [2] In practice, this means that Rijkswaterstaat is (was) responsible, among other things, for tendering, technical management and the relationship with the Ministry of Infrastructure and Water Management and the Ministry of Ministry of Agriculture, Nature and Food Quality, and Natuurmonumenten focuses mainly on project management, the secretariat, communication and environmental management. [7] In order to decide who would be on the project team, complementarity between the two organisations and the best available competences were considered at the individual level, for the benefit of the project. [2]

Tender process
The project was issued as a European tender, after which seven parties submitted their project approach and gave a presentation, followed by a competitive dialogue with three parties. In the initiation phase, the Marker Wadden project "merely" consisted of a sketch and description of the idea. After the competitive dialogue, a consortium led by contractor Boskalis won the tender. [2]

Partially shared interests
It follows from the interviews that the interests of Natuurmonumenten and Rijkswaterstaat as clients are partly in line with each other, but do not completely overlap. Whereas the primary interest of Natuurmonumenten is to develop new nature, which attracts birds and is appreciated by visitors, water quality is a high priority interest for Rijkswaterstaat. During the project, the parties did not experience this as conflicting, as stated by our interviewees, because there was mutual understanding and transparent communication.

Of course, it cannot be ruled out that interests will conflict more in the future than they have so far. For instance, for any follow-up to Marker Wadden, the issue of the Markermeer as a freshwater supply is higher on the agenda. After all, the more islands are realised, the more pressure there could be on the Markermeer as a freshwater supply, which is of extra concern in the current context of climate change and drought. In one of our conversations the question was raised whether, from the point of view of maximising the contribution to ecology and water quality in the Markermeer, the same design should be chosen again next time, or whether a different design - with more shallow waters along the edges of the lake - would be more appropriate. It is also conceivable that in future management choices there could be a conflict in goals between the first goal (FPES) and second goal (Bird paradise) of the project.

2. Project and knowledge governance

2.1 Stakeholders and roles

Continuity as a success factor

One interviewee points out to us that, unlike many other government projects, Marker Wadden involved a high degree of stability in the composition of the project team over time. Many of the people involved in the initiation phase are still part of the project team today. This is a contributing factor to the success of the project. It ensures the preservation of knowledge and content continuity and avoids the need to develop personal relationships over and over again. At the same time, it is a consequence: among the people involved with the project there was (and still is) a sense of identification with and belief in the project, more so than in most other projects.

It also depends on the persons

The sense of identification with the project is also a success factor in its own right. The picture that emerges from the interviews is that the project team was convinced of the project and managed to strike an excellent balance between passion (dream) and pragmatism (deed). In each case, solutions were sought that were in the project's best interests, reducing the focus on the interests and the usual procedures of the underlying organisations.

2. Project and knowledge governance

2.2 Construction strategy and costs

The project philosophy of Marker Wadden

In constructing the project, “expeditiousness" was an important part of the strategy, states one interviewee. This was an idealistic choice by the project team, prompted by the desire to demonstrate that government projects in the Netherlands can also be realised quickly. To achieve expeditiousness, we were explained, they started reasoning backwards from the time of construction to the start of the preparation phase. It was found that "only" a number of permits and a zoning plan were needed. Unlike, for instance, in the established project development system for infrastructure (“MIRT“), the team did not work in sequential steps, but started working on procedures and processes simultaneously. For instance, the zoning plan was drawn up while the Marker Wadden design was not yet ready. This approach was not without risks, but also created certainty quickly.

Adverse effect of expeditiousness?

At one point, the expeditiousness potentially backfired, according to several interviews. In the project proposal to the government, Natuurmonumenten indicated it would need a budget of about €75m for the construction of about 1,000 hectares, including 500 hectares of land area. The cooperation agreement included a total amount of €50m (incl. VAT) as the initial project budget for realisation of about 300 hectares of land, most of which came from the Ministry of Economic Affairs, the Ministry of Infrastructure and Water Management, and Natuurmonumenten (through the Droomfonds contribution). [4] The aim was to expand the budget to €75m during the project through fundraising. Natuurmonumenten bore this responsibility. But ultimately, this fundraising goal was not met. [2] Some say the expeditiousness was partly to blame for this. Indeed, the "go / no go" moment (€50m spent, question whether the next €25m will also be spent) was reached so quickly that raising the extra funds from third parties was no longer feasible, so that in the end both the public (total: €47.5m) and private parties (total: €30.5m) that were already involved in the project delivered the extra funding. [2] With more time, the success of the fundraising would not have been a certainty either, but there would have been more room to further develop a possible business case for private investors. In addition to the aforementioned parties in the cooperation agreement, the province of Noord-Holland and the municipality of Lelystad (indirectly, to the facilities of the port) eventually also contributed financially. [2]

See the following table for an overview of the financial contributions per party to the realisation of Marker Wadden (phase 1, excluding the extension). This does not include the costs of management and maintenance by Natuurmonumenten. [4] The KIMA is (also) paid for separately.

	Party	2014 agreement	Supplementary	Total
Public	Ministry of Economic Affairs	€15m	€4m	€47.5m
	Ministry of Infrastructure and Water Management	€15m	€3m	
	Prov. of Flevoland	€3.5m	€3m	
	Prov. of Noord-Holland	-	€4m	
Private	Natuurmonumenten (own contribution)	€1.5m	€7m	€30.5m
	Natuurmonumenten (Droomfonds)	€15m	€7m	
Total		€50m	€28m	€78m

Table 1 - Summary of financial contributions by party, based on sources [2], [4] and [9]

2. Project and knowledge governance

2.2 Construction strategy and costs

Tendering without full coverage
As mentioned, at the time the tender started, the full target budget of €75m was not yet available. This raised a dilemma: in principle, only work that is also covered by funding can be tendered. But that would mean that a second tender would be needed at a later date for the remaining €25m This would cause delays and additional administrative burdens, while there is no obvious benefit of competition when one organisation is already constructing major parts of the project. An interviewee told us that a solution to this was found by introducing work with a €25m estimate as a form of "planned additional work", which could be commissioned as soon as the funds became available. The contracting authorities have been transparent about this to the contractor. In the interview it was stated that this choice was made in the interest of the project and followed procurement rules.

Cost and physical realisation
The budget of €75m was used as a fixed point of reference during tendering and realisation. During the tender, contracts were awarded based on best quality within a fixed budget, with the size of the landscaped nature area as the main selection criterion. [2] Contractors could also win points through other qualitative plans, which is why they also used ecologists and landscape architects when preparing their offer.

With a fixed budget, and the desire for maximum quality, belongs a set of requirements that is not set in stone. We were explained that central elements of the design, for instance the location of the public harbour, were not fixed. This gave contractors room to optimise the design.

The budget was adhered to during construction. Interviewees explained that it meant that the client and contractor sat down regularly to discuss progress and developments, with the budget being fixed and the scope being the main variable. The desire to realise an area as big as possible for a fixed price remained. This created a mutual relationship between client and contractor that went beyond the "traditional" relationship, where the contractor is merely an executor. However, the working method did not go as far as, for example, an alliance contract, where both parties explicitly take financial risks. In the end, the chosen working method was successful, according to those directly involved, and the willingness of all parties to work well together was a critical success factor.

On budget and well within schedule
We note that, all in all, the project was realised almost within the originally targeted budget of €75m. We consider the difference (€75m budgeted and €78m spent) to be nearly negligible. The physical realisation was also in line with original planning. An area of about 500 hectares of land was targeted; realised is about 480 hectares. And the schedule was also met: the set completion date for the project was 31 December 2020. The first island was already officially opened to the public on 8 September 2018, and the rest was also completed well before this set completion date. Several interviewees tell us that choices were also made on the contractor's side that contributed to fast and cost-efficient implementation: a fairly large dredging vessel that became available soon after the project started, was used by the contractor for the work. This allowed a lot of surface to be offered at a relatively low cost.

2. Project and knowledge governance

2.3 Post-construction management

Discussion on management responsibility

The post-construction operational management of Marker Wadden is one of the more complex issues in the project and knowledge governance. It involves a piece of new land, for which there is no single designated manager. Many opinions were shared in the interviews on which party would be best to hold this responsibility. In favour of choosing Rijkswaterstaat as manager, it speaks for the fact that Rijkwaterstaat is manager of the national waters and thus of the Markermeer. From the idea that management of the ecological system should be in one hand as much as possible, Rijkswaterstaat might have been the logical organisation. On the other hand, Marker Wadden does not have an obvious water safety function. Also, nature management is not the core competence of Rijkswaterstaat and, certainly at the time of the preparation of Marker Wadden, received less attention. By 2022, incidentally, Rijkswaterstaat's vision on this has evolved. In a broader sense, Rijkswaterstaat now profiles itself more as a nature manager.

A decisive factor in the decision to let Natuurmonumenten manage the nature islands (with the exception of the sandy edges, which are still temporarily managed by Boskalis) was the strong desire from Natuurmonumenten itself to get the ground lease right and thus the responsibility for management. There were also substantive arguments for this, interviews revealed. Firstly, as the initiator of Marker Wadden, Natuurmonumenten is best acquainted with the nature objectives and therefore best placed to steer for results with management activities. Secondly, Natuurmonumenten can manage the area very cost-effectively, through the efforts of its volunteers as well as the full use of the commercial revenues for management; this is not possible, or at least very difficult to achieve for a government agency. And thirdly, Natuurmonumenten has extensive experience with nature management (in combination with recreation).

Financial arrangements, opportunities and risks

For the management tasks, Natuurmonumenten incurs costs, even though these are relatively low due to the use of volunteers. Natuurmonumenten also pays a (nominal) ground rent. The ground rent is fixed for 30 years and amounts to €1 per hectare. As long as the function of Marker Wadden remains the same, the ground lease also remains with Natuurmonumenten. This has been contractually established.

Natuurmonumenten pays for the management partly from the recreational function of Marker Wadden, which gives it an independent revenue model: visitors pay for the ferry service, spend money in the pavilion and can stay overnight in some cottages. Proceeds from this benefit the management of Marker Wadden. Management is also partly funded from Natuurmonumenten's own funds as an association.

The financial aspects of management involve both opportunity and risk. This has partly been laid down in agreements, but some consequences remain partly implicit. There is a chance that Marker Wadden will generate more income than expected. It was therefore decided to review Natuurmonumenten's income from the management of Marker Wadden every five years. Unexpected extra revenues could lead to an increase in the ground rent, we have been told. The "downside" is less clear; a few pointed out that Natuurmonumenten may not have sufficient funds available especially for "bigger" management tasks in the future, such as continuing to fill the silt islands or future maintenance of the sandy edges.

2. Project and knowledge governance

2.4 Knowledge programme (KIMA)

The research programme KIMA

In 2017, Rijkswaterstaat, Natuurmonumenten, Deltares and EcoShape set up the KIMA. [2] Participating parties signed a letter of intent a year later, establishing the research programme as a partnership and officially launching it. The KIMA is inextricably linked to Marker Wadden. It is an overarching research programme under which all learning and research activities surrounding Marker Wadden take place. The programme aims to gain as much relevant knowledge as possible about the innovative way of the realisation of nature displayed in the project. In addition, it aims to "increase the project's societal added value and thus to maintain and strengthen the Netherlands' leading position in ecology, hydraulic engineering and water governance." [2]

Content scope and organisation

Participants of the KIMA are companies, research institutes, governments and NGOs working together on research on three main themes: (i) Building with silt, (ii) Ecosystem of value and (iii) Adaptive governance. One of the main features of the KIMA approach is the 'Living Lab'. This means that the entire project area is set up as a research environment, where interested parties can conduct research and experiments on their own initiative. [10] There is, as it were, an "open invitation" for research, with the intention of generating even more knowledge. [2]

The programme has its own Steering Committee and a core team. The four founders are represented in both bodies. The core team is in charge of the day-to-day management of KIMA. There are also 'topical groups', linked to the three themes mentioned above. The core team provides coordination between the Steering Committee and the topical groups.

[10] Rijkswaterstaat, Deltares and Ecoshape contribute financially to the programme. The KIMA has a total cost of €5m, of which €1m is contributed by Deltares. [10] This leads to the situation that Deltares is not only a contractor, but also a co-owner of the programme. A contribution of €1.5m was made by the Ministry of Infrastructure and Water Management (Directorate-General Water and Soil)), via a contract to Rijkswaterstaat. This makes the Ministry of Infrastructure and Water Management the client of the knowledge programme, without being part of it itself.

Source [C]

2. Project and knowledge governance

2.5 Conclusions project and knowledge governance

Our main conclusions from this part of the evaluation are as follows.

There were no obvious conflicts of goals between the parties
Differences in interests were not perceived as conflicting by the parties during the project, partly because there was mutual understanding and transparent communication. Of course, it cannot be ruled out that conflicts of interest may become manifest in the future, for instance in the case a further expansion of the project has an effect on the freshwater supply of the Markermeer, or regarding choices in type of management of Marker Wadden.

Smooth realisation and cost-efficient management
The project was realised within budget, schedule and physical scope. Expeditiousness as a project philosophy was an important factor, as was keen steering on a fixed budget as a point of reference. The contractor's choice of a dredger with relatively high capacity also put less pressure on the construction schedule.

The choice to make Natuurmonumenten responsible for post-construction operational management is cost-efficient, since a lot of knowledge is available at Natuurmonumenten and since, unlike government agencies, Natuurmonumenten can work with volunteers and use commercial revenues for management.

Some discussions about operational management are not yet settled
There were logical arguments for choosing Natuurmonumenten as manager. But we see that "under the surface" there is still discussion about the management issue, both between Rijkswaterstaat and Natuurmonumenten, and within different parts of Rijkswaterstaat. A factor in this is that, in the perception of some (not all), Rijkswaterstaat now, more than a decade ago, presents itself as a manager of nature.

3. Goal 1: Ecology (FPES) and recreation

3. Goal 1: Ecology (FPES) and recreation

3.1 The goal and underlying MEP-questions

The first goal of the Marker Wadden project, according to the KIMA Synthesis Report, reads:

"For the Markermeer-IJmeer, the future perspective is a Future Proof Ecological System (FPES): an ecological system that is vital, varied and robust and that offers the legal space to enable the desired (large-scale) spatial and recreational developments. The first phase of Marker Wadden is seen as an important step in the Rijk-Regioprogramma Amsterdam-Almere-Markermeer (RRAAM) to improve the ecological quality and recreational opportunities and thus achieve the FPES. "

For the above objectives, the following evaluation questions have been defined as relevant within the Monitoring and Evaluation Programme (MEP) Marker Wadden: [11]

1. Does Marker Wadden contribute to achieving the ecological targets that are set for the system and for the whole of the Netherlands (Natura 2000 objectives and the Water Framework Directive)?
2. Does Marker Wadden contribute to the productivity of the Markermeer-IJmeer?
3. Has the construction of Marker Wadden resulted in a desired conversion of silt into a stable substrate, suitable for the development of a higher diversity of habitats for flora and fauna?
4. Has the construction led to more diversity in the underwater landscape and how far does this influence extend? (For example, has the spatial variation of mobile silt in the water column increased and are there changes in the soft silt layer on the bottom of the Markermeer?)
5. To what extent does the construction of Marker Wadden create (legal) space for spatial developments (RRAAM objectives)? And to what extent does Marker Wadden limit this (potential) use of space (circles of influence surrounding Marker Wadden)?
6. To what extent are goals concerning co-use of Marker Wadden and Markermeer met (recreation, fishing, shipping)?

In the following pages, we discuss the results for this objective. We distinguish between the monitoring results (to be read as: results from written sources) and insights from the interviews and our own analysis within the framework of this evaluation. We deliberately report the results from the monitoring briefly; for further explanations we refer to the underlying documents.

NB. unless otherwise indicated, the monitoring results in this section come from the KIMA Synthesis Report.

3. Goal 1: Ecology (FPES) and recreation

3.2 Monitoring results

Vegetation on land and under water
On Marker Wadden, pioneer vegetation developed almost immediately after realisation, in particular marsh endive and red goosefoot. In addition, bulrush and reed, partly supported by specific management (seeding and placement of rhizomes). Development towards a nutrient-rich reed marsh is underway and new habitats have developed, such as: shallow waters, high sandy parts, mudflats and land-water transitions.

The vegetation on Marker Wadden is still developing; its composition changes mainly due to natural processes every year. Between the years 2018 and 2021, there was a large increase in vegetated area. Forest formation is also visible on a small scale.

Although no new species of aquatic plants for the IJsselmeer region have been discovered at Marker Wadden, relatively rare species such as curlyleaf pondweed, short-leaved water-starwort, fan-leaved water-crowfoot and rigid hornwort are now more common. In general, in the Netherlands, species belonging to the habitat 'shallow water' are underrepresented; Marker Wadden thus contributes positively to the diversity of aquatic flora. This is also true in a spatial sense, since around the chosen location in the eastern part of the Markermeer there was hardly any aquatic vegetation.

Benthic fauna
Locally, and spatially at the level of the water system, Marker Wadden contributes to a diversity in invertebrates. Nonbiting midges, flies, butterflies, dragonflies, beetles and spiders have reached the islands. Worms and mosquito larvae have also been found in the deep wells around the islands.

Fish species
Fish species observed are mainly the common species with relatively low requirements concerning habitat (non-critical species). Habitat diversity does benefit different fish. Lee, shallow inlets promote (underwater) vegetation development and are therefore suitable as spawning areas as well as areas for juvenile fish to grow up (due to shelter). High densities of fish larvae have been found in the reed banks of the harbour. And zander and bream regularly use the sand extraction wells. The low visibility of the effects of Marker Wadden on the development of local fish stocks are related to the currently limited areas of shallow waters (with rich marsh vegetation).

3. Goal 1: Ecology (FPES) and recreation

3.2 Monitoring results

Water quality and productivity
Because winds from the west and south-west dominate, on average relatively clear water is found in the west and murky water in the east of the Markermeer. This is reinforced by the fact that the west is shallower, has a thinner layer of silt, has a lot of aquatic plants and hosts filtering triangular and quagga mussels. The Marker Wadden construction site in the eastern part has deeper water (4m), a decent silt layer and no aquatic plants or mussels.

Water murkiness affects productivity. The production of phytoplankton - an important food source for other organisms - suffers from lack of light and probably also decreased phosphate supply. Phytoplankton attaches to silt, making it less suitable as a food source for organisms such as water fleas or mussels, which in turn act as food for fish and birds.

Marker Wadden could be expected to contribute to the productivity of the Markermeer in two ways: by creating lee areas and by connecting reed marsh to the lake. In practice, construction work was also found to have a temporary effect on the productivity due to the recirculation of nutrients from the sediment.

The realisation of Marker Wadden has created lee areas (on the east side of the islands) on a limited scale, with new gradients in clarity. In lee areas, the ratio of chlorophyll to suspended matter appears high, meaning phytoplankton is more readily available to the food web. So far, only local effects have been identified. (Almost) all compartments of Marker Wadden are now in open communication with the lake, but this is still too recent to measure possible effects on the entirety of the Markermeer. Marker Wadden is still to less developed to act as an organic carbon source for (a larger part of) the Markermeer. This is expected to require significant further development and maturation of the nutrient-rich marsh.

Recreation
Marker Wadden attracts many visitors and the visit is highly rated. See page 35 of this report.

Bonding with the local population (especially from Lelystad) is still difficult, as it concerns an island. In practice, the fact that you can only get there by boat poses little obstacle for people to visit the islands. There is extra attention to the management of the bond between visitors and the project, among other things through the participatory monitoring model: Marker Wadden appeals to birdwatchers, who can record their observations digitally. Additionally, methods of contributing to the monitoring of insects and butterflies have also been developed for visitors.

3. Goal 1: Ecology (FPES) and recreation

3.2 Monitoring results

Silt as a building material

Marker Wadden is built with large amounts of (holocene) silt, originating from the subsurface of the Markermeer. The silt consolidates, so filling takes place in stages. The speed of consolidation depends on the water level. This makes water level management an important variable in controlling the consolidation process. Consolidation stops only once the silt layer has sufficient density to form a self-supporting structure. Silt monitoring took place in separate compartments - designated for research. This showed, among other things, that the final density of the silt is higher than previously expected. As a result, a bigger volume of silt was needed for the filling than was taken into account in the design.

The original idea was to build the islands with the holocene material and to gain experience in using captured fine sediment as a building material for future islands. The latter did not succeed in practice. Not enough fine sediment was initially captured in the silt trench (currently, the trench and wells do contain a lot of silt). For this reason, the compartments were filled with holocene sediment at the time. Less knowledge was therefore gained about applying fine sediment as an innovative method for island construction than previously hoped.

The holocene material that was used instead turned out to be very nutrient-rich and favourable for the germination and rapid growth of vegetation. Pioneer vegetation developed almost immediately, and the new land was also passable for geese within weeks. As a result, management was also needed from the start to protect the planted reeds from being eaten by the geese. The reeds on the islands are rooting fast and deep. This helps to retain silt and prevent erosion.

As the islands continue to subside due to progressive consolidation, they are also expected to require periodic embankment. In theory, this can be done with the fine sediment from the silt trench, as it does capture enough for future maintenance of the islands. However, due to the lack of practical experience with this thin material for construction purpose, there are important concerns: the low density and uncertainty about the quality of fine sediment as a productive substrate. The KIMA Synthesis Report recommends testing the use of fine sediment for maintenance of Marker Wadden and monitoring its effects.

3. Goal 1: Ecology (FPES) and recreation

3.3 Insights from evaluation

Monitoring shows predominantly positive effects locally
Monitoring of vegetation, benthic fauna and water quality paints a positive picture so far. Definitive conclusions are mostly not yet possible because the area is still developing and/or because measured effects are limited to the project area itself (as opposed to the entire Markermeer).

It is noted by stakeholders that Marker Wadden is a unique project in terms of scale that already has verifiable ecological value (partly precisely because of that scale). People are positively surprised at how nature is establishing itself in the area and the project is seen as a successful action for improving ecology. On the other hand, little can yet be said about (future) effects of Marker Wadden on the entire Markermeer. Local effects in water quality and productivity are visible, but effects on a larger scale are not yet visible. And in terms of fish stocks, little change is currently observed. This observation is supported by the "Natuurthermometer Markermeer-IJsselmeer 2021" [12]: the nature projects that have been implemented in the area, such as Marker Wadden, are contributing to better conditions for plants, fish and birds. Effects are visible locally, around the projects, but not in the entire area. This is going to need several years and has to be of sufficient scale.

This immediately raises an important point. One cannot expect a single project to solve the ecological challenge of the Markermeer. The current 1,000 hectares of Marker Wadden are only part of the solution. This partly explains the apparent limited effect on the Markermeer. For imaging purposes: according to one of the interviewees, there is a goal, which stems from the FPES, to turn 10% of the water surface of the entire Markermeer (approx. 700,000 hectares) into floodable reed marshes no deeper than 1.5 metres. Also relevant in this context: the KIMA Synthesis Report states that the contribution of the design of the Marker Wadden to the improvement of water quality was considered less important for the selection of a contractor during the tender, as the area of influence was considered too small. [2]

Location, design, contract design and management influence achievement of goals
The location of Marker Wadden is the deeper part of the Markermeer, with relatively high levels of silt present and the absence of aquatic plants and mussels. As a result, the potential ecological gain was greater than if Marker Wadden had been realised in the western part of the lake. From a recreational perspective, it is also conveniently located near Lelystad. And because of its distance from land, it is a relatively quiet area for migratory and resident birds. The design of the islands also ensures lee areas and the creation of favourable ecological conditions. In the contract design, construction requirements were set that have had a positive impact on flora and fauna, such as steering for the largest possible area and limiting the amount of construction material allowed to come from outside the Markermeer. Finally, management was aimed at preserving valuable pioneer vegetation, which in turn attracts special species of breeding birds. These choices all contributed to the FPES targets.

3. Goal 1: Ecology (FPES) and recreation

3.3 Insights from evaluation

Active management needed initially, future unclear

For the time being, the concept of Building with Nature translates differently in Marker Wadden than in other projects, for example the Sand Engine (de Zandmotor). While sediment extraction has been used in both cases to create new land, the Sand Engine was more about "letting nature do its work", while Marker Wadden seems (initially) to require quite a lot of management to (continue to) achieve its goals, and natural processes play a smaller role in construction. The aspect of letting nature do its work was sought through the construction of "wash-overs", but in practice these have not yet worked well. Furthermore, the original idea of using captured silt from the silt trench ultimately did not work well. [2]

In the meantime, the management ambition has also been adjusted. [3] Originally, the "natural landscape" management strategy was assumed for the entire 10,000 hectares of the project area, but it was later realised that this was not realistic for phase 1. At the beginning, human influence is still so great and the area so small that natural landscape-forming processes could not exist. The ambition was, however, to keep internal management at a minimal level and to deploy nature management only when the way the islands were developing started to cause friction with the set requirements. [8] An observation in this evaluation is that relatively much management was needed to adjust, including the planting of reeds and the prevention of geese eating the reed. There are indications that the intensity of management may well reduce over time (see page 36), but it is also quite possible that more weather extremes will create new management challenges in the future. There is no accurate prediction of this at the moment.

Can targets even be quantified?

Around the construction of Marker Wadden, there has been reluctance to quantify targets (KPIs) very tightly in advance. There are a number of reasons for this:

- This is an innovative project that has not been realised in this way before. A quantitative prediction of targets is therefore extremely difficult.
- This is an area in a dynamic environment that can only be partly modelled. The behaviour of new flora and fauna is difficult to predict.
- Measurements during the construction phase were partly influenced by the construction activities, possibly leading to an underestimation of ecological effects.
- Marker Wadden is one of the projects to contribute to the FPES. But in addition, there are several other interventions, and it is never one-to-one identifiable which system-level effect was caused by which intervention.
- In a general sense, KPIs sometimes offer false security because they assume a binary world (achieved or not achieved). By looking at trends instead, more attention could be drawn to "shades of grey".

The great advantage of the reluctancy to quantify targets too tightly is that it creates a more holistic approach to the value of the project: not being judged on a few targets that might just fall short but being able to steer based on "best for project" and focus on overall value. This also means that a final verdict on the success of the Marker Wadden on multiple individual components is not easily possible. But as mentioned, positive effects have been observed on a local scale.

3. Goal 1: Ecology (FPES) and recreation

3.4 Conclusions goal 1

Our main conclusions from this part of the evaluation are as follows.

Predominantly positive effects at local level, but too early for conclusions
Indicatively, Marker Wadden has shown that it is possible to initiate a positive ecological change. The monitoring results for vegetation, benthic fauna, water quality and productivity so far show positive results on and surrounding the islands. Marker Wadden contributes to the FPES for the Markermeer.

At system level, few statements can yet be made. Firstly, since Marker Wadden is still in an early ecological stage, long-term effects are uncertain. But also because the current project area is only a small part of the entire challenge. Consequently, it was stated beforehand that the Marker Wadden's zone of influence would be too small to cause a significant improvement in water quality.

Logical choice not to set (too many) target values in advance
There are several reasons not to set too many numerical targets beforehand in such an innovative nature development project. The choice not to focus on target values but on the overall picture helps to make choices based on "best for project".

There is limited knowledge about building with silt, more monitoring is needed
It is also too early to conclude on silt as a stable substrate. The consolidation of silt and succession of vegetation is still ongoing. The holocene material used appears to be very nutrient-rich and therefore favourable for the development of vegetation. However, little knowledge has been gained so far on the innovative application of fine sediment as a construction material. Meanwhile, enough fine sediment is available for the maintenance of the nature islands, and it is recommended to start testing and monitoring its behaviour as a building material. Based on this, relevant lessons for the future can be formulated.

4. Goal 2: Bird paradise

4. Goal 2: Bird paradise

4.1 The goal and underlying MEP questions

The second goal of the Marker Wadden project is described in the KIMA Synthesis Report as follows:

"The aim is for Marker Wadden to develop into a large-scale marsh with a great diversity of resting and foraging areas for birds. In doing so, the ambition is to conserve target species from Natura 2000 and reverse negative trends. Possibly, Marker Wadden can also contribute to hosting nationally relevant Natura 2000 bird species. A precondition for a bird paradise is to increase food availability. Furthermore, a goal is to let the public experience Marker Wadden as a bird-rich nature island."

The goal has been translated into two questions in the MEP: [11]

1. Is Marker Wadden developing into a productive and sustainable ecosystem for marsh and water birds?
2. Is Marker Wadden perceived by the public as a bird paradise?

In the following pages, we discuss the results for this objective. We distinguish between the monitoring results (to be read as: results from written sources) and insights from the interviews and our own analysis within the framework of this evaluation. We deliberately report the results from the monitoring briefly; for further explanations we refer to the underlying documents.

NB. unless otherwise indicated, the monitoring results in this section come from the KIMA Synthesis Report.

4. Goal 2: Bird paradise

4.2 Monitoring results

Marker Wadden has appeal for birds
Almost immediately after realisation, Marker Wadden proved to be a suitable and popular area for birds. In a short period, a diverse resident bird community with 47 different species has emerged (measured in 2021). Migratory birds are also finding Marker Wadden, attracted by the availability of food and secluded areas. In the 2020/2021 season, there were more than 60,000 migratory birds.

Marker Wadden is attractive to pioneer bird species. The breeding success of these pioneer birds varied per species and also per year but was generally good to very good. The pioneer vegetation and macrofauna in the water surrounding Marker Wadden have proven to be an important food source for both pioneer species that breed on the Marker Wadden (pied avocet and chicks of little tern and plover) as well as non-breeding pioneer birds (northern shoveler and Eurasian teal). The role of pioneers will decrease in the coming years due to overgrowth of bare spots. However, with targeted management, enough bald patches will remain on Marker Wadden for populations of smaller-sized pioneer birds for the foreseeable future.

For water and marsh birds, avian communities have emerged. However, these are still in the early stages of development, appropriate to the stage of development of the nature on the islands.

Species and stage of development are related
Following on from the above: the attraction of the area for a particular type of bird depends on the stage of development of nature. The first breeding birds to settle make nests on bare sand and among low pioneer vegetation (such as common tern and Kentish plover). With the emergence of other vegetation, the population of black-headed gulls, for example, increases, which is now coincidentally the most common breeding bird on the islands.

Without targeted management, habitat for birds that breed on bare ground, such as terns, plovers and avocets will shift to the newly created islands, and finally decline. Other communities, such as birds that breed in land rich with reed, shrublands and thickets will increase in the coming years. An emerging community of marsh birds has also been identified in the last two years; almost all on the main island where reedbeds are sufficiently developed to provide favourable habitat.

Diversity of bird species in the Markermeer has increased
The construction of Ierst, Marker Wadden and Trintelzand has clearly increased the diversity of birds in this part of the Markermeer. The average number of species observed from the air almost quadrupled between 2016 and 2020, from 6 to 23. The new area - in combination with Ierst and Trintelzand - has also proven suitable for bird species that did not - or very rarely - breed in the Netherlands before. Examples are the successful breeding of a long-tailed duck and the nest find of a dunlin.

The size and location of Marker Wadden contributes to an increase in observed bird species. The new islands encourage birds to also use Ierst, Trintelzand, Oostvaardersplassen and areas in the south-western part of the IJsselmeer. One of the species doing so is the Eurasian spoonbill.

4. Goal 2: Bird paradise

4.2 Monitoring results

Contribution to Natura 2000 objectives
For the Markermeer, there are Natura 2000 conservation objectives for both resident and migratory birds. In the category of resident birds, the target for the cormorant on the Markermeer has not yet been met; it has not been spotted on Marker Wadden either. The common tern has been breeding on Marker Wadden since 2017 and ground counts show that the target for this species has been met every year since then.

For Natura 2000 conservation objectives of migratory birds, targets have been set for 18 species on the Markermeer and Marker Wadden has made a favourable contribution in 14 of them. The numbers vary greatly for each species of bird.

High rating from visitors, some disruption though
Visitors greatly appreciate the landscape and experience on the island. A survey shows that 96% of visitors feel welcome in the area. Almost all visitors state that they would like to return. The vast majority of respondents come to hike, observe flora and fauna and take photographs. Visitors most often come by ferry or else by private boat or charter.

The accessibility of Marker Wadden to recreational visitors (and researchers) and the construction activities (also at surrounding projects such as Trintelzand) have caused disturbance to birds. The degree of disturbance varies per species. For example, molting water birds are particularly sensitive to construction activities. Disturbance can be partly reduced by creating recreational zones and providing sufficient viewpoints, which is what is done in practice. This provides recreational users with good vantage points but prevents people from going into areas where it would be better not to go from a bird's point of view.

4. Goal 2: Bird paradise

4.3 Insights from evaluation

Management affecting vegetation and bird development
The development of bird species goes hand in hand with vegetation succession, but its continued management is essential. As manager, Natuurmonumenten is responsible for securing longer-term goals. Initially, much effort is needed to give small marsh vegetation space. The idea is that once it has established itself in sufficient size, the (unwanted) willow forest will not have a chance, and subsequently management activities can be scaled back in that context. As an illustration, the Oostvaardersplassen have been mentioned, where there has been stable reed vegetation without willows for decades. Reed in water sometimes becomes open water due to grazing by geese or other birds; reed on drought can remain stable reed without too much management.

However, some bird species actually do need forests. Forests were deliberately resisted in the first phase, but now the plan for one of the extra islands - that is part of the extension of the first phase - is to see how the island develops without active management. This is to promote a diversity of species on and around Marker Wadden as well as to learn from it. At the same time, this example shows that different management choices may have to be made for different project goals (FPES and Bird paradise). A conflict of objectives therefore cannot be ruled out. This requires continued attention to the consequences of management choices.

Natura 2000 objectives match poorly with system restoration
Several interviewees indicated that the Natura 2000 objectives are prohibitive in several respects. These targets are used to manage the conservation of certain species. The targets are set at some point in time and are therefore a snapshot, so to speak. In projects where system restoration is the aim (the system as it once was), just as Marker Wadden is intended to contribute to system restoration of the entire Markermeer, this can have an opposite effect. A possible situation might occur where system restoration is achieved, but at the same time might cause target species to decline or disappear, which is unfavourable in terms of Natura 2000 objectives.

Policymakers are showing awareness of this. Within the Ministry of Agriculture, Nature and Food Quality this is on the radar, partly inspired by Marker Wadden.

Disturbance is inherent to the combination of nature and recreation
When combining recreation and nature in one project, there will always be some friction. It is important to find the right balance. Without visitors, an area quickly receives little attention and is much less actively experienced; with visitors, there is a risk of too much disturbance of flora and fauna. By investing in a considerable number of hectares of nature area, of which substantial parts protected from recreation, the disruptive effect is limited. This has contributed to the ecological results that are now observed.

For a possible continuation of the Marker Wadden project, the idea is to create an island, accessible by land (instead of by boat). This will add a new dynamic to the visiting of the current islands; it is not inconceivable that this will decrease slightly.

4. Goal 2: Bird paradise

4.4 Conclusions goal 2

Our main conclusions from this part of the evaluation are as follows.

Marker Wadden is an attractive area for birds
Almost immediately after realisation, Marker Wadden proved to be a suitable and popular area for birds. Within a few years, a diverse community of resident birds emerged with 47 different species. The appeal for birds depends on the development stage of the nature islands. The first resident birds settled on bare sand and among low pioneer vegetation; with emergence of other vegetation, other populations increase. The continued success of the "bird paradise" does depend on targeted management. As the area is still forming, the structural impact and long-term effects on the variety of bird species are still difficult to pinpoint.

Some disturbance to birds occurs due to visitors to Marker Wadden. But due to the many hectares of new nature and the restricted access of the area for visitors, this is limited.

Visitors experience nature as very positive
Visitors indicate in a survey that they greatly appreciate the landscape and experience on the island. Almost all visitors say they would like to return. Experiencing nature is a main reason for visiting Marker Wadden.

Natura 2000 is too narrow an approach to ecological value
The Natura 2000 objectives are quantitatively determined for specific species. This gives them the character of hard targets. However, in striving for system restoration, it is possible that a situation might occur where the successful restoration works opposite. Assessing the added value of a bird paradise, as has been demonstrated on and around Marker Wadden, therefore requires taking a broader view of ecological value.

5. Goal 3: Learning and innovation

5. Goal 3: Learning and innovation

5.1 The goal and underlying MEP questions

Unlike the other two objectives (FPES and Bird paradise), the third objective ('Learning and Innovation') was not part of the MEP, but this was rather the means to achieve it. The MEP formulates the following two – open-ended - evaluation questions for this goal: [11]

1. What can we learn from the realisation?
2. How can the gained knowledge 'flow through' to science and practice?

In the following pages, we discuss the results for this objective. As in the previous chapters, we distinguish between monitoring results (to be read as: results from written sources) and insights from the interviews and our own analysis as part of this evaluation.

NB. unless otherwise indicated, the monitoring results in this section come from the KIMA Synthesis Report.

5. Goal 3: Learning and innovation

5.2 Monitoring results

Cooperation within KIMA
The KIMA encouraged cooperation between various parties in research and knowledge development. The open character of the programme (based on the governance of the National Knowledge- and Innovation Programme Water and Climate, NKWK) also made it easy for third parties to join as research partners on certain topics, using their own money and man-hours. This did however result in more complicated accountability (not only to the KIMA steering committee, but also to all investors) and a lack of central control of the various research projects.

Dissemination by KIMA
Since its inception, the KIMA has invested in knowledge gathering and knowledge sharing. This has included: workshops per theme, an several overarching annual research and fieldwork plans, a mid-term review, annual conferences and other formal and informal forms of communication such as newsletters, publications and reports. All this was done based on a communication plan.

The KIMA has resulted in 10 scientific papers, three PhD theses and 46 reports. Scientific research within the KIMA was done in the 'Nature in Production' programme, with three PhDs and one postdoc. Six activities have now been completed or are underway within the Living Lab. These projects provide information on coastal protection (dune development and strengthening of the Houtribdijk) or test innovative measurement methods. A fact sheet has been made of each activity within the Living Lab and can be found on the KIMA website.

Knowledge from the KIMA has also landed in TV programmes and in a documentary, thus contributing to positive attention for the project.

Various areas for improvement
Much knowledge was gained, and the KIMA managed to collect integral lessons on Marker Wadden, building with silt, ecological development and governance. However, specifically data collection, data management and accessibility did not get off the ground well enough. The storage of data was arranged (e.g. through a data management plan), but sharp ambitions and sufficient budget were lacking. Partly as a result of this, it is unclear whether gatherred knowledge can be transferred to other projects or programmes.

Another area for improvement is the knowledge exchange between the construction team and the researchers involved in the KIMA. This was quite limited; the interaction could have yielded more. Researchers felt little space and appreciation for their research activities during the construction phase, which made it difficult to act in accordance with the construction activities. And vice versa, there was too little notion of urgency among researchers for progress of the construction phase.

Finally, many feel that long-term monitoring (>5 years) is not yet well organised. This is important because certain interventions in the ecological system have (visible) effects only after longer periods of time.

5. Goal 3: Learning and innovation

5.3 Insights from evaluation

Satisfied with knowledge gained, time and money were limiting factors
Knowledge partners in the KIMA, and the contractor, are predominantly satisfied with the knowledge they were able to gain so far in the project. For example, a lot of new knowledge on vegetation (development), the effect of management, consolidation of silt and the behaviour of beaches has emerged, which in turn proved useful in other projects. Moreover, it provides the contractor with (international) exposure. Specifically, the research on the North Beach was mentioned, where many students and PhDs were able to do work. Rather unique about the knowledge organisation is that commercial parties themselves invested in knowledge development. No conclusions were shared about whether these commercial parties found it was "worth the investment".

Yet, critical notes are also raised. Some discussion partners believe that not enough is yet learned from the studies being conducted. Also, the research is not comprehensive, in the sense that choices had to be made about the topics to be investigated. Lack of funding is identified as one of the main reasons for this. This demanded (too) much selectivity in the topics to be investigated and studies had to stop early. The accumulation of knowledge is seen as an important asset and thus deserves a greater investment, according to those involved.

In line with this, many interviewees regret that the KIMA is ending, especially as the duration of about five years is a short observation period in ecological terms. This corresponds to the picture from the KIMA Synthesis Report. Long-term monitoring requires a vision for knowledge development and additional funding. Both are currently lacking.

Construction and knowledge development poorly connected
Construction work had been ongoing for about two years when the KIMA started. The reason given was that the project team had not set aside enough money to include a knowledge programme in the implementation. According to knowledge partners, the financial contribution requested from them was unrealistically high, which ultimately led to the KIMA not being able to start until much later. This is perceived by many as a missed opportunity.

Knowledge development within the KIMA therefore only had value for the contractor much later, e.g. through the contribution with data on beaches. Construction had a rather small role in KIMA; the contractor did not participate in the programme. Knowledge exchange was not optimal the other way around either. There is talk of limited openness on own monitoring from the contractor to the KIMA. All this does not fit well with the idea of "joint learning", which was an aspiration in the Marker Wadden project. In the end, however, an approach was found in which knowledge exchange took place back and forth. The knowledge the contractor gained about e.g. vegetation development and consolidation of silt was shared with Natuurmonumenten twice a year. This had a function: this showed, among other things, that the sowing of reed was going too slow, and as a result a different method was applied.

5. Goal 3: Learning and innovation

5.3 Insights from evaluation

Embedding of the KIMA still too limited
We note that the KIMA was successful on its own in gaining knowledge, but that it could have had more impact. Incidentally, this is not necessarily the KIMA itself to blame. There is still a lack of structural embedding of the knowledge programme in other (research) projects and programmes. This is especially true on a national scale, where there is no structural interaction between Marker Wadden and projects such as the Sand Engine or Zandmaas/Grensmaas. This interaction could help in the joint generation of knowledge across projects.

More than just technical innovation
Marker Wadden was innovative, not only conceptually and in terms of design and the intended technique (building with silt), but also in terms of approach. Consider the legal aspects (such as tendering and contract design), the cooperation between Rijkswaterstaat and Natuurmonumenten as a private, non-profit party and the involvement of the public. For instance, during construction, visitors were allowed to visit the area with appropriate safety measures, and this required stepping over a few mental barrieres. These innovative choices quickly threaten to get snowed under in the visible and measurable technical and ecological effects but are at least as valuable.

Monitoring and evaluation, in relation to innovation, is also relevant to mention here. In a "normal" project, there are several ways to achieve a well-defined and measurable objective, such as water safety or traffic flow. There, a "value for money" study is appropriate: have the objectives been met in the most cost-efficient way? With nature (restoration) projects, it is often difficult to predict how the conditions and the nature will develop, so targets are often not sharply defined. In the Marker Wadden project, too, the goals are relatively abstract and formulated more at the system level. What is effectiveness in that regard, can it also be concluded (without appropriate material for comparison) that this is a "good project"? How to read trends in dynamic nature and how to benchmark them in terms of alternative investments? Such evaluations have been done to a limited extent and are in their infancy in terms of their development. The course that Marker Wadden has taken, by keeping pace in the realisation and thereby consciously accepting uncertainty, means that lessons can be learned from the project and steps can be taken in this regard.

5. Goal 3: Learning and innovation

5.4 Conclusions goal 3

Our main conclusions from this part of the evaluation are as follows.

The project has generated a lot of new knowledge
Since its establishment in 2018, the KIMA has invested heavily in knowledge development and knowledge sharing. This has produced demonstrable output, such as reports, dissertations and conferences. This knowledge has reached a wide audience, e.g. through a documentary on Marker Wadden. This has created a link between project, knowledge and public. Many stakeholders are satisfied with the knowledge gained within the project.

Knowledge development is not yet complete
A 5-year study is short in ecological terms. There is still too little attention to long-term monitoring (>5 years) and long-term analyses, while certain effects only become visible later. This requires a vision and additional resources, both of which are currently lacking. Building up knowledge is seen as an important asset and deserves greater investment, according to stakeholders.

Better integration would have yielded more
We find that the KIMA worked satisfactorily on its own, but that the impact of the knowledge programme could be greater. There is still a lack of structural embedding of the KIMA in other government projects and programmes on a national scale. For instance, the Sand Engine project also had a knowledge programme, but the structure for sharing knowledge between projects and generating cross-project knowledge is missing.

In line with this, opportunities were missed to link the construction work (even) more intensively with the KIMA and vice versa. The tricky part here was that the programme was established only two years after construction work started.

Innovation lies in several aspects
There has been visible innovation at various levels; this is not limited to the technical domain but is also in the approach to and collaboration in the project.

6. Conclusions and lessons learned

6. Conclusions and lessons learned

6.1 Structure of the chapter

In this chapter we first present, based on previous chapters, our overarching conclusion from the policy evaluation on the Marker Wadden project. Furthermore, we provide a number of lessons formulated by ourselves, which may be relevant for a possible extension of the project and/or for other similar projects. The lessons are divided into four themes:

1. Lessons on the **construction period**
2. Lessons on the **management phase**
3. Lessons on **knowledge development**
4. Lessons on the **societal value** of Marker Wadden

In almost every case, the lessons are traceable to one or more insights from the earlier chapters of this evaluation report. Occasionally, a lesson contains an overarching consideration that had no place in the structure of the earlier chapters. The lessons also follow the scope of the policy evaluation. For further understanding of the more technical lessons, we refer to the underlying (KIMA) reports.

6. Conclusions and lessons learned

6.2 Overall conclusion Marker Wadden project

The Marker Wadden project added many hectares of new nature to the Netherlands, both within budget and well within schedule. Although optimisations are always conceivable (think of the contribution of private funding to the project), that in itself is an achievement for spatial projects of this calibre. By definition, a pure statement on **efficiency** is not possible. This would require a benchmark on cost efficiency of similar projects. Due to the unique nature of the Marker Wadden project, such comparative material is lacking. Nevertheless, given the combination of objectives, the involvement of various organisations with their own interests, the realisation within budget and planning, and the cost-efficient management, Marker Wadden has many characteristics of an efficiently executed project.

Marker Wadden has three objectives. The project has partially contributed to a FPES for the Markermeer (goal 1). Ecologically, the area is still in its early stages. Monitoring shows positive effects, but of many aspects, effects have been observed mainly locally and/or the final picture is still unclear. In terms of recreation, the goals seem to have been achieved: Marker Wadden is a popular destination for nature lovers. The creation of a bird paradise (goal 2) has been achieved, one could say. Ultimately, no really firm conclusion can be drawn about this, because no targets were set beforehand and the long-term situation has yet to emerge, but the area does host a great diversity of resident and migratory birds and is appreciated by visitors as a bird paradise. Learning and innovation (goal 3) has succeeded to some extent. Much knowledge has been accumulated, but this knowledge has been of limited value in the project (e.g. for construction, because of the timing difference between construction and the KIMA) and in other projects (because of the lack of a higher-level strategic knowledge structure). Innovation has been demonstrably achieved in several aspects.

In short, the project contributed positively to all three goals, and the extent to which differs for each goal. Preferably, more would have been known about the effects of the project on e.g. the water quality of the Markermeer, and more would have been gained from the accumulated knowledge. An overarching conclusion on system-level **effectiveness** is not possible, partly because it is now too early for that, partly because the objectives were formulated open-ended and partly because the causal relationship between project and results is not always clear. The Marker Wadden project shows positive outcomes on all objectives, but whether it is effective at system level will have to be proven by the results of further (ecological) monitoring.

Few, if any, conflicts between the three goals have occurred. To some extent, disturbance of birds occurred due to local tourism (and the construction activities). But by closing four islands to visitors, this was limited and much space was given to pristine nature. For the future, target conflicts such as "nature vs. recreation" and "additional nature area vs. Markermeer as a freshwater supply" cannot be ruled out.

6. Conclusions and lessons learned

6.3 Lessons construction period

Steering through a fixed budget has worked well, but is not possible everywhere
The construction of Marker Wadden had a clear financial framework, and the project was delivered within budget. The choice was made to steer tightly on the budget and less tightly on the scope. In case of windfalls and setbacks, it was always examined how the largest area could be realised within the available budget. If, for instance, it had turned out that building with silt had not been (properly) possible, the team would have been open to building differently or, for instance, constructing less surface area.

The sharpness in budget control provided clarity: there was no room for change orders of the contract in the case of additional work, so there could be no discussion about it. And the clear budget also limited the clients in possible additional wishes. A condition for success, however, was good cooperation between the clients themselves and between them and the contractor. The cooperation with Boskalis was characterized as a good partnership; there was plenty of room to discuss matters. One example is the setback due to the need to refill silt more often than expected. While this was costly for the contractor, it was compensated by the high production of the dredger. If there is no real cooperative relationship with the contractor, matters like this might not see the light of day.

All these insights cannot be translated one-to-one to other projects; after all, it is not possible to build "just a little less" everywhere. But the lesson is that tight budget control does not always have to lead to a purely “businesslike” collaboration.

Ecological target setting can now be done sharper
In the first phase of the project, there was little focus on hard targets/KPIs (such as the extent and diversity of different types of vegetation and birds or certain observed improvement in water quality). This was a conscious and understandable choice. Given the novelty, it was also partly a surprise how the islands would develop, what kind of birds it would attract, etc. Moreover, there was a risk of being judged on (narrowly) missing static targets (such as Natura 2000 conservation objectives) while the added value of the project is broader. Now, towards a possible follow-up, based on the results of the monitoring, it is possible to sharpen the expectations beforehand and to steer even more sharply on this. Without turning into a binary judgement setting; it remains a balancing act between wanting to formulate SMART goals and at the same time maintaining freedom of action. Where uncertainties remain, it is good to make this explicit ('we are doing X, but we don't know exactly what effect this will have on Y').

6. Conclusions and lessons learned

6.3 Lessons construction period

A swift construction phase is partly reproducible
For a large and high-profile project like Marker Wadden, it works well to work with a compact and experienced team, with a high pace and a willingness to take risks, by seeking solutions within the spirit of the rules whilst maybe not literally being in the rules. Expeditiousness was an explicit part of the project philosophy, and that required procedural creativity. In short, especially in project preparation, initiators can achieve rapid project execution by consciously choosing a particular team composition and working attitude.

In addition, there were specific elements that contributed to the speed of construction but were more outside the sphere of influence of the clients. For instance, there was a desire to construct as much new area as possible in the time available and the contractor could dispose of a large-capacity dredging vessel fairly soon after the tender. Besides for the clients, this also offered advantages for the contractor: it could generate economies of scale and had extra time to make adjustments in case of setbacks.

Building with silt has (international) potential
Building or creating land with silt is a concept that can be applied elsewhere in the Netherlands and in other deltas around the world. It is in high demand internationally because of the global shortage of sand. This requires looking towards locations with suitable physical conditions, e.g. large lakes or dammed rivers. Within Europe, one can look at water systems where mankind has restricted natural dynamics, but ecological ambitions have been formulated. The institutional setting is also important: it must be possible to forge a "coalition of the willing" behind the plan.

Experiences with Marker Wadden do reveal areas of concern that need to be taken into account in design and planning. More silt was found to be needed to fill the compartments than assumed in the design (due to the different bulk density). How much silt has been deposited and how much still needs to be deposited is unclear. Another issue is the silt trench. This was part of the design, intended to capture fine sediment, which could then be collected and used as construction material. In practice, however, this did not work out that way; it turned out that initially too little silt ended up in the trench. Less knowledge was therefore gained about the application of fine sediment as an innovative construction method than previously hoped for.

Such insights on building with silt are essential for other similar project. But also for international profiling. The Netherlands wants to further engage in building with silt, and in a broad sense, maintain and strengthen the Netherlands' leading position in hydraulic engineering internationally. It is then important to (be able to) use the examples available for this purpose. Marker Wadden has shown that building with silt is possible, at least for nature projects, because it places limited demands on the strength of the subsoil. The constructor's estimate is that in time, housing construction on silt substrate could also be possible, for instance. However, more research will be needed first, including into the specific adjustments needed and whether it is financially feasible.

6. Conclusions and lessons learned

6.3 Lessons construction period

Success factors from well-run public-private partnership
In the project, Natuurmonumenten and Rijkswaterstaat worked closely together, probably a unique combination. This worked relatively well. Success largely depended on the individuals and their attitude - the will to think constructively and in the interest of the project. It is no coincidence that a compact project team with mostly the same people remained involved throughout the project. Regardless of the dependence on individuals for the success of a project like Marker Wadden, there are some lessons that can also be applied in other projects.

There was mostly open communication and transparent handling of (divergent) interests, and considerations were made in the interest of the project. Having two very different organisations working together allowed different qualities to be utilised and created room for creativity. The project team was able to work with a broad mandate from the underlying organisations and therefore partly develop solutions that were not immediately obvious. Working with "planned additional work" in the tender phase is an example of this.

Greater focus on climate impact and sustainable construction
More attention could be paid to the sustainability of construction in a potential follow-up phase of Marker Wadden, for example through concepts such as CO2-neutral construction and slow building. The latter obviously contains a target conflict with the expeditiousness that was part of the project philosophy. This requires conscious consideration. Working with silt also releases greenhouse gases; this is being measured during the extension of the first phase of the Marker Wadden project. It is good to consider that aspect in future projects.

6. Conclusions and lessons learned

6.4 Lessons management phase

Early arrangements for management, from "best for project" point of view
Marker Wadden consists of new land and the project has multiple objectives. In such a case, there is no single party that should obviously be manager. Therefore, a specific consideration is needed about the who bears the responsibility of management; after all, the manager influences the scope of the objectives.

Clear management agreements are also always needed. The earlier such agreements can be made, the better. In that case a later management strategy can already be anticipated during realisation. For Marker Wadden, these management arrangements have been made for the short and medium term. But new challenges will arise in the future. For example, silt replenishment and maintenance of the sandy edges. The contractor will no longer bear responsibility for the latter at some point and in this policy evaluation the question was raised of whether the current manager is organisationally and financially equipped to deal with this "major maintenance".

Against this background, for future and similar projects, it is important to reason backwards from the long-term goals: who has the skills and capacity to achieve the goals as effectively and efficiently as possible through management? And then: what could and should it cost, and who should bear these costs? This can be written down in a long-term management vision. Such a vision is also an appropriate place to explore the impact of future scenarios and how best to anticipate or react to them.

6. Conclusions and lessons learned

6.5 Lessons knowledge development

Explicit consideration of the timing of a knowledge programme
The KIMA stimulated multidisciplinary collaboration and generated a lot of knowledge on the core elements of Marker Wadden (building with silt, ecological development, etc.). The programme had an “open invitation” for parties to join, which also led to additional research projects on a limited scale. In doing so, the knowledge programme made a valuable contribution to the project itself and also to sectoral knowledge development.

Nevertheless, further improvement is possible. Central to this is the timing of the programme. Within this project, the KIMA was only partly linked to construction: the programme only started after construction, but it ended with delivery. Ideally, the relation should be different: have construction and knowledge development start at the same time, but also have knowledge development continue after completion. The latter is important because in a dynamic and natural environment, many results only become visible and measurable after a longer period of time. All the more so because many construction activities continue to take place, that get in the way of monitoring. In addition, it can be valuable to involve the contractor more directly in the development of knowledge, something that can be included more strongly in the contracting phase. From the point of view of synergy, it is desirable if the contractor is part of the knowledge programme, as knowledge can then automatically flow back and forth, strengthening the effectiveness of the project.

In future projects, it is therefore important for the commissioning parties to provide clarity on the financial framework of the knowledge programme at an early stage. It may also help to set clearer conditions for knowledge sharing between parties in the project. This benefits "joint learning".

Looking to the future, it is advisable to think about the "soft landing" of the knowledge programme. Monitoring of such nature projects, whose effects can only partly be predicted in advance, has a longer horizon than a few years. For certain components, at least, it makes sense to continue ‘light’ monitoring, because too little is known about them after five years. This can be deliberately weighed in the planning and distribution of the budget over the programme in advance.

A strategic knowledge infrastructure can be of value
The knowledge development through Marker Wadden was valuable but could be better embedded in a broader knowledge infrastructure. It is useful to link the knowledge programmes of water and nature projects nationwide, to compare results and to identify best practices across project boundaries. Strategic research assignments can then also be given to specific projects, the results of which can be used more widely. In this way, even more can be gained from research activities. Rijkswaterstaat is involved in several national water and nature projects and seems the logical party to take the initiative for this.

The future policy for large waters (Programmatische Aanpak Grote Wateren, PAGW) is one of the conceivable landing spots for such function of a strategic knowledge infrastructure. Especially since discussions on the feasibility of goals and external influences (such as climate change) are also held within PAGW. In PAGW, structural knowledge assurance and sharing would fit well, even if no budget has yet been earmarked for this from the client. As inspiration, the so-called KING programme that has emerged around some large infrastructural projects (Betuweroute, HSL-Zuid, etc.) can serve as an example.

6. Conclusions and lessons learned

6.6 Lessons societal value

Funding: opportunities for private co-financing?
With the exception of a contribution from the Nationale Postcode Lotterij, Marker Wadden was constructed purely with public funds and money from Natuurmonumenten (non-profit). In theory, the ecosystem services around the nature islands offer opportunities for private co-financing. To attract this form of funding for the construction of new islands, it is important to speak the investor's language and know what objectives are important to an investor. Some form of realism needs to be guarded here: ecosystem services are still in their infancy as a financing instrument, and it is far from certain that they offer a viable route at all. Future, similar projects can be used as pilots for this purpose. In development, it will then be important to focus on the provision of services rather than objects.

In addition to this, it is of course worth pointing out the management costs, which are kept low by using income from tourism and the efforts of volunteers, among other things.

Recognition for iconic value of Marker Wadden
Marker Wadden is an iconic project, innovatively adding a recognisable piece of nature to the Netherlands. Such a project creates value to society, even in ways not foreseen beforehand. An example is the construction of the Erasmus Bridge in Rotterdam: although it was more expensive than building a purely functional riverbank connection, it has resulted in the creation of a recognisable symbol for modern Rotterdam.

Marker Wadden can also be looked at in this way. It symbolises sustainability and innovation and can be used as such. That could lead to positive spill-over effects, for example for the attractiveness of Lelystad, or for the way nature development is viewed in the Netherlands. At the same time, of course, the importance of nature must be kept into account. Too much recreation is not desirable. All this means that careful thought must be given to the communication around Marker Wadden, and that a party must feel responsible for propagating this iconic value.

Appendices

Appendix I - Answering the 12 evaluation questions
Appendix II - Sources

Appendix 1 – answering the 12 evaluation questions

Evaluation question	Concise answer
1. To what extent was the approach to Marker Wadden efficient, both in its preparation and realisation, e.g. think of the use of silt as a construction material?	By definition, a pure statement on efficiency is not possible. However, given the combination of objectives, the involvement of different organisations with each their own interests, the realisation within budget and planning, and the cost-efficient management, Marker Wadden has many characteristics of an efficiently executed project.
2. To what extent have the three policy goals been realised, both locally and nationally, e.g. think of N2000? Is this temporary or has there already been a structural break in the trend? Quantified as much as possible based on available information.	Whether the Marker Wadden project is effective at system level will have to be proven by further (ecological) monitoring. The project does show positive local effects on all goals: • Goal 1: Ecology (FPES) / recreation. Marker Wadden is still in its early stages ecologically. The first positive effects on vegetation, benthic fauna and water quality are visible locally, but not yet measured further away from the islands. In terms of fish stocks, little change is currently visible. Marker Wadden is popular among visitors. Consolidation of silt is still in progress, so it is not yet possible to draw conclusions about silt as a stable substrate. However, it is clear that holocene clay is better suited as a building material (than fine sediment) and appears to be very nutrient-rich. • Target 2: Bird paradise. Although no target values have been attached to it beforehand, it can be observed that Marker Wadden hosts a great diversity of resident and migratory birds and is appreciated by visitors as a bird paradise. • Goal 3: Learning and innovation. The necessary knowledge about Marker Wadden has been accumulated, but this knowledge could have been better utilised in the project, and in other projects. Innovation has been demonstrably achieved in several aspects - not just in a technical way.
3. How can these results be explained? Can any parts of the concept Marker Wadden be identified as being crucial for this, for example in approach, design and location?	Several factors can be identified for realisation within budget and time, such as: sticking to a fixed budget and steering on quality, a solution-oriented attitude of both clients, a good atmosphere of cooperation between them and the contractor, and an expeditious project philosophy. For the contribution to goals 1 and 2, the choice of location in the Markermeer, the design of Marker Wadden (by creating lee areas), the contract requirements set for the contractor and the management undertaken have been factors of great influence.

Evaluation question	Concise answer
4. Could all evaluation questions in the MEP be adequately answered? If not, what is the reason these questions could not be answered and does this affect whether the policy objectives are met?	• For the MEP questions under goal 1, some could be answered, some could not and some could partially be answered. Reasons being that some effects are still only locally visible or that the long-term picture is yet (by definition) missing. For some sub-questions, only anecdotal information was collected within the research programme. • For the MEP questions under goal 2, the same is more or less true: the questions were partly answerable, but the long-term picture (which birds will we mainly see in x years?) is missing for now. • The MEP questions under goal 3 are so open-ended that it is not possible to say whether they have been adequately answered or not.
5. What effect has the Marker Wadden had in a broad context? Not only on water quality and nature, but also specifically on the appreciation of Marker Wadden by visitors of the Markermeer area?	Visitors rate Marker Wadden highly and also like to return. Nature and bird lovers especially like to visit the area.
6. The concept of large-scale transitions of land and water are an important part of FPES. Is there now an expectation that this approach will also lead to achieving FPES targets? What is decisive in this regard?	Between 2017 and 2020, there was a considerable improvement in the FPES system condition 'sizeable land-water zones', partly due to the construction of Marker Wadden. The final target for number of hectares of land-water zones in the Markermeer has thus not yet been achieved, but is getting closer thanks in part to Marker Wadden. Whether the approach will lead to achieving the FPES targets cannot be determined at this time.
7. Succession and management are inextricably linked. Can some pioneer species be preserved with management, and what is the manager's handling perspective in this regard?	With active management, it seems possible to preserve some pioneer species for longer periods of time. Whether this remains successful in the long term is still difficult to say. There is always a risk that willow forest will develop. Experience from other nature projects does show that management efforts can be scaled down at some point. Once marsh vegetation has established itself to a sufficient extent, the chances of forest formation decrease. On the other hand, future uncertain factors, such as weather extremes, will have an impact on the required management efforts, but to what extent is not clear.
8. Work is underway on a follow-up to Marker Wadden (phase 2) as part of future policy for large waters (Programmatische Aanpak Grote Wateren, PGAW). Is this expected to be efficient and effective, and what future areas of concern exist in knowledge development and innovation? Which areas of concern are there for future management?	Several points of interest can be identified - in terms of construction, management, knowledge development and social value - that can be taken into account for a possible second phase of Marker Wadden. See chapter 6 of the main report for these. Partly at the request of the guidance group, this evaluation report does not contain any recommendations on a possible continuation of the Marker Wadden project. Therefore, the study also contains no opinion on the expected efficiency and effectiveness of phase 2. In this sense, a conscious decision was made to only partially answer this evaluation question.

Evaluation question	Concise answer
9. What lessons can be learned from the cooperation between the various initiators during the planning phase, the construction and in the knowledge programme, and what experience has been gained for a more general follow-up?	The public-private partnership between Natuurmonumenten and Rijkswaterstaat was quite unique and worked well. Important in this was the joint attitude to reason in the interest of the project and dare to take risks. Working with a compact and experienced team was pleasant and also important was a high degree of stability of people involved in the project team, which ensured, among other things, that knowledge remained secure. The cooperation between the client(s) and contractor was also characterised as pleasant. The cooperation between contractor and the KIMA was rather limited, which could be improved next time.
10. Can we learn lessons from how Marker Wadden deals with N2000 objectives for future projects in the Netherlands?	Marker Wadden is an example that a system restoration initiative is sometimes difficult to reconcile with the static approach (snapshot) of Natura 2000 conservation objectives. Focusing too much on the Natura 2000 (and Water Framework Directive) objectives creates a risk that the broad ecological added value of a project like Marker Wadden receives too little attention, especially where system restoration is pursued.
11. What are the pros and cons of building with silt and can this concept be applied elsewhere?	Silt is widely available and a "free" construction material. Holocene clay was used for the construction of Marker Wadden. This appears to be very nutrient-rich and favourable for vegetation development. As yet, little knowledge has been gained with fine sediment as a construction material. Points of concern with this type of material are its low density and uncertain quality as a stable substrate. Because of the global shortage of sand, the concept of building with silt is being watched with great interest. Under the right conditions, it is conceivable in other deltas in the Netherlands and beyond.
12. How is the way of working in the knowledge programme appreciated, and can we use it in other areas?	The KIMA encouraged multidisciplinary collaboration and generated a lot of knowledge about the characteristics of Marker Wadden (building with silt, ecological development, etc.). The programme had an “open invitation” for parties to join, which also led to additional research projects on a small scale. The way of working is applicable elsewhere. However, there are issues of concern on how to implement it properly.

Appendix 2 - Sources

Consulted documents

[1] Bestuursovereenkomst RRAAM, 2013
[2] Syntheserapport KIMA – Deltares et al., 2022
[3] Beheervisie Marker Wadden, 2016
[4] Samenwerkingsovereenkomst eerste fase Marker Wadden, 2014
[5] Selectiedocument Eerste fase Marker Wadden, 2014
[6] Uitvoeringsovereenkomst, 2014
[7] Marker Wadden. Innovatie in de praktijk – publicatie Otar, 2021
[8] Leren van Marker Wadden. Over het speelveld en governance opgaven – Deltares et al., 2018
[9] Een uniek project, een unieke samenwerking. De governance van Marker Wadden ontleed – Deltares et al., 2020
[10] Intentieverklaring KIMA, 2016
[11] MEP Marker Wadden – Deltares, 2018
[12] Natuurthermometer Markermeer-IJsselmeer (stand 2020) – Sweco, 2021

Sources of figures

[A] Natuurmonumenten.nl, consulted on the 30th of August 2022, link: https://www.natuurmonumenten.nl/projecten/marker-wadden/noodzaak-van-het-project
[B] Werkplan Marker Wadden ten behoeve van de Natuurbeschermingswet-vergunning, Arcadis, 2016
[C] Ecoschape.org, , consulted on the 21st of September 2022, link: https://www.ecoshape.org/en/pilots/marker-wadden/

Consulted organisations

Boskalis
Deltares
Ministry of Infrastructure and Water Management
Ministry of Agriculture, Nature and Food Quality
Natuurmonumenten
Province of Flevoland
Rijkswaterstaat